The International Transmission of Local Economic Shocks Through Migrant Networks

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1. Motivation, research question, and related literature

Much of the work on the economics of immigration focuses on effects in the country receiving immigrants. We know a great deal about the effects of immigration on native-born workers' wages and productivity, innovation, and government budgets (Blau and Mackie 2016). Yet a full accounting of the global costs and benefits of U.S. immigration policy requires estimates of the effects on immigrants themselves and on the communities that support their migration. In this project, we will leverage newly available and recently validated data on birthplace-based migration networks to examine how access to a strong U.S. labor market affects local economic development outcomes for communities in Mexico. Mexican immigrants comprise roughly 35 percent of all U.S. immigrants and roughly 50 percent of immigrants with no more than a high school degree. Proposed policy changes to decrease the amount of immigration among less educated immigrants would therefore have outsized effects on Mexicans' ability to access the U.S. labor market.

To measure the effects of U.S. migration on economic outcomes in Mexican sending communities, we will rely on newly available data that contains information on individual Mexican immigrants' locations in the United States and their specific places of birth in Mexico. As discussed in detail in our forthcoming paper in *Demography*, data from the *matrícula consular* program allow us to measure migrant networks between the U.S. and Mexico with far more spatial detail than what is observable in other data sources with national coverage (Caballero, Cadena, and Kovak 2017).[1] In that paper, which uses detailed tabulations published by the Mexican government, we confirm the quality and representativeness of the data by documenting close agreement with well-known household surveys. The same government agency that publishes the cross-tabulations has recently begun sharing the underlying

[1] The paper is available here: http://www.andrew.cmu.edu/user/bkovak/caballerocadenakovak_mcasnetworks.pdf

micro data (without individual identifiers). These data will allow us to observe migrants' birthplaces and locations in the U.S. with even finer geographic detail: *municipios* in Mexico and counties in the U.S. Once we have cleaned and coded these data, we will combine them with household survey data on economic outcomes to determine how local economic and policy shocks on one side of the border are transmitted internationally through the migrant network. In particular, we expect to find that labor demand declines during the U.S. Great Recession had spillover effects in Mexico, with the largest effects occurring in communities with strong network ties to the hardest hit U.S. destinations.

To our knowledge, this will be the first research to study the role of migration networks in transmitting local economic shocks internationally. However, our analysis closely relates to multiple streams of the existing literature. Massey, Rugh, and Pren (2010) introduce the *matrícula consular* data as a source of information on spatial migration patterns between Mexico and the U.S. A large body of work cutting across fields and methodological perspectives documents the effects of emigration on source country economic outcomes. Mishra (2014) provides an excellent summary of the extensive literature on emigration's effects on source country wages. We expect that migration networks transmit local shocks primarily through changes in migration patterns and changes in remittances. There has also been important research examining the effects of remittances on labor markets, education, entrepreneurship, and investment in receiving communities, which motivates the extensive set of outcomes we plan to examine (see Table 1 below). Yang (2011) provides a thorough review of work addressing these topics.

2. Hypotheses

i) Fluctuations in labor demand in the U.S. labor market lead to changes in international migration for specific sending regions in Mexico. Previous work has found that the choice to migrate from Mexico to the U.S. responds to overall economic conditions (Hanson and Spilimbergo 1999) and that migrants tend to choose locations with higher expected earnings (Borjas 2001, Cadena 2013, Cadena and Kovak 2016). We expect to find that changes in net migration from Mexican sending regions depend upon the

strength of the community's ties via the migrant network to the hardest hit U.S. destination markets during the Great Recession. [Confirmed in preliminary analysis. See Section 4.]

ii) Local economic or policy shocks on one side of the border affect outcomes in network-connected communities in the other country. We further expect that the loss of access to strong foreign labor markets will lead to a slowdown in economic development for the most affected sending regions in Mexico. As conditions in a U.S. local labor market deteriorate, many immigrants return to Mexico, remittances to Mexico decline, and potential migrants are discouraged from leaving Mexico. These responses transmit the negative conditions in the U.S. local labor market to connected Mexican locations. We will use existing household survey data and administrative records to examine outcomes in sending *municipios*, including wages, employment, health, child mortality, and household investment.

To our knowledge, these hypotheses are new to the economics and policy literatures studying the connections between U.S. and Mexican labor markets. Further, although our analysis uses the Great Recession as a source of identifying variation, we expect that the effects we document will be informative regarding the likely effects of recent policy proposals that would limit Mexicans' access to the U.S. labor market.[2]

3. Data Sources

We measure changes in relevant U.S. labor demand by focusing on the Great Recession. Employment declined in nearly every local labor market during the Great Recession, but there was substantial variation across space, with the most-affected locations losing more than 10 percent of employment and the least-affected seeing small growth. We will use these dramatic changes to identify local labor demand shocks across migrant destinations (Cadena and Kovak 2016).

Our main database for measuring migration networks at the sub-national level comes from a new set of micro data covering the universe of identity cards issued under Mexico's *Matrícula Consular de*

[2] For example, universal E-Verify, which would sharply limit unauthorized immigrants' access to the U.S. labor market, was included in Senate Bill S.744 in July 2013 alongside an expanded guest worker program.

Alta Seguridad (MCAS) program from 2006-2014. These data were provided by the *Instituto de los Mexicanos en el Exterior*. All personally identifying information, including individuals' exact addresses, was removed, but the data include *municipio* of birth in Mexico and county of residence within the U.S. The cards, which provide a secure form of identification and verified current residence for banking and other legal transactions, are issued primarily to Mexican nationals who lack authorization to live and work in the U.S., and who therefore cannot access other forms of identification.[3] These data will allow us to determine which sending communities in Mexico had stronger network ties to the U.S. labor markets experiencing the largest downturns.

Table 1: *Municipio*-Level Outcome Data Sources

Data Source	Description and Use in Research
Vital Statistics	Administrative data on fertility and child mortality: births and deaths for children less than five years old.
Vehicle Registrations	Administrative data on household and business investment: vehicle registration by type and use (car, taxi, bus, truck, and motorcycle).
Census of Population	Household survey data. Migration measures: return migration from the U.S. and emigration to the U.S. Economic outcomes: self-employment, wages, employment. Demographic outcomes: population, marital status school attendance. Investment measures: acquisition of durable goods (washing machines, refrigerators, computers, cars).
Economic Census [a]	Establishment survey data on economic activity: small business formation, business investments and performance

[a] We are still working to obtain access to these data at the municipio level. All other outcome data are in hand.

The data on outcomes in the sending communities come from a variety of sources, including household surveys such as Demographic and Economic Censuses, and administrative data (see Table 1 for details). At the *municipio* level, we are able to measure outcomes prior to and following the Great Recession in four main categories: migration (emigration to the U.S. and return migration to Mexico), investment (e.g. small business formation, business investments and performance, vehicle registrations, durable purchases) schooling (e.g. schooling at older ages, schooling among girls), and health (fertility, infant mortality). We

[3] Massey et al. (2010) conclude that it is safe to assume that all *matrícula* holders are unauthorized immigrants, since "persons legally in the United States would have no need for such documentation" (p.132).

are also pursuing a variety of potential data sources on remittances at the Mexican *municipio* level, but have thus far been unable to obtain credible estimates at this fine level of geography.

4. Research methods and analytic approach

We will begin by cleaning these data sets and ensuring consistent geographic coding across time and across data sources, allowing us to merge the network and outcome data by geographic location. The MCAS data in particular will require a substantial time investment. The locations listed in the micro data are stored as strings, and we need to resolve abbreviations and misspellings among other errors, in addition to matching the strings to geocoded *municipios* in Mexico and to counties in the U.S. Much of the budgeted time for research assistance will be spent on these and related tasks.

Once the data cleaning tasks are complete, we will use the MCAS data and multiple U.S. data sources to construct the key explanatory variable – the network-connected change in U.S. labor demand for each *municipio*. Our main identification strategy leverages variation across U.S. counties in the depth of the decline in housing construction, which we measure using Census Bureau New Residential Construction data. Given the disproportionate representation of Mexican-born workers in the construction sector and the sharp and spatially heterogeneous declines in construction during the Great Recession, this measure provides quite a bit of variation in the labor market prospects faced by Mexicans in different parts of the U.S. However, to ensure that this measure is not endogenous to the locations of Mexican migrants prior to the housing bust, we will also use variation from other sources. First, we will use a standard Bartik measure, based on the ex-ante distribution of regional employment across industries and national changes in employment at the industry level, as in our prior work (Cadena and Kovak 2016). We will also use variation in ex-ante household leverage, following Mian and Sufi (2014), and we will consider using variation in local bank lending patterns, following Greenstone, Mas, and Nguyen (2015). Because both of these latter shock measures may affect local labor demand through a variety of channels, we plan to use them in reduced-form regressions, and we will present instrumental variables regressions only in cases where the exclusion restriction is plausible.

To fix ideas, suppose that $\Delta \ln (emp_d)$ represents the exogenous employment decline (reflecting one or more of the measures above) in each U.S. destination, *d*. We construct network-connected changes in demand, ND_S, as a weighted average of these declines for each Mexican source community, with weights based on the share of migrants from source *s* that previously selected each U.S. destination. Specifically, the change in U.S. demand faced by *municipio s* is

$$ND_s = \sum_d \frac{m_{sd}}{M_s} \Delta \ln (emp_d), \quad (1)$$

where m_{sd} is the number of individuals born in *s* receiving an identity card in destination *d,* and M_s is the total number of cards issued to migrants born in *s*. This measure combines variation in destination mix across sending *municipios* and variation in demand changes across destinations. Our empirical analysis will then examine the relationships between these network-connected labor demand shocks and the various *municipio*-level outcomes listed in Table 1. The analysis will proceed in two steps, each corresponding to a hypothesis listed in Section 2 above.

Hypothesis i): We will first examine how emigration to the U.S. and return migration to Mexico responded to changes in labor demand across U.S. destination regions. In particular, we regress changes in migration flows at the *municipio* level on the network-connected demand shock (ND_S). Because we can characterize the migration network at fine level of geographical detail, these regressions will utilize more than 2,000 observations. As a key control, we can include Mexican state fixed effects (α_r) in specifications like the following:

$$\Delta y_{sr} = \beta_0 + \beta_1 ND_{sr} + \alpha_r + \epsilon_{sr}, \quad (2)$$

where $\Delta y_{sr} = \ln(y_{sr,2010}) - \ln(y_{sr,2005})$ is the change in log of the return migration or emigration rate from 2005 to 2010 for each specific Mexican source *municipio s*. We compute the standard errors clustered at the Mexican state level to allow for potential heteroskedasticity and/or correlation in migration patterns among *municipios* in the same Mexican state.

The return migration rate is calculated using a question in the Mexican Census and intercensal *Conteo* that asks respondents their country of residence five years earlier. This information allows us to

calculate the number of individuals returning to Mexico between 2000 and 2005, using the 2005 *Conteo*, and those returning to Mexico between 2005 and 2010, using the 2010 Mexican Census. Thus, return migration rates for each Mexican source are calculated as the number of return migrants during the relevant period divided by the *municipio's* population at the beginning of the period. Emigration rates are calculated using the 2010 Mexican Census migration module (*cuestionario ampliado*), which reports the year in which household members traveled to the U.S. We calculate the emigration rate as the number of people who reported emigrating in a given year divided by the source *municipio* population in that year, for 2005 and 2010. These migration measures are constructed in the same way as the measures used in Caballero, Cadena, and Kovak (2017), which demonstrated that net migration to the U.S. fell in source communities more tied to Arizona following the implementation of the Legal Arizona Workers Act, a policy designed to discourage unauthorized migrants.

After cleaning and matching the detailed micro data, we will be able to calculate network-connected demand shocks using a weighted average across U.S. counties. In order to determine the likely success of our approach, however, we have constructed a version of ND_S using U.S. states as destinations, based on cross-tabulations of the MCAS data rather than on the detailed micro data. The use of states rather than counties likely sharply understates the variation in network-connected demand. Figure 1 presents the scatter plot and fitted values relating the change in the natural log of the return migration rate from 2005 to 2010 to the network-connected demand shock, which is calculated based on the change in construction employment across U.S. states. Consistent with expectations, return migration rates rose more in Mexican sending *municipios* facing larger employment declines in their U.S. destinations.

Figure 1: *Municipio* Level Return Migration Rates

Table 2: *Municipio* Level Return Migration Rates

	Change in log of return migration rate			
	Cluster	Control for outliers	Cluster	Control for outliers
	(1)	(2)	(3)	(4)
Panel A. Construction Employment				
Change in log construction	-0.539*	-0.538***	-0.489*	-0.463**
employment	(0.279)	(0.143)	(0.284)	(0.203)
Constant	1.495***	1.487***	0.932***	0.943***
	(0.0916)	(0.0570)	(0.0975)	(0.227)
R-squared	0.007	0.008	0.131	0.157
Panel B. Housing Permits				
Change in log housing	-0.366**	-0.355***	-0.197	-0.156
permits	(0.161)	(0.0880)	(0.149)	(0.116)
Constant	1.185***	1.191***	0.834***	0.891***
	(0.203)	(0.125)	(0.202)	(0.267)
R-squared	0.007	0.007	0.132	0.155
Mexican State FE	No	No	Yes	Yes
Observations	2,188	2,188	2,188	2,188

*** p<0.01, ** p<0.05, * p<0.1

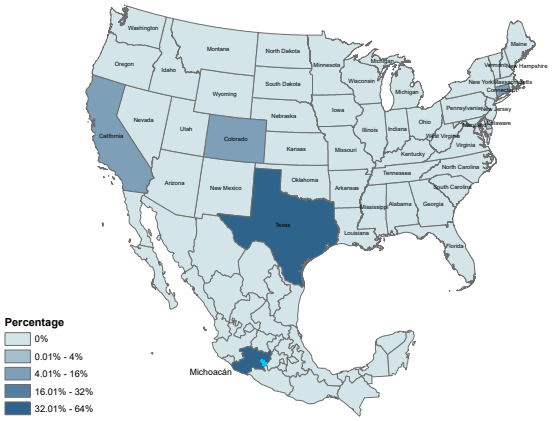
The first column of panel A of Table 2 provides the coefficient estimates from this specification. Columns (2) - (4) of Table 2 examine the robustness of this result. The second and fourth column provides results from a robust regression technique that reduces the impact of high leverage outliers.[4] The point estimate is incredibly stable, although the standard error falls. We also plan to investigate proper weighting techniques to improve the efficiency of the estimates. In columns (3) and (4) we add Mexican state fixed effects as additional controls. Because the specification examines the within-*municipio* change in migration, the fixed effects remove the influence of any *changes* in the sending areas that are common to all *municipios* within a Mexican state. The point estimates are roughly -0.5 and statistically significant across all specifications, even when we rely only on within-state variation in network-connected demand. This estimate implies that the elasticity of the return migration rate with respect to network connected demand is -0.5, i.e. each ten percent decrease in network-connected construction employment leads to a five percent larger increase in a *municipio's* return migration rate. Panel B measures changes in U.S. labor demand using the change in log housing permits issued, as an alternative to the construction employment measure in Panel A. As discussed above, this variable provides a reduced-form measure of the degree to which a *municipio* lost access to employment prospects in the US construction industry due to declines in demand for housing, with quite similar results.

Including Mexican state fixed effects in these regressions requires substantial variation in the destinations selected by migrants from different *municipios* in the same Mexican state. Caballero, Cadena, and Kovak (2017) explicitly document that such variation exists. As an example, the included maps in Figure 2 show the differences in destinations selected for two *municipios* within the Mexican state of Michoacán. Although Tiquicheo and Ciudad Hidalgo are quite close to each other geographically, they send migrants to very different parts of the United States. We expect that the micro data will reveal even more variation in the destinations chosen once we are able to break down U.S. geography into counties rather than states.

[4] Specifically, we use `rreg` in STATA.

Figure 2: Migrant Destinations

Tiquicheo



Ciudad Hidalgo

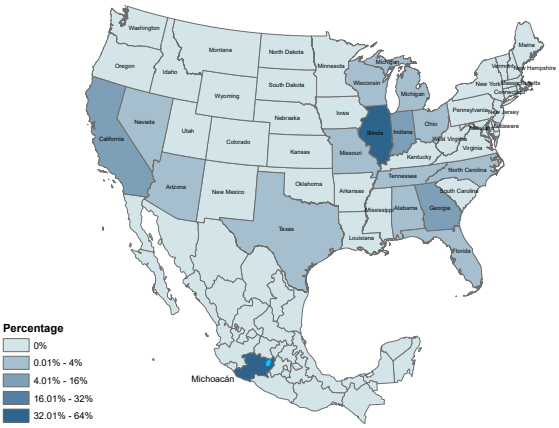


Figure 3 examines the effect of network-connected demand shocks in the U.S. on emigration rates from Mexican *municipios*. The results are symmetric to the return migration results in Figure 1 – emigration rates decline more in Mexican sending *municipios* facing larger employment declines. As above, we anticipate that after incorporating the micro data with more detailed information on U.S. destinations, this relationship will be even stronger.

Figure 3: *Municipio* Level Emigration Rates

Table 3: *Municipio* Level Emigration Rates

	Change in log of emigration rate			
	Cluster	Control for outliers	Cluster	Control for outliers
	(1)	(2)	(3)	(4)
Panel A. Construction Employment				
Change in log construction employment	1.096**	1.214***	0.969**	1.021***
	(0.470)	(0.230)	(0.457)	(0.327)
Constant	0.342*	0.374***	0.724***	0.793**
	(0.197)	(0.0911)	(0.157)	(0.332)
R-squared	0.013	0.016	0.175	0.172
Panel B. Housing Permits				
Change in log housing permits	0.695**	0.752***	0.607***	0.626***
	(0.255)	(0.144)	(0.210)	(0.191)
Constant	0.903**	0.970***	1.212***	1.288**
	(0.364)	(0.204)	(0.284)	(0.405)
R-squared	0.013	0.015	0.174	0.171
State FE	No	No	Yes	Yes
Observations	1,765	1,765	1,765	1,765

*** p<0.01, ** p<0.05, * p<0.1

Table 3 presents the regression results associated with Figure 3. The table is structured identically to Table 2, and the point estimates of the emigration rate elasticity are near +1 and statistically significant across all specifications. Panel B again replaces the employment measure with the housing permits measure, with similar results.

Hypothesis ii): Together, the preliminary results in Figures 1 and 3 and Tables 2 and 3 show that migration patterns at the Mexican *municipio* level respond substantially to economic conditions in destination regions. These responses imply changes in labor supply in source regions and likely changes in remittances, both of which are likely to affect a variety of economic and social outcomes in source regions. The remainder of our analysis will examine the effects of the Great Recession in the U.S. on *municipio*-level outcomes in Mexico. We will estimate regressions of the form shown in equation (2), but where Δy_{sr} represents the change in each of the outcomes shown in Table 1 rather than migration rates.

These outcomes include wages, self-employment rates, fertility rates, child mortality, school attendance, and household investment. As in the migration results presented thus far, these regressions will have more than 2,000 observations because of the detailed *municipio*-level geography in the MCAS data. We will continue to include Mexican state fixed effects (α_r) and to cluster standard errors by Mexican state. Because the specification is in first differences, these fixed effects allow for unobservable *changes* in the determinants of the key outcomes that are common to *municipios* within the same state. As in our prior work, we will also introduce controls reflecting other changes in the attractiveness of particular U.S. destinations including the potential decline in the value of traditional migrant enclaves (Card and Lewis 2007) and anti-immigrant employment legislation or 287(g) local immigration enforcement agreements using data from Santillano and Bohn (2012).

In addition to specifications following equation (2), we will also consider models that take advantage of the variation across *municipios* in the total amount of historic migration to and from the U.S., with the expectation that the effects of network-connected demand will be stronger in communities that have historically sent more migrants to the U.S.

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