Development and the Urban and Rural Geography of Mexican Emigration to the United States

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Past research on international migration from Mexico to the United States uses geographically-limited data and analyzes emigrant-sending communities in isolation. Theories supported by this research may not explain urban emigration, and this research does not consider connections between rural and urban Mexico. In this study we use national data from Mexico to investigate rural and urban emigration. We find that a central motivation for emigration – self-insurance through labor market diversification – is most relevant to less rural, non-metropolitan places. Paradoxically, while Mexican cities have the lowest rates of emigration, the rural places that are spatially proximate to cities have the highest rates. These findings suggest that while urban development retains emigrants within city borders, it may generate emigration out of neighboring rural places.

For most of the 20th century, the geographic origins of Mexican migrants to the United States were remarkably unchanging, as most emigrants originated in "traditional" sending areas, or rural places in the center-west region of the country (Durand, Massey, and Zenteno 2001). After 1970, the proportion of emigrants originating in Mexican cities increased, a trend detected across multiple data sources using different definitions of urban areas (Durand et al. 2001; Lozano Ascencio 2004; Marcelli and Cornelius 2001). Between 1995 and 2000, equal proportions – about a third – of Mexican emigrants originated from households in highly rural places (of less than 2,500 people) and in highly urban places (of more than 100,000 people) (Roberts and Hamilton 2007).

Because of the historical continuity in Mexican emigrant origins, most research on the causes of international migration in the sending country has used data from rural places and/or from the center-west region of Mexico (e.g., Lindstrom and Lauster 2001; Massey and Espinosa 1997; Stecklov et al. 2005; Taylor 1986). This research is complemented by studies using country-level, time-trend data (Bean et al. 1990). As a whole, this body of research understands international migration as a response to the uncertainty brought about by economic development in the sending country and to be sustained over time by migrant networks (Massey and Espinosa 1997).

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This theoretical account reflects the experiences of the traditional emigrant-sending area in Mexico, which was targeted for survey data. It is reasonable to suspect that this account may not be relevant to urban-origin emigration, as the economic and social contexts of Mexican cities and rural Mexico are vastly different and increasingly unequal (Bouillon, Legovini and Lustig 2003). It is also the case that past work, which either analyzed communities in isolation or analyzed country-level data, could not assess potential connections between rural and urban places. In this study, we investigate these ideas using national, municipal-level data from Mexico. First, we test for differences in the theoretical accounts of urban and rural emigration. Second, we test whether emigration levels differ among rural areas based on their proximity to urban places, assuming that proximity is a proxy for integration into, vs. isolation from, processes occurring in cities that may encourage emigration.

Our analysis builds on recent work arguing that predominant theories of international migration may not apply to urban settings (Fussell and Massey 2004). We focus in particular on the new economics of labor migration, which has received substantial support in research based in rural settings. This theory predicts that households use international migration to diversify risk across multiple labor markets, given the underdevelopment of local labor, insurance and capital markets (Stark and Bloom 1985). Because urban labor markets are more highly developed than rural ones, urban households may be able to diversify risks locally, instead of internationally. We test this idea with national data from the 2000 Mexican Census, which allow us to examine the relevance of NELM to emigration across the entire Mexican geography along a rural-to-urban continuum. We find the clearest support for NELM in places marked by mid-levels of urbanization. Second, we test and find support for the hypothesis that the limited explanatory power of the NELM theory in highly urban and highly rural places reflects the unevenness of socioeconomic development across rural and urban Mexico.

An examination of rural and urban differences in international migration implies that rural and urban places in Mexico are separate and distinct entities. In the second part of this study, we explore the connection between rural and urban places by testing whether rural emigration rates are higher in municipalities that are spatially proximate to, vs. distant from, Mexican cities. Rural places that are closer to Mexican cities may be affected by processes occurring in and coordinated from cities, whereas those that are distant from Mexican cities may be isolated from these same processes. We find that, paradoxically, while rates of emigration are lowest out of Mexican cities, rates of emigration are highest out of rural communities that are close to Mexican cities. This distinction draws a connection between urban development and rural emigration that has been heretofore unexplored, but which is consistent with a number of theories of international migration. In particular, higher rates of emigration in rural places proximate to cities support historical-structural accounts of how urban-led development may displace and mobilize rural populations. This analysis also lends new insight into the geography of Mexican emigration, with potential implications for future migration flows out of Mexico.

This study contributes to an important body of research studying the causes of international migration from the sending country's perspective. The bulk of this research

has focused intentionally on places in Mexico where emigration has been predominant. By expanding our view with nationally-representative data, in this study we confirm that theories most supported by this research may not be relevant to areas outside this geographical purview. Moreover, we investigate how the geographic patterning of Mexican emigrant origins reflects processes occurring outside of the local boundaries of emigrant-sending places. Taken together, our results suggest that urban development, which retains emigrants within city borders, may in fact generate emigration out of neighboring rural places.

Theories of International Migration and Rural and Urban Emigration from Mexico

In a series of articles reviewing the literature on the causes of international migration, Massey and his colleagues proposed a "synthetic theoretical account" of international migration (Massey 1999:47). This account understands international migration to be the outcome of forces operating on different conceptual levels, which are each tied to one or more theories of the causes of international migration, including neoclassical economics, NELM, dual labor market theory, world systems theory, social networks theory and cumulative causation theory. In focusing on different conceptual levels, these theories "decompos[e] an enormously complex subject [i.e., international migration] into analytically manageable parts," and, as such, they are not necessarily incompatible (Massey et al. 1993:433). Nevertheless, understanding when and where different theories may be more or less relevant to explaining international migration is a useful exercise for furthering our understanding of international migration. As previously mentioned, research on Mexican emigration has for the most part tested these theories in geographically-limited data. Stated simply, this research finds that Mexican emigration is initiated in response to economic uncertainty inherent to economic development and is sustained over time by migrant networks (Massey and Espinosa 1997).

Very few studies have examined whether this account is applicable to emigration flows outside of the traditional rural and regional sending regions in Mexico. It may not be the case that households in all areas of Mexico are equally affected by the uncertainty brought about by economic development, as economic development unfolds unevenly across space and tends to be concentrated in and directed from cities (Massey 1988). As a result, households in urban Mexico may benefit from the more highly developed urban economy, and so this motivation for migration – as a means of dealing with the uncertainties of development – may not be relevant to urban households.

One study tested this idea by comparing the individual determinants of emigration from a sample of urban and rural communities in the traditional sending region and Tijuana (Fussell and Massey 2004). Interacting individual characteristics with an indicator of urban origin, Fussell and Massey (2004) found that manufacturing and service workers have higher odds of emigration to the United States than agricultural workers in rural places but found no difference in the odds of emigration for workers from these different industrial sectors in urban places. Their results suggest that international migration is a necessary way to diversify income sources due to limited local

labor opportunities outside of agriculture in rural labor markets, but in dynamic and diverse urban labor markets, international migration is not necessary for that purpose. A major tenet of the new economics of migration theory, then – that households use international migration to diversify sources of income as a risk minimization strategy (Stark and Bloom 1985) – does not appear to be relevant to urban-origin emigration primarily because of the higher levels of economic development in Mexican cities.

The present study builds on Fussell and Massey's work by examining the relevance of NELM theory to rural and urban emigration in nationally representative data.[1] Specifically, we test whether local labor market diversity, which measures the opportunity for households to diversify sources of income locally, is associated with emigration rates in a similar way for metropolitan areas and for non-metropolitan Mexican municipalities defined by their level of rurality. Based on the findings in Fussell and Massey's study, we expect local labor market diversity to be negatively associated with emigration levels in non-metropolitan municipalities, meaning that emigration levels are higher out of rural labor markets that are less diverse. This would be consistent with the idea that rural households use international migration to substitute for local opportunities to self-insure. The effect of labor market diversity on emigration should be weaker in metropolitan areas where more developed economies provide alternative means for self insurance. Because economic development is thought to drive these differences across levels of urbanization, we then test whether economic development accounts for the relationship between labor market diversity and emigration in urban and rural places.

Proximity to Metropolitan Areas and Rural Emigration

Emigrant-sending communities are not isolated from each other, although that is generally assumed in the methods of past research. In studies of the causes of international migration, causal factors are typically defined for the community in which the emigrant lives (e.g., female labor force participation in the community or community migration prevalence) or at the national level (e.g., foreign investment into Mexico). In this study we examine the broader context of rural-origin emigration by testing whether emigration rates vary by proximity to major urban areas. Rural places that are proximate to cities may be integrated into or affected by urban-led development, whereas rural places that are distant from cities may be isolated from or less affected by urban-led development.

Since the 1980s, Mexican socioeconomic development has occurred under the auspices of neoliberal reform and integration into the global marketplace, processes coordinated in and directed from cities (Parnreiter 2002; Sassen 2002). Neoliberal economic reform is associated with a number of social and economic changes in Mexico, including rising regional and rural-urban inequality and a restructuring of the urban system away from the primacy of one large city (Mexico City) towards a more balanced structure featuring a number of large cities (Bouillon et al. 2003; Portes and Roberts 2005). These urban-led economic and structural changes are also associated with a rising rate of urban emigration (Hernández-León 2008). In this article we argue they may also be associated with a rising rate of rural emigration in neighboring communities.

That city-driven economic and structural changes may raise rates of neighboring rural emigration is consistent with a number of theories of international migration. First, urban-led development, especially that taking place in the context of increasing foreign trade and foreign investment ushered in by neoliberal reform, may disrupt, displace and mobilize local populations, as predicted by world systems theory (Sassen 1988). Disruption of rural, agricultural populations occurs as markets expand, landholdings are consolidated, and subsistence-based economies are made unviable (Massey 1988), processes that are accelerated under foreign-directed, neoliberal reforms and integration into the global marketplace (Sassen 1988).

This displaced population is then mobilized to emigrate through the development of ideological and material links to destinations (Sassen 1988). Ideological links include exposure to foreign culture, and material links include transportation and communication ties. To the extent that Mexican cities are the sites of neoliberal economic coordination, and are more integrated into the global marketplace, contemporary Mexican cities likely have greater material and ideological links to the United States than most rural places. Rural places that are proximate to cities may then be better situated to use these links than rural places that are distant from cities, where the cost of migration may be prohibitive without access to such links.

An additional reason we might expect higher rates of international emigration out of rural places that are proximate to cities is drawn from NELM theory. Earnings by international migrants provide capital in a foreign currency, which substitutes for limited domestic financial and insurance markets (Stark and Bloom 1985). This motivation is especially pronounced in places where there is an opportunity for investment in the first place (Lindstrom and Lauster 2002). Because of the changes brought about by urban-led development, rural places that are close to Mexican cities may have opportunities for investment without access to stable forms of capital, therefore generating a strong motivation for international migration.

Using national data, previous work has demonstrated that emigration increases with urbanization and economic development over time, at least in the short term (Hatton and Williamson 1994; Massey 1988). In this research we suggest that there may be a relationship between urbanization, economic development and emigration not only across time, but also across space: the uneven spatial origins of Mexico's emigrants may reflect Mexico's urban geography and the role of urban development in disrupting, motivating and mobilizing emigration from neighboring rural places. Testing this idea, we move beyond a usual focus on causes located in the immediate sending community or at the national level.

Research Methods

Sample of Urban and Rural Municipalities

The unit of analysis in this study is the Mexican municipality, which is roughly equivalent to the U.S. county.[2] We analyzed municipal emigration because our primary data source, the long-form questionnaire of the 2000 Mexican Census, does not allow for

an individual analysis of emigration. The 2000 Census long-form included a migration supplement inquiring about household members who emigrated between 1995 and 2000. Unfortunately, individual emigrants were not assigned unique identifiers to link them to individuals in the household roster of the long-form questionnaire, and as a result it is impossible to identify individual emigrants among the full enumeration of individuals in the long-form questionnaire. This is true regardless of whether the emigrant had returned to Mexico by 2000. However, the data do allow for an estimation of municipal-level emigration rates, using the count of all emigrants reported in the migration supplement within each municipality expressed as a proportion of the 1995 municipal population.

In 2000, there were 2,443 Mexican municipalities, including 16 districts in the Federal District, with an average population of 39,900. In order to treat municipalities within cities as a single unit, we aggregated the municipalities belonging to Mexico's 55 metropolitan zones, which are defined by population size, density and degree of interconnectedness between municipalities (SEDESOL, CONAPO and INEGI 2004). Oaxacan municipalities are far smaller than the average Mexican municipality; in 2000 there were 570 municipalities in Oaxaca, more than a fifth of the national total. For comparability, we aggregated Oaxacan municipalities into 30 rural districts commonly used for statistical purposes and one metropolitan zone, Oaxaca City (INEGI 2002). Twenty-one municipalities were excluded from the sample because of missing values for some of the variables obtained from the 1995 Mid-Census Population Count.[3] Forty-one new municipalities were created between 1990 and 2000. In order to avoid dropping these municipalities as missing values, we used the population distributions of the municipalities in 2000 to estimate measures for earlier years. This method assumes that the distribution of municipal characteristics in 1990 in municipalities that later split is proportionally equal to the population distribution across the new municipal boundaries in 2000. The final analytic sample includes 1,595 non-metropolitan municipalities and 55 metropolitan areas.

Among non-metropolitan municipalities, we distinguished between those that are more and less rural, defined as municipalities where 50 percent or more of the municipal population lived in localities of 2,500 or less in 1995 (n = 980) and where fewer than 50 percent of the municipal population lived in localities of 2,500 or less in 1995 (n = 615). The 2,500 cutoff point is a common international definition of rural and urban areas based on population size, and it is the definition used by INEGI, which is the Mexican equivalent of the U.S. Census Bureau (United Nations 2007; Villalvazo Peña, Corona Medina and García Mora 2002).[4]

Data Sources

Data for this study came from the 2000 Census of Population and Households, the 1995 Mid-Census Population Count, the 1994 Economic Census and the 1990 Census of Population and Households. In most cases, municipal data counts were obtained from published reports by INEGI or CONAPO.

Dependent Variable: Municipal Emigration

The municipal U.S.-bound emigration rate is equal to the number of young adult (ages 15-55) emigrants to the United States between 1995 and 2000 divided by the 1995 municipal young adult (ages 10-50) population in 1995.[5] Limiting the emigration rate to ages 15-55 adjusts for variation in age structure across municipalities and excludes dependent emigrants. The numerator was estimated from the 2000 Census international migration supplement, in which resident household members in 2000 reported whether any household member migrated abroad between 1995 and 2000, their country of destination, and the age and gender of the emigrant. Because emigrants are reported by households in Mexico, the data exclude households that emigrate in their entirety, which likely results in an underrepresentation of permanent emigrants, female emigrants and more educated emigrants (Ibarraran and Lubotsky 2007). As a consequence, it is possible that our estimates of emigration are biased towards emigration of temporary, male, less educated Mexicans. Because the migration supplement was administered to a sample of Census households in 2000, weights provided by INEGI were used to estimate municipal counts of emigrants. The denominator, the 1995 municipal population at risk of emigration, was taken from the 1995 Mid-Census Population Count. Table 1 shows that the average municipal U.S.-bound emigration rate in the late 1990s was 4.2, meaning that the approximately 4.2 percent of Mexicans ages 10-50 in 1995 emigrated to the United States between 1995 and 2000 from the average municipality (see Table 1). The rate was highest in more rural, non-metropolitan areas and lowest in metropolitan areas (4.6% vs. 2.2%).

Key Independent Variables

To test the NELM hypothesis that international migrants are compensating for limited local labor markets, we used an index of local labor market diversity. The index measures the distribution of the municipal workforce across fourteen industries reported in the 1990 Census.[6] The index is equal to 1 minus the sum of the squared proportions of the municipal workforce in each industry, over all industries (see Gibbs and Martin 1962). With 14 industries, the index ranges between zero, when all municipal workers are employed in one industry, and .93, when equal proportions of workers are employed in each industry.[7] The labor market diversity index is highest in metropolitan areas and lowest in the most rural municipalities (.8 vs. .5; Table 1).

We expect that differences in the relationship between labor market diversity and emigration by level of urbanization reflects different levels of economic development. To test this idea, we used a measure of development called the marginality index, which was created by the Mexican National Population Council using 1990 Census data (CONAPO 2000). The nine components of the index include the proportion of the municipal population living in households with dirt floors, without indoor plumbing or a private toilet, without electricity, without access to piped water, and with more than two people per room; the proportion of the municipal population living in localities of 5,000 or less; and the proportion of municipal adults who are illiterate, have not completed primary education, and do not earn more than two minimum daily wages. The index is approximately

normally distributed, ranging between -3 and 3, with higher scores indicating greater marginality. Table 1 shows that marginality was highest in the most rural places in 1990.

Finally, to test whether rural emigration rates vary by proximity to Mexican cities, we incorporated a measure of the distance in kilometers from the centroid of a given rural community to the nearest metropolitan area, which was estimated using Geographical Information Systems software and the 2000 municipal boundaries.

Theoretical Controls

In multivariate models, we included a number of control variables that are derived from theories of international migration (see Massey et al. 1993). Wages, unemployment and cost of migration constitute the standard variables of the neoclassical economics

Table 1: Average Economic, Geographic and Demographic Characteristics of Mexican Municipalities by Level of Urbanization

		Non-Metropolitan Areas		
Measure	Entire Sample	More than 50% Rural	Less than 50% Rural	Metro Areas
Adult U.S. emigration rate, 1995-2000 (%)	4.2	4.6*	3.8	2.2*
Labor market diversity index, 1990	.6	.5*	.7*	.8*
Marginality index, 1990	-.1	.3*	-.6*	-1.5*
Distance to nearest metropolitan area, 2000 (km)	82.0	88.3	78.9*	0
Wages, 1990 (Mexican pesos)	4759.2	4346.9	5280.8*	6208.1
Unemployment rate, 1990 (%)	3.0	3.2	2.8*	2.8
Distance to U.S. border, 2000 (km)	690.9	683.7	708.8	629.1
Foreign investment, 1994 (%)	1.9	.6*	3.3*	8.5*
Young age structure, 1990 (%)	11.3	11.0*	11.7*	12.1*
Migrant networks, 1990 (%)	.3	.2	.3	.3
Rate of domestic out-migration, 1995-2000 (%)	3.6	3.6	3.5	3.3
Sample size	1650	980	615	55

Sources: 2000 Mexican Census, 1995 Mexican Mid-Census Population Count, 1994 Mexican Economic Census and 1990 Mexican Census.

*p < .05 based on a t-test of equal means. For metropolitan areas, the test is with non-metropolitan areas that are less than 50% rural; for non-metropolitan areas that are less than 50% rural, the test is with non-metropolitan areas that are more than 50% rural; for non-metropolitan areas that are more than 50% rural, the test is with metropolitan areas.

model of migration, which argues that migrants respond primarily to differences in labor markets across places (Lewis 1954; Todaro 1969). The average hourly wages for all actively employed adults in each municipality is computed from the 10 percent sample of the 1990 Census. The unemployment rate is defined as the proportion of all economically active adults who report being unemployed in 1990. In 1990, the average hourly wage in Mexico was about 4,800 pesos, which was equivalent at that time to approximately $1.71, and reported unemployment was about 3 percent, with highest mean hourly wages and lowest unemployment in metropolitan areas (Table 1). Distance to the U.S. border is our proxy for cost of migration, under the assumption that cost increases with increasing distance from the U.S. border. Although travel distance is certainly not the primary factor determining cost of emigration, it is the only measurable factor that clearly varies by municipality of origin. Distances are calculated from the centroid of the municipality to the nearest point on the Mexico-U.S. border using GIS software and the 2000 municipal boundaries.

Foreign investment is a key variable identified by world systems theory, which understands migration as an outcome of the mobility of capital into developing economies, where workers are displaced and mobilized as a result (Sassen 1988). Our measure of foreign direct investment comes from the 1994 Economic Census and is equal to the proportion of the workforce employed in manufacturing, service, and commercial firms that have some level of foreign ownership. In 1994, less than 2 percent of the Mexican workforce in these sectors was employed in firms with foreign ownership; in metropolitan areas, this rate was four times higher, at 8.5 percent (Table 1).

Fast population growth leads to a young age structure, which generates labor shocks that have direct, positive effects on emigration rates (Hanson and McIntosh 2010). Net of its impact on labor market conditions, population growth could also generate emigration through a direct age effect – a young population age structure has large emigration-prone age cohorts. Population growth is captured by a measure of age structure, the proportion of the population ages 10-20 in 1990 based on the Census. In 1990, 10 to 20 year olds will be ages 15-25 in 1995 and 20-30 in 2000, and thus they comprise the age cohort most likely to emigrate. In 1990, about 1 in 10 Mexicans was in this age group, with a slightly higher proportion in metropolitan areas (12% vs. 11% in the most rural places; Table 1). The larger cohort size in metropolitan areas is likely due to domestic in-migration of young adults, as opposed to fast natural population growth in cities.

U.S. migrant networks are measured by the proportion of the 1990 population that reported being in the United States in 1985 in the 1990 Census. In 1990, about .3 percent of the population reported living in the United States in 1985 (Table 1). This measure is an underestimate of emigration during the late 1980s because it only captures return international migration (as opposed to emigration) based on presence in the United States in 1985 and return by 1990; this is why it is substantially smaller than our measure of emigration from 1995 to 2000, which is based on reports by households of all departing members. Although this measure is limited, it is the best municipal measure of networks available, and has been previously used by migration scholars as an indirect estimate of emigration (e.g., Lindstrom and Lauster 2001).

Finally, we use a measure of domestic out-migration to test whether the relationship we observe between spatial proximity to metropolitan areas and emigration may be mediated by domestic migration – for example, emigration rates could be low in municipalities close to cities because individuals migrate to those cities instead of to the United States. We used the 10 percent sample from the 2000 Census, which asked all household members about their municipality of residence in 1995, to estimate the domestic out-migration rate. Individuals who lived in a different municipality in 1995 are defined as domestic migrants, and a municipality's domestic out-migration rate is defined as the proportion of that municipality's 1995 population who were living in a different municipality in 2000. As with the emigration rate, expansion weights provided by INEGI were used to estimate municipal counts of domestic migrants from the survey data; data on municipal populations at risk of migration from 1995 to 2000 were taken from the 1995 Mid-Census Population Count, and the rate is restricted to young adults ages 15 through 50 to focus on those most at risk of migrating for work-related reasons.

Spatial Methods

Because we used contiguous areal units of analysis (municipalities), we used spatial methods to account for spatial interdependence, or dependence between units that are spatially proximate. Specifically, we employed spatial lag regression models in order to account for spatial autocorrelation across contiguous municipalities.[8] The spatial lag is preferable to a spatial error model because spatial error models ignore possible spatial autocorrelation or dependence in measured covariates. The spatial lag model, by contrast, allows for both the error term and covariates in proximate municipalities to be spatially correlated. In the spatial lag model, the error term and measured covariates of neighboring municipalities affect a given municipality's migration rate through their effect on neighboring emigration rates (Beck, Gleditsch and Beardsley 2006; Morenoff 2003). We used the geographical analysis software Geographical Data Analysis (GeoDA) to calculate the weights matrix and estimate the spatial lag regression model by maximum likelihood (Anselin 2003).

Results

Rural-Urban Differences

Table 2 shows results from multivariate regressions of municipal emigration rates on theoretical predictors separately for three groups of municipalities based on their level of urbanization: non-metropolitan areas that are more than 50 percent rural, non-metropolitan areas that are less than 50 percent rural, and metropolitan areas.[9]

Labor market diversity is the key variable testing whether NELM is equally relevant to urban and rural emigration. According to this theory, households will use international migration to diversify sources of labor in order to minimize risk, given limited local labor markets. Therefore, the association between labor market diversity and emigration should be negative. The first set of models in Table 2 shows that the association between labor market diversity and emigration is negative in less

rural non-metropolitan areas and metropolitan areas, but it is positive (and marginally significant, $p < .06$) in the most rural places. Metropolitan areas and less rural, non-metropolitan areas with less diverse labor markets have higher rates of emigration, which is consistent with the idea that households in less locally diverse labor markets use international migration to diversify labor portfolios and thereby manage risk. Model 2, which adds a control for marginality, suggests that this effect is largely explained in highly rural places and metro areas by different levels of socioeconomic

Table 2: OLS Regression Coefficients of U.S. Emigration Rates among Mexican Municipalities, by Level of Urbanization, 1995-2000

	Model 1			**Model 2**		
	Non-metropolitan Areas			Non-metropolitan Areas		
	More than 50% Rural	Less than 50% Rural	Metro Areas	More than 50% Rural	Less than 50% Rural	Metro Areas
Labor market diversity	.016	-.032**	-.163*	.003	-.029*	-.088
	(.008)	(.011)	(.072)	(.010)	(.013)	(.054)
Wages	.009**	.015*	.070	.008*	.016*	.140
	(.003)	(.007)	(.064)	(.003)	(.008)	(.072)
Wages squared	-.000**	-.003	-.049	-.000**	-.002	-.087
	(.000)	(.002)	(.041)	(.000)	(.002)	(.046)
Unemployment	.429**	.531**	.126	.450**	.528**	-.210
	(.068)	(.083)	(.226)	(.068)	(.084)	(.324)
Distance to U.S. border	-.001	.001	.002	.004	-.000	-.010
	(.006)	(.006)	(.009)	(.006)	(.007)	(.012)
Young age structure	.754**	.394*	.423	.654**	.421*	.296
	(.147)	(.081)	(.609)	(.154)	(.181)	(.524)
Foreign direct investment	-.026	-.051**	-.073**	-.026	-.050**	-.074**
	(.025)	(.011)	(.025)	(.025)	(.011)	(.023)
U.S. Migrant Networks	3.671**	3.012**	2.956*	3.437**	3.025**	3.000*
	(.461)	(1.025)	(1.265)	(.465)	(1.041)	(1.428)
Marginality				-.006*	.001	.018*
				(.003)	(.004)	(.008)
Constant	-.070**	-.014	.078	-.055**	-.018	.046
	(.015)	(.021)	(.120)	(.017)	(.021)	(.082)

Continued

development, as the coefficient for labor market diversity loses statistical significance and declines in size in this model. It remains statistically significant in less rural non-metropolitan areas, suggesting an independent association between labor market diversity and emigration in those areas marked by mid-levels of urbanization.

Model 2 shows that marginality is *positively* associated with emigration out of metropolitan areas but *negatively* associated with emigration out of highly rural municipalities. In other words, among Mexican cities, development is associated with lower levels of emigration (urban development seems to retain emigrants), but among highly rural places, development is associated with higher levels of emigration (development in highly rural Mexico seems to generate emigration).

Table 2: *Continued*

	Model 1			Model 2		
	Non-metropolitan Areas			Non-metropolitan Areas		
	More than 50% Rural	Less than 50% Rural	Metro Areas	More than 50% Rural	Less than 50% Rural	Metro Areas
Observations	980	615	55	980	615	55
R-squared	.28	.27	.45	.28	.28	.53

Sources: 2000 Mexican Census, 1995 Mexican Mid-Census Population Count, 1994 Mexican Economic Census and 1990 Mexican Census.
Note: Standard errors in parentheses.
*p < .05 **p < .01

The remaining theoretical control variables do not differ in the direction of their associations with emigration across levels of urbanization. The positive coefficient for wages and the negative coefficient on its square suggest a non-linear relationship between emigration and wages. Unemployment is highly positively associated with emigration in non-metropolitan municipalities (emigration is higher out of non-metropolitan Mexican municipalities with higher levels of unemployment). Distance to the border, a weak measure of cost of migration, is not significantly associated with emigration. Young age structure is positively associated with rural emigration, net of labor market conditions, meaning that large migration-prone cohorts are associated with larger emigration rates in rural places, where the demographic transition is ongoing (Tuiran et al. 2005). Networks are also universally associated with emigration.

Foreign investment has a negative association with emigration in urban places and less rural places but no association in more rural places, likely because there is very little foreign investment in highly rural municipalities in Mexico.[10] This negative association is not consistent with the theoretical

prediction of world systems theory, which argues that the immersion of foreign capital into sending areas displaces and mobilizes workers, leading to emigration. Our result of a negative association between FDI and emigration across Mexican municipalities in the late 1990s suggests the opposite relationship – that municipalities with higher levels of FDI have lower levels of U.S.-bound emigration. This is consistent with studies measuring foreign investment at the national level (Kritz 1998; Massey and Espinosa 1997) and suggests that the jobs created by FDI retain potential urban migrants in their communities of origin (or unmeasured characteristics of places attracting foreign investment do).[11]

Role of Proximity to Metropolitan Areas for Non-metropolitan Municipalities

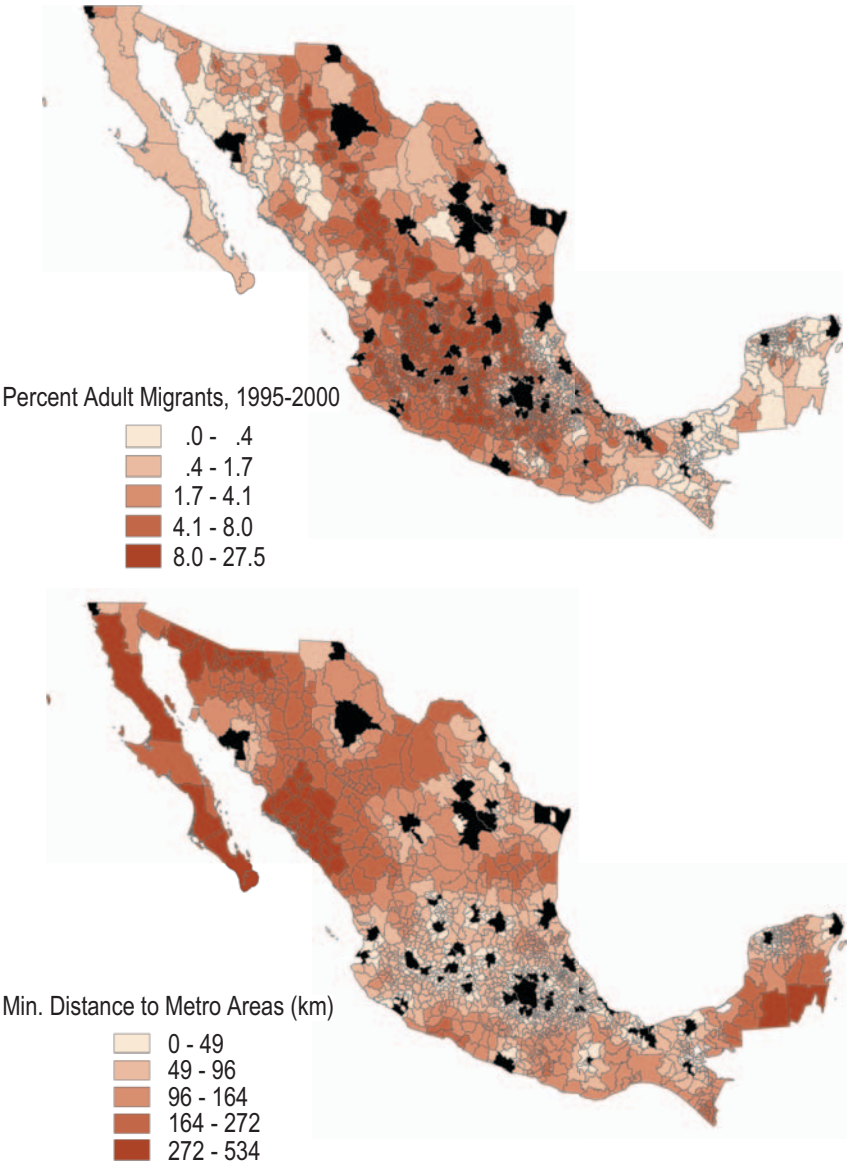
One of the central hypotheses of this article is that the levels of emigration from rural areas in Mexico depend not only on the size of the population but also how connected they are to urban centers, as measured by their proximity (distance in kilometers) to the nearest metropolitan area. Figure 1 shows maps of the U.S.-bound emigration rate and the proximity to the nearest metropolitan area, categorized into quintiles, for all non-metropolitan Mexican municipalities in 2000. The 55 metropolitan areas are shown in black. In the map of U.S.-bound emigration rates, the darker shaded area, corresponding to higher levels of emigration, in the center-west region of Mexico shows the continued predominance of the traditional sending region in the late 1990s. There is a clear spatial clustering of emigrant origins in this region as well as in a line of high-emigrant sending areas that runs up the middle of the country from the traditional region towards the border.

The map of proximity to metropolitan areas also shows strong regional patterns due to the clustering of metropolitan areas in the center part of the country (Garza 2004), and these regional patterns correspond with the regional clustering of emigrant origins. The non-metropolitan municipalities that are most distant from metropolitan areas are located in the northern and southeastern regions of Mexico, where emigration levels are the lowest. Overall, the map of U.S.-bound emigration rates visually contrasts with the map of proximity to metropolitan areas, suggesting that the two are negatively correlated. Places that are spatially distant from metropolitan areas appear to have lower levels of U.S.-bound emigration.

Figure 2 shows this relationship non-spatially by presenting the average, unadjusted U.S.-bound emigration rate for municipalities defined by their level of urbanization and divided into "proximate" municipalities, which are municipalities that are closer than the mean distance to metropolitan areas, and "distant" municipalities, which are municipalities that are farther than the mean distance to metropolitan areas. Figure 2 confirms the contrasting pattern observed visually in the maps. The overall rate of U.S.-bound emigration is lowest in metropolitan areas, at 2.2 percent, and it increases with increasing rurality to a high of 4.8 percent in non-metropolitan, majority rural municipalities that are spatially proximate to metropolitan areas. Among non-metropolitan areas, for both levels of rurality, it is those that are spatially proximate to metropolitan areas that have higher levels of emigration.

Table 3 shows results from ordinary least squares (Model 1) and spatial lag models (Models 2-5) for non-metropolitan municipalities. Across all models there is a

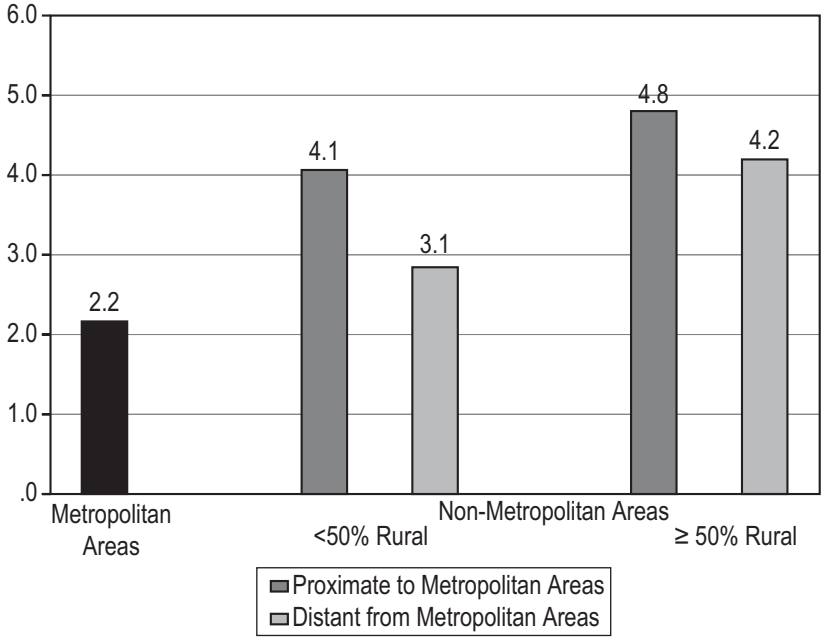
Figure 1. Spatial Patterns of U.S. Emigration Rates and Proximity to Metropolitan Areas (in black) for Non-metropolitan Mexican Municipalities, 1995-2000



Note: Metropolitan areas are colored in black.
Source: 2000 Mexican Census.

persistent, negative coefficient for distance-to-metropolitan-areas. This result confirms that municipalities that are spatially closer to metropolitan areas have higher levels of U.S.-bound emigration, even when controlling for economic, demographic and social characteristics of municipalities. In separate analyses not shown, we find that this result

Figure 2. Average Adult U.S. Emigration Rate by Level of Urbanization and Proximity to Metropolitan Areas among Mexican Municipalities, 1995-2000



Sources: 2000 Mexican Census and the 1995 Mid-Census Population Count.

is the same for both highly rural and less rural non-metropolitan municipalities. We also tested alternative measurements of this variable, including incorporating a square term and categorizing distance into quintiles. These specifications corroborated our findings and suggested that the effect is primarily driven by a difference between those farthest away (in the fifth quintile) and those closest (in the first).

As we saw in the map in Figure 1, spatially distant municipalities are concentrated in the border and southeastern regions, where emigration levels are the lowest. To test whether the distance-to-metropolitan-areas effect is simply capturing the regional variation in emigration, Model 3 (in Table 3) adds regional dummies, with the traditional region omitted. The coefficient for distance is reduced by more than 50 percent in Model 3, suggesting that more than half of the effect of distance to metro areas is captured by regional variation in emigration rates and the regional clustering of cities. However, even accounting for this, the coefficient for proximity to metro areas is still negative and statistically significant. In separate analyses not shown, we estimated the effect of distance to metropolitan areas separately by region to test whether the effect is driven by a particularly strong association in one region. We found that the effect is negative in all four regions, although it is strongest in the traditional and border regions.

Municipalities that are closer to metropolitan areas may have higher U.S.-bound emigration rates because they have lower internal migration rates – that is, there may be a substitution between the two forms of migration. Model 4 tests whether the

distance effect reflects levels of domestic out-migration. We find no support for this hypothesis, as the coefficient for distance to metropolitan areas is virtually unchanged between models 2 and 4. It is interesting to note the negative and significant coefficient for domestic out-migration, meaning that municipalities with high levels of domestic out-migration tend to have low levels of U.S.-bound emigration and vice versa.[12]

Finally, the results from the spatial lag models (2-5) indicate a strong, positive spatial dependence in emigration rates across non-metropolitan municipalities. Emigration from a municipality is not only a function of its own characteristics but also of the emigration rates in nearby municipalities, and, by extension, the sociodemographic characteristics of those municipalities affecting their own emigration rate. Moreover,

Table 3: OLS and Maximum Likelihood Regression Coefficients of U.S. Emigration Rates from Non-metropolitan Mexican Municipalities, 1995-2000

	OLS		Maximum Likelihood		
	(1)	(2)	(3)	(4)	(5)
Distance to metro area	-.146**	-.058**	-.020*	-.056**	-.027*
	(.014)	(.011)	(.014)	(.011)	(.014)
Percent rural	.031**	.019**	.018**	.020**	.019**
	(.004)	(.003)	(.003)	(.003)	(.003)
Wages	.007**	.003	.002	.003	.002
	(.002)	(.002)	(.002)	(.002)	(.002)
Wages squared	-.000*	-.000	-.000	-.000	-.000
	(.000)	(.000)	(.000)	(.000)	(.000)
Unemployment	.502**	.238**	.244**	.235**	.241***
	(.042)	(.033)	(.032)	(.032)	(.032)
Distance to U.S. border	-.000	.002		.002	
	(.007)	(.003)		(.003)	
Labor market diversity	-.003	-.013*	-.017**	-.013*	-.017**
	(.007)	(.006)	(.006)	(.006)	(.006)
Young age structure	.550**	.269**	.246**	.262**	.240**
	(.108)	(.084)	(.086)	(.084)	(.086)
Foreign direct investment	-.035**	-.015	-.014	-.014	-.013
	(.013)	(.010)	(.010)	(.010)	(.010)
Networks	3.356**	1.574**	1.432**	1.525**	1.390**
	(.242)	(.195)	(.201)	(.195)	(.201)

not accounting for spatial dependence in emigration rates across municipalities leads to biased estimates of the coefficients for other predictors in the model. In the spatial lag model, the coefficients for wages become statistically non-significant, while the coefficients for percent rural, unemployment, age structure, networks and foreign investment are substantially reduced, and the coefficient for industrial sector diversity increases and becomes statistically significant.

Conclusion

From the sending country's perspective, the predominant theoretical account of the initiation of international migration from Mexico to the United States describes it as an

Marginality	-.007**	-.005**	-.005**	-.005**	-.005**
	(.002)	(.001)	(.002)	(.001)	(.002)
Region (reference = Traditional)					
Northern			-.014**		-.014**
			(.003)		(.003)
Central			-.005*		-.005
			(.002)		(.002)
Southern			-.012**		-.012**
			(.002)		(.003)
Domestic out-migration rate				-.044**	-.041**
				(.015)	(.015)
Spatial lag term		.650**	.595**	.647**	.592**
		(.021)	(.023)	(.021)	(.023)
Constant	-.051**	-.028**	-.014	-.026*	-.012
	(.014)	(.011)	(.011)	(.011)	(.011)
Observations	1595	1595	1595	1595	1595
R squared	.32	.60	.60	.60	.60
Log likelihood	3005.66	3340.73	3359.98	3345.01	3363.71

Sources: 2000 Mexican Census, 1995 Mexican Mid-Census Population Count, 1994 Mexican Economic Census and 1990 Mexican Census.
Note: Standard errors in parentheses.
*p < .05 **p < .01

adaptive response to the uncertainties brought about by economic development (Massey and Espinosa 1997). This account has been largely supported by research using rural and regionally-limited data from Mexico, in large part because the origins of Mexican emigrants have historically concentrated in rural places and the center-west region of Mexico. Research has also been unable to examine connections between sending places in Mexico, as it has tended to analyze communities in isolation. In this research, we used nationally-representative data of the full set of Mexican municipalities to explore the relationship between urbanization, development and emigration. Specifically, we tested whether the NELM hypothesis that emigration is a mechanism for self-ensuring, given limited local labor market opportunities, is relevant to more developed, urban settings. We also investigated the connection between urban and rural places by examining how rural emigration varies by proximity to metropolitan areas.

Our analysis is consistent with previous findings that the new economics of migration argument that emigrants use international migration to diversify sources of labor and thereby manage risk is less relevant to the dynamic and diverse labor markets of Mexican cities (Fussell and Massey 2004). Our results suggest that this hypothesis is most relevant to places marked by mid-levels of urbanization. These differences seem to be driven by different levels of development in rural and urban Mexico. That is, whereas high levels of development in urban Mexico retain emigrants by providing local opportunities to diversify labor, self-insure and access capital, the absence of these opportunities generates emigration out of places marked by mid-levels of urbanization, where emigration can be effectively used to compensate for these locally underdeveloped markets. In highly rural places, in fact the opposite occurs: labor market diversity is associated with higher levels of emigration, which is explained by the fact that emigration is higher out of more developed, highly rural settings. These differences reflect an inverse-U shaped relationship between development and emigration and the location on that curve of rural places (on the left) and urban places (on the right). Additional work is needed to understand the causes of urban-origin emigration, given that urban emigrants make up a third of all emigrants to the United States from Mexico, and as Mexico continues to urbanize that proportion may increase.

A second major finding is that, among non-metropolitan areas, spatial proximity to Mexico's metropolitan areas differentiates U.S.-bound emigration rates. Paradoxically, emigration levels are highest among non-metropolitan municipalities that are spatially proximate to metropolitan areas despite the fact that emigration rates are lowest in Mexican cities. There are at least two theoretical explanations for this finding. First, rural populations in places that are close to Mexican cities may be displaced by urban-led development and exposed to or provided access to material and ideological links created through urban-led development, as predicted by the world systems theory. Second, rural places that are close to Mexican cities may have opportunities for investment but limited access to credit or capital to fund such development, as predicted by the new economics of migration theory.

In other words, it is in places that are affected by development but not fully developed that emigration is the highest. It is possible that the process of urbanization and

socioeconomic development in cities upsets neighboring rural livelihoods in ways that generate emigration – by commercializing markets, displacing subsistence workers, consolidating landholdings and generating consumer tastes without providing access to capital and insurance markets to facilitate the transition. This argument is consistent with theories of the causes of international migration that understand emigration as the outcome of development in the short run, but it locates this process within Mexico's rural and urban geography and extends the argument by suggesting that the spatial dynamics of urban development may be a key mechanism through which rural communities are transformed. Urbanization may result in higher emigration out of nearby rural places by in fact ushering along the uneven process of socioeconomic development, while spatially isolated rural communities are left out of global processes that are increasingly coordinated in cities. Additional research is needed to fully understand the social processes that lead to higher emigration from rural communities located near cities.

The relationship between spatial proximity to metropolitan areas and U.S.-bound emigration levels may also explain the recent changing regional origins of Mexican emigrants. In the late 1990s the longtime continuity of regional origins of Mexican emigrants began to shift, as during this period the proportion of emigrants originating in the center and southeastern regions was higher than previously observed (Durand and Massey 2003; Marcelli and Cornelius 2001). At the same time, Mexico's urban system was becoming increasingly decentralized, as Mexico City's primacy declined and a growing number of large metropolitan areas joined its rank as major cities (Garza 2004). Our finding of a spatial proximity effect to metropolitan areas draws a connection between the changing regional origins of Mexican emigrants and the changing Mexican urban system. As Mexico's urban system changes, with a growing number of large metropolitan areas in geographically diverse regions of the country, the origins of emigrants may continue to change, reflecting the effect of urbanization on neighboring rural places.

Our study also uncovered a strong spatial dependency in emigration rates, confirming that the broader social context – that beyond the immediate community – is important for levels of international emigration. Spatial dependence means that the rate of U.S. emigration in a given municipality is significantly affected by its neighboring municipalities' levels of emigration as well as their socioeconomic and demographic characteristics. Previous work has analyzed emigration from Mexican communities in isolation. The results of our spatial lag models, and of our analysis of proximity to urban areas, demonstrate that the level of emigration from a Mexican municipality is not only a function of the characteristics of that municipality but also of neighboring municipalities and its position within the broader urban system.

Notes

1. We are unable to examine Fussell and Massey's (2004) conclusion that cumulative causation does not occur in Mexican cities. Cumulative causation is the perpetuation of migration flows over time due to migration feedback loops to the community of origin, such that the economic factors that initially motivated emigration become less important

(Massey 1990). Cumulative causation has been identified empirically by an independent, heightening effect of community migration prevalence, a measure of the most important feedback loop, networks, on an individual's likelihood of emigration (Massey and Espinosa 1997). Fussell and Massey found that migration prevalence never reaches a level high enough in urban communities to exert an independent effect on urban individuals' likelihood of emigration, and they argued that this was likely due to the retention effect of urban labor markets. We are unable to test cumulative causation in our analysis because we do not have individual-level emigration or longitudinal data.

2. This aggregate analysis is therefore subject to the Modifiable Areal Units Problem, which has two elements: the results may be sensitive to the scale of the unit of analysis, and the results may be sensitive to the particular boundaries drawn at that scale. The first issue implies a potential ecological fallacy of attributing a phenomenon observed at an aggregate level to an individual relationship. We are cautious throughout this article to clearly relate our findings to the characteristics of municipalities. The second issue of arbitrary boundaries is assuaged by our use of spatial models, which by definition recognize that social phenomena are related across these boundaries.

3. Inclusion of these cases substituting 2000 data for the missing 1995 data did not alter the results.

4. Garza (2004) suggests that a more appropriate cutoff between rural and urban places is a population size of 15,000. There was only one difference in our results using 15,000 as the cutoff: a significant, negative coefficient for FDI in majority rural municipalities (i.e., municipalities where 50% or more of the 1995 population lived in localities of population size 15,000 or less). See endnote 10.

5. Because the dependent variable is positively skewed, we estimated the models transforming the dependent variable by taking its square root. Although the logarithmic function is a more common way of reducing skewness, taking the log of the migration rate resulted in a substantial loss of cases of municipalities with no emigrants (n = 91, or 5.5% of the sample) because the logarithmic function is not defined for values of zero. The substantive conclusions didn't change using the transformed dependent variable, so we present results using the untransformed variable for parsimony.

6. For labor market diversity, wages, unemployment and the index of marginality, we use data from the 1990 Census because the 1995 Mid-Census Population Count did not ask employment or education questions at all, and the 1994 Economic Census was restricted to three industries (manufacturing, commercial and services). It is possible that these economic characteristics changed in the first half of the 1990s, in particular due to the economic crisis in 1994. In order to examine this possibility we estimated regression models using these same variables measured in 2000 instead of 1990. The results were generally consistent with those presented except that the standard errors for the coefficients were larger, possibly reflecting the fact that they are measured five years after the beginning of the migration period under consideration. This resulted in the statistical significance of some of the coefficients dropping below the .05 level, depending on the model.

7. The occupational diversity index, D, is calculated with the equation $D = 1 - \sum p_i^2$. The upper limit of the index, when equal proportions are employed in all fourteen categories, is equal to $1 - (14)\ (1/14^2) = 1 - (1/14) = .93$.

8. The spatially-lagged dependent variable is a weighted average of emigration rates in adjacent municipalities, which are defined using a first-order contiguity, row-normalized weights matrix (Anselin 1988). The spatial lag regression model is specified as: $\mathbf{y} = \rho\mathbf{W}\mathbf{y} + \mathbf{X}\beta + \varepsilon$

where y denotes the vector of dependent variables, ρ is a spatial autoregressive coefficient, W is the weights matrix, X is a matrix of explanatory variables with an associated vector of regression coefficients β, and ε is a vector of normally-distributed error terms. The spatial autoregressive coefficient ρ measures the strength of the spatial autocorrelation and can be interpreted as the effect of a one-unit change in a given municipality's neighbors' average emigration rate on a municipality's own emigration rate.

9. Because we use an entire universe of rural and urban municipalities, the statistical significance levels for the coefficients in the regression models cannot be easily interpreted. In order to corroborate our results we used bootstrapping to generate an alternative estimate for the standard errors of the coefficients. The results were largely consistent with those presented in Table 2. The only substantive difference was that the coefficient for wages in highly rural places was not statistically significant at the .05 level. A separate issue is spatial dependence. To make the results in Table 2 comparable across samples, we used non-spatial, OLS models, but our samples of non-metropolitan municipalities include contiguous municipalities that are potentially affected by spatial autocorrelation. Therefore, we tested spatial lag models for these two samples. The results were largely consistent with those presented in Table 2.
10. The coefficient for FDI was significant and negative using a cutoff of 15,000 as rural (see endnote 4). This difference suggests that it is only in the most rural places – municipalities where 50% or more of the 1995 population lived in localities of 2,500 or less – where levels of foreign investment are not high enough to have a statistically significant association with emigration.
11. However, relating municipal emigration rates to municipal foreign investment at one point in time is not an ideal test of world systems theory as it has been argued in the case of international migration. Such a test requires comparative historical data to relate the initial immersion of foreign capital into emigrant-sending places (see Portes 1997).
12. This finding is subject to endogeneity bias. Domestic out-migration and international emigration are both a function of the same un-modeled municipal characteristics, and so the domestic out-migration variable will be correlated with the error term in the regression models, violating a central assumption of statistical regressions.

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