Online Appendix (not for publication)

A Proofs

In this section, we provide proofs of Theorem 1, Corollary 1, Lemma 1, and Proposition 1.

A.1 Proof of Theorem 1

In this section, we prove Theorem 1 using the contraction mapping theorem. Recall that the system of Equations $F : \mathbb{R}^{N\times K}_{++} \to \mathbb{R}^{N\times K}_{++}$ are written as:

$$F\left(\mathbf{x}\right)_{ik} \equiv \sum_j K_{ij,k} \prod_{l=1}^{K} \left(x_{j,l}\right)^{\alpha_{k,l}} \prod_{l=1}^{K} \left(x_{i,l}\right)^{\lambda_{k,l}} \prod_{m=1}^{M} P_m\left(\mathbf{x}_j\right)^{\gamma_{k,m}} \prod_{m=1}^{M} P_m\left(\mathbf{x}_i\right)^{\chi_{k,m}},$$

where $Q_m\left(\cdot\right)$ are nested CES aggregating functions:

$$P_m\left(\mathbf{x}_j\right) \equiv \left(\sum_{l\in S_m} \frac{1}{|S_m|} \left(\left(\sum_{n\in T_l} \frac{1}{|T_n|} \left(x_{j,n}\right)^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}\right)^{\frac{1}{\beta_m}},$$

where $\delta_{m,l} > 0$ and $\beta_m > 0$ for all m and l, $\{K_{ij,k}, U_l, T_{j,n}\}$ are all strictly positive parameter values; S_m and $T_{l,m}$ are (weak) subsets of $\{1, ..., K\}$; and $\{\alpha_{k,l}, \lambda_{k,l}, \gamma_{k,m}, \chi_{k,p}\}$ are all real-valued.

It proves helpful to instead consider an equivalent function $G : \mathbb{R}^{N\times K} \to \mathbb{R}^{N\times K}$:

$$G\left(\mathbf{x}\right) \equiv \log \sum_j K_{ij,k} \prod_{l=1}^{K} \left(\exp x_{j,l}\right)^{\alpha_{k,l}} \prod_{l=1}^{K} \left(\exp x_{i,l}\right)^{\lambda_{k,l}} \prod_{m=1}^{M} \exp Q_m\left(\mathbf{x}_j\right)^{\gamma_{k,m}} \prod_{m=1}^{M} \exp Q_m\left(\mathbf{x}_i\right)^{\chi_{k,m}},$$

where:

$$Q_m\left(\mathbf{x}_j\right) \equiv \log \left(\sum_{l\in S_m} \frac{1}{|S_m|} \left(\left(\sum_{n\in T_l} \frac{1}{|T_n|} \left(\exp x_{j,n}\right)^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}\right)^{\frac{1}{\beta_m}}.$$

Clearly if there is any fixed point $\tilde{\mathbf{x}}^* \in \mathbb{R}^{N\times K}$ such that $G\left(\tilde{\mathbf{x}}^*\right) = \tilde{\mathbf{x}}^*$implies that $\mathbf{x}^* \equiv \exp\left(\tilde{\mathbf{x}}^*\right) \in \mathbb{R}^{N\times K}_{++}$ is a fixed point for F, i.e. $F\left(\mathbf{x}^*\right) = \mathbf{x}^*$ (where it is understood that the exponential function is element by element).

For any $\mathbf{x}$ and $\mathbf{y}$ in $\mathbb{R}^{N\times K}$, consider the "max" metric $d\left(\mathbf{x}, \mathbf{y}\right) = \max_{i,k} |x_{i,k} - y_{i,k}|$. Then $\left(\mathbb{R}^{N\times K}, d\right)$ is a complete metric space so that by the contraction mapping theorem, there exists a unique $\tilde{\mathbf{x}}^* \in \mathbb{R}^{N\times K}$ such that $G\left(\tilde{\mathbf{x}}^*\right) = \tilde{\mathbf{x}}^*$ (and hence there exists a unique $\mathbf{x}^* \in \mathbb{R}^{N\times K}_{++}$) if there exists a $\rho \in [0, 1)$ such that for all $\mathbf{x}$ and $\mathbf{y}$ in $\mathbb{R}^{N\times K}$ we have $d\left(G\left(\mathbf{x}\right), G\left(\mathbf{y}\right)\right) \leq \rho \times d\left(\mathbf{x}, \mathbf{y}\right)$. We define $\rho \equiv \max_{k\in\{1,...,K\}} \left(\sum_{m=1}^{M} |\gamma_{k,m}| + \sum_{l=1}^{K} |\alpha_{k,l}| + \sum_{m=1}^{M} |\lambda_{k,m}| + \sum_{m=1}^{M} |\chi_{k,m}|\right)$, and show in the following that $d\left(G\left(\mathbf{x}\right), G\left(\mathbf{y}\right)\right) \leq \rho \times d\left(\mathbf{x}, \mathbf{y}\right)$, as required.

First, choose any two $\mathbf{x}$ and $\mathbf{y}$ in $\mathbb{R}^{N\times K}$. We then can calculate the metric of $G\left(\mathbf{x}\right)$ and

$G(\mathbf{y})$:

$$
\begin{aligned}
d\left(G\left(\mathbf{x}\right),G\left(\mathbf{y}\right)\right) = & \max_{i,k} |\log \sum_j K_{ij,k} \exp\left(\sum_{l=1}^{K}\alpha_{k,l}x_{j,l} + \sum_{m=1}^{M}\gamma_{k,m}Q_{j,m}\left(\mathbf{x}_j\right) + \sum_{m=1}^{M}\chi_{k,m}Q_{j,m}\left(\mathbf{x}_i\right)\right) \iff \\
& -\log \sum_j K_{ij,k} \exp\left(\sum_{l=1}^{K}\alpha_{k,l}y_{j,l} + \sum_{m=1}^{M}\gamma_{k,m}Q_{j,m}\left(\mathbf{y}_j\right) + \sum_{m=1}^{M}\chi_{k,m}Q_{j,m}\left(\mathbf{y}_i\right)\right)| \\
= & \max_{i,k}\left|\log\frac{\sum_j K_{ij,k}\exp\left(\sum_{l=1}^{K}\alpha_{k,l}x_{j,l}+\sum_{m=1}^{M}\gamma_{k,m}Q_{j,m}\left(\mathbf{x}_j\right)+\sum_{m=1}^{M}\chi_{k,m}Q_{j,m}\left(\mathbf{x}_i\right)\right)}{\sum_j K_{ij,k}\exp\left(\sum_{l=1}^{K}\alpha_{k,l}y_{j,l}+\sum_{m=1}^{M}\gamma_{k,m}Q_{j,m}\left(\mathbf{y}_j\right)+\sum_{m=1}^{M}\chi_{k,m}Q_{j,m}\left(\mathbf{y}_i\right)\right)}\right| \iff \\
= & \max_{i,k}\left|\log\sum_j C_{ij,k}\left(\exp\left(\begin{array}{c}\sum_{l=1}^{K}\alpha_{k,l}\left(x_{j,l}-y_{j,l}\right)+\\ \sum_{m=1}^{M}\gamma_{k,m}\left(Q_{j,m}\left(\mathbf{x}_j\right)-Q_{j,m}\left(\mathbf{y}_j\right)\right)+\\ \sum_{m=1}^{M}\chi_{k,m}\left(Q_{j,m}\left(\mathbf{x}_i\right)-Q_{j,m}\left(\mathbf{y}_i\right)\right)\end{array}\right)\right)\right|, \qquad (14)
\end{aligned}
$$

where $C_{ij,k} \equiv \sum_j \frac{K_{ij,k}\exp\left(\sum_{l=1}^{K}\alpha_{k,l}y_{j,l}+\sum_{m=1}^{M}\gamma_{k,m}Q_{j,m}(\mathbf{y}_j)+\sum_{m=1}^{M}\chi_{k,m}Q_{j,m}(\mathbf{y}_i)\right)}{\sum_j K_{ij,k}\exp\left(\sum_{l=1}^{K}\alpha_{k,l}y_{j,l}+\sum_{m=1}^{M}\gamma_{k,m}Q_{j,m}(\mathbf{y}_j)++\sum_{m=1}^{M}\chi_{k,m}Q_{j,m}(\mathbf{y}_i)\right)}$. Note that $\sum_j C_{ij,k} = 1$ for all i and k.

Second, note that we can bound the difference in the CES aggregate functions $Q_m(\cdot)$ as follows:

$$
\begin{aligned}
\left|Q_{j,m}\left(\mathbf{x}_j\right)-Q_{j,m}\left(\mathbf{y}_j\right)\right| = & |\log\left(\sum_{l\in S_m}\frac{1}{|S_m|}\left(\left(\sum_{n\in T_l}\frac{1}{|T_n|}\left(\exp\left(x_{j,n}\right)\right)^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}\right)^{\frac{1}{\beta_m}} \iff \\
& -\log\left(\sum_{l\in S_m}\frac{1}{|S_m|}\left(\left(\sum_{n\in T_l}\frac{1}{|T_n|}\left(\exp\left(y_{j,n}\right)\right)^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}\right)^{\frac{1}{\beta_m}} | \\
= & \left|\frac{1}{\beta_m}\log\left(\frac{\sum_{l\in S_m}\left(\left(\sum_{n\in T_l}\frac{1}{|T_n|}\left(\exp\left(x_{j,n}\right)\right)^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}}{\sum_{l\in S_m}\left(\left(\sum_{n\in T_l}\frac{1}{|T_n|}\left(\exp\left(y_{j,n}\right)\right)^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}}\right)\right| \iff \\
= & \left|\frac{1}{\beta_m}\log\left(\sum_{l\in S_m}\left(\lambda_l\left(\sum_{n\in T_l}\omega_{n,l}\exp\left(\delta_{m,l}\left(x_{j,n}-y_{j,n}\right)\right)\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}\right)\right|,
\end{aligned}
$$

where $\omega_{n,l} \equiv \frac{(\exp(y_{j,n}))^{\delta_{m,l}}}{\sum_{n\in T_l}(\exp(y_{j,n}))^{\delta_{m,l}}}$ and $\lambda_l \equiv \frac{\left(\left(\frac{1}{|T_n|}\sum_{n\in T_l}(\exp(y_{j,n}))^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}}{\sum_{l\in S_m}\left(\left(\sum_{n\in T_l}\frac{1}{|T_n|}(\exp(y_{j,n}))^{\delta_{m,l}}\right)^{\frac{1}{\delta_{m,l}}}\right)^{\beta_m}}$. Note that $\omega_{n,l} \geq 0$ and $\sum_{n\in T_l}\omega_{n,l} = 1$ and, similarly, $\lambda_l \geq 0$ and $\sum_{l\in S_m}\lambda_l = 1$, i.e. both $\omega_{n,l}$ and λ_l

are weights. As a result we have:

$$|Q_{j,m}(\mathbf{x}_j) - Q_{j,m}(\mathbf{y}_j)| = \left| \frac{1}{\beta_m} \log \left(\sum_{l \in S_m} \left(\lambda_l \left(\sum_{n \in T_l} \omega_{n,l} \exp\left(\delta_{m,l}\left(x_{j,n} - y_{j,n}\right)\right) \right)^{\frac{1}{\delta_{m,l}}} \right)^{\beta_m} \right) \right| \implies$$

$$|Q_{j,m}(\mathbf{x}_j) - Q_{j,m}(\mathbf{y}_j)| \leq \frac{1}{\beta_m} \log \left(\sum_{l \in S_m} \left(\left(\sum_{n \in T_l} \omega_{n,l} \exp\left(\delta_{m,l}\left(\max_{i,k}|x_{i,k} - y_{i,k}|\right)\right) \right)^{\frac{1}{\delta_{m,l}}} \right)^{\beta_m} \times \lambda_l \right) \iff$$

$$|Q_{j,m}(\mathbf{x}_j) - Q_{j,m}(\mathbf{y}_j)| \leq \max_{i,k}|x_{i,k} - y_{i,k}| \tag{15}$$

Third, we apply Equation (15) and the fact that $\sum_j C_{ij,k} = 1$ to derive the following bound:

$$\sum_j C_{ij,k} \left(\exp \left(\begin{array}{c} \sum_{l=1}^{K} \alpha_{k,l}\left(x_{j,l} - y_{j,l}\right) + \\ \sum_{m=1}^{M} \gamma_{k,m}\left(Q_{j,m}(\mathbf{x}_j) - Q_{j,m}(\mathbf{y}_j)\right) + \\ \sum_{m=1}^{M} \chi_{k,m}\left(Q_{j,m}(\mathbf{x}_i) - Q_{j,m}(\mathbf{y}_i)\right) \end{array} \right) \right) \leq \sum_j C_{ij,k} \left(\exp \left(\begin{array}{c} \sum_{l=1}^{K} |\alpha_{k,l}|\,|x_{j,l} - y_{j,l}| + \\ \sum_{m=1}^{M} |\gamma_{k,m}|\,|(Q_{j,m}(\mathbf{x}_j) - Q_{j,m}(\mathbf{y}_j))| + \\ \sum_{m=1}^{M} |\chi_{k,m}|\,|Q_{j,m}(\mathbf{x}_i) - Q_{j,m}(\mathbf{y}_i)| \end{array} \right) \right)$$

$$\leq \exp\left(\sum_{l=1}^{K} |\alpha_{k,l}| + \sum_{m=1}^{M} |\gamma_{k,m}| + \sum_{m=1}^{M} |\chi_{k,m}| \right) \max_{i,k}|x_{i,k} - y_{i,k}|. \tag{16}$$

Finally, applying Equation (16) to Equation (14) yields:

$$d\left(G(\mathbf{x}), G(\mathbf{y})\right) \leq \rho \times d(\mathbf{x}, \mathbf{y}),$$

as required.

A.2 Proof of Corollary 1

We first derive two equilibrium equations from the four conditions defining the equilibrium presented in Section 4.3. We then apply Theorem 1 to this system of equations.

Suppose migration costs are symmetric. Recall the first equilibrium condition requires both:

$$L_i^{n,s} \left(\frac{w_i^{n,s}}{P_i} u_i^{n,s} \right)^{-\theta^{n,s}} = \sum_{j \in \mathcal{N}} \left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}} \left(\Pi_j^{n,s}\right)^{-\theta^{n,s}} L_j^{n,s}$$

$$\left(\Pi_i^{n,s}\right)^{\theta^{n,s}} \equiv \sum_{j \in \mathcal{N}} \left(\mu_{ij}^{n,s}\right)^{-\theta^{n,s}} \left(\frac{w_j^{n,s}}{P_j} u_j^{n,s} \right)^{\theta^{n,s}}$$

It turns out that this set of two equations can be simplified to a single equation when migration costs are symmetric. To see this, suppose that the following relationship holds true for some scalar $\kappa^{n,s} > 0$:

$$L_i^{n,s} \left(\frac{w_i^{n,s}}{P_i} u_i^{n,s} \right)^{-\theta^{n,s}} = \kappa^{n,s} \left(\Pi_i^{n,s}\right)^{\theta^{n,s}}$$

Then the first equation becomes:

$$\begin{aligned}
L_i^{n,s}\left(\frac{w_i^{n,s}}{P_i}u_i^{n,s}\right)^{-\theta^{n,s}} &= \sum_{j\in\mathcal{N}}\left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}}\left(\Pi_j^{n,s}\right)^{-\theta^{n,s}}L_j^{n,s} \iff \\
\kappa\left(\Pi_i^{n,s}\right)^{\theta^{n,s}} &= \sum_{j\in\mathcal{N}}\left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}}\left(\frac{w_j^{n,s}}{P_j}u_j^{n,s}\right)^{\theta^{n,s}}\kappa \iff \\
\left(\Pi_i^{n,s}\right)^{\theta^{n,s}} &= \sum_{j\in\mathcal{N}}\left(\mu_{ij}^{n,s}\right)^{-\theta^{n,s}}\left(\frac{w_j^{n,s}}{P_j}u_j^{n,s}\right)^{\theta^{n,s}},
\end{aligned}$$

where the last line imposed symmetry. Hence both equations in the system are identical given the above relationship. This allows us to consider a single non-linear equation:

$$L_i^{n,s} = \kappa^{n,s}\sum_{j\in\mathcal{N}}\left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}}\left(\frac{w_i^{n,s}}{P_i}u_i^{n,s}\right)^{\theta^{n,s}}\left(\frac{w_j^{n,s}}{P_j}u_j^{n,s}\right)^{\theta^{n,s}}. \tag{17}$$

Similarly, suppose trade costs are symmetric. Recall the fourth equilibrium condition requires that both:

$$\begin{aligned}
Y_i^{\sigma}Q_i^{1-\sigma} &= \sum_{j\in\mathcal{N}}\tau_{ij}^{1-\sigma}P_j^{\sigma-1}Y_j \\
P_i^{1-\sigma} &\equiv \sum_{j\in\mathcal{N}}\tau_{ji}^{1-\sigma}Y_i^{1-\sigma}Q_i^{\sigma-1}
\end{aligned}$$

Suppose that the following relationship holds true for some scalar $\kappa > 0$:

$$\begin{aligned}
Y_i^{\sigma}Q_i^{1-\sigma} &= \kappa P_i^{1-\sigma} \iff \\
P_i &= \kappa^{\frac{1}{\sigma-1}}Y_i^{-\frac{\sigma}{\sigma-1}}Q_i
\end{aligned} \tag{18}$$

then the first equation becomes:

$$\begin{aligned}
Y_i^{\sigma}Q_i^{1-\sigma} &= \sum_{j\in\mathcal{N}}\tau_{ij}^{1-\sigma}P_j^{\sigma-1}Y_j \iff \\
\kappa P_i^{1-\sigma} &= \sum_{j\in\mathcal{N}}\tau_{ij}^{1-\sigma}\left(\kappa Y_j^{-\sigma}Q_j^{\sigma-1}\right)Y_j \iff \\
P_i^{1-\sigma} &= \sum_{j\in\mathcal{N}}\tau_{ji}^{1-\sigma}Y_j^{1-\sigma}Q_j^{\sigma-1}
\end{aligned}$$

where the last line imposed symmetry of trade costs. Hence the two equations are identical.

This allows us to consider a single non-linear equation:

$$
\begin{aligned}
Y_i^{\sigma} Q_i^{1-\sigma} = \kappa \sum_{j\in\mathcal{N}} \tau_{ij}^{1-\sigma} Y_j^{1-\sigma} Q_j^{\sigma-1} \iff \\
Y_i = \kappa \sum_{j\in\mathcal{N}} \tau_{ij}^{1-\sigma} \left(Y_i^{1-\sigma} Q_i^{\sigma-1}\right)\left(Y_j^{1-\sigma} Q_j^{\sigma-1}\right).
\end{aligned}
\tag{19}
$$

Substituting the price index equation (18) into the migration equation (17) yields:

$$
\begin{aligned}
L_i^{n,s} &= \kappa^{n,s} \sum_{j\in\mathcal{N}} \left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}} \left(\frac{w_i^{n,s}}{P_i} u_i^{n,s}\right)^{\theta^{n,s}} \left(\frac{w_j^{n,s}}{P_j} u_j^{n,s}\right)^{\theta^{n,s}} \iff \\
L_i^{n,s} &= \frac{\kappa^{n,s}}{\kappa^{\frac{2\theta^{n,s}}{\sigma-1}}} \sum_{j\in\mathcal{N}} \left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}} \left(\frac{w_i^{n,s}}{Y_i^{-\frac{\sigma}{\sigma-1}} Q_i} u_i^{n,s}\right)^{\theta^{n,s}} \left(\frac{w_j^{n,s}}{Y_j^{-\frac{\sigma}{\sigma-1}} Q_j} u_j^{n,s}\right)^{\theta^{n,s}}
\end{aligned}
$$

Moreover, using the equilibrium equation (3) for wages from the first order conditions of the producer (the third equilibrium condition):

$$
w_i^{n,s} = A_i^{n,s} Y_i Q_i^{\frac{1-\rho}{\rho}} \left(Q_i^s\right)^{\left(\frac{1}{\rho_s}-\frac{1}{\rho}\right)} \left(L_i^{n,s}\right)^{-\frac{1}{\rho_s}}
$$

we have:

$$
\begin{aligned}
L_i^{n,s} =& \frac{\kappa^{n,s}}{\kappa^{\frac{2\theta^{n,s}}{\sigma-1}}} \sum_{j\in\mathcal{N}} \left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}} \left(\frac{w_i^{n,s}}{Y_i^{-\frac{\sigma}{\sigma-1}} Q_i} u_i^{n,s}\right)^{\theta^{n,s}} \left(\frac{w_j^{n,s}}{Y_j^{-\frac{\sigma}{\sigma-1}} Q_j} u_j^{n,s}\right)^{\theta^{n,s}} \iff \\
L_i^{n,s} =& \tilde{\kappa}^{n,s} \sum_{j\in\mathcal{N}} \left(\frac{A_i^{n,s} u_i^{n,s} A_j^{n,s} u_j^{n,s}}{\mu_{ij}^{n,s}}\right)^{\theta^{n,s}} \left(Y_i^{\frac{2\sigma-1}{\sigma-1}} Q_i^{-\frac{2\rho-1}{\rho}} \left(Q_i^s\right)^{\left(\frac{1}{\rho_s}-\frac{1}{\rho}\right)} \left(L_i^{n,s}\right)^{-\frac{1}{\rho_s}}\right)^{\theta^{n,s}} \\
& \times \left(Y_j^{\frac{2\sigma-1}{\sigma-1}} Q_j^{-\frac{2\rho-1}{\rho}} \left(Q_j^s\right)^{\left(\frac{1}{\rho_s}-\frac{1}{\rho}\right)} \left(L_j^{n,s}\right)^{-\frac{1}{\rho_s}}\right)^{\theta^{n,s}}.
\end{aligned}
\tag{20}
$$

We apply Theorem 1 to the system of equations (19) and (20). Note that the second equilibrium condition defines how Q_i and Q_s are functions of the $\{L_i^{n,s}\}_{n\in\{M,U\}}^{s\in\{h,l\}}$. Recall that Theorem 1 applies to any system of Equations $F : \mathbb{R}_{++}^{N\times K} \to \mathbb{R}_{++}^{N\times K}$ are written as:

$$
F(\mathbf{x})_{ik} \equiv \sum_j K_{ij,k} \prod_{l=1}^{K} \left(x_{j,l}\right)^{\alpha_{k,l}} \prod_{l=1}^{K} \left(x_{i,l}\right)^{\lambda_{k,l}} \prod_{m=1}^{M} Q_m\left(\mathbf{x}_j\right)^{\gamma_{k,m}} \prod_{m=1}^{M} Q_m\left(\mathbf{x}_i\right)^{\chi_{k,m}},
$$

where $Q_m(\cdot)$ are nested CES aggregating functions:

$$
Q_m\left(\mathbf{x}_j\right) \equiv \left(\sum_{l\in S_m} U_l \left(\left(\sum_{n\in T_{l,m}} T_{j,n} \left(x_{j,n}\right)^{\delta_{m,n}}\right)^{\frac{1}{\delta_{m,n}}}\right)^{\beta_m}\right)^{\frac{1}{\beta_m}},
$$

$\{K_{ij,k}, U_l, T_{j,n}\}$ are all strictly positive parameter values; S_m and $T_{l,m}$ are (weak) subsets of $\{1, ..., K\}$; and $\{\alpha_{k,l}, \lambda_{k,l}, \gamma_{k,m}, \chi_{k,p}\}$ are all real-valued.

Equations (19) and (20) are one such system where N is the number of locations, $K = 5$ is the number of endogenous variables in each location (corresponding to the four types of labor $L_i^{h,M}, L_i^{h,U}, L_i^{l,M}, L_i^{l,U}$ and the income in each location Y_i, using the production function – equilibrium condition), and $M = 3$ (one CES aggregate for high-skill labor Q^h, one CES for low-skill labor Q^l, and one nested CES aggregate across both high and low-skill labor Q). Under the assumptions that $\rho_s > \rho$ for $s \in \{h, l\}$, $\rho > \frac{1}{2}$ and $\sigma > 1$, Theorem 1 provides the following sufficient conditions for uniqueness:

$$\theta^{n,s} < \frac{1}{2}\left(\frac{\sigma - 1}{4\sigma - 3}\right) \; \forall n \in \{M, U\}, s \in \{h, l\}$$

$$\sigma < \frac{5}{4},$$

as claimed.

A.3 Proof of Lemma 1

First, note that we can immediately construct the total income of a location from the location observables as follows: $Y_i = \sum_{n \in \{U,M\}, s \in \{h,l\}} w_i^{n,s} L_i^{n,s}$. Noting that $Y_i = p_i Q_i$ as well and rearranging Equation (8), we have:

$$p_i^{\sigma-1} = \sum_{j=1}^{N} \tau_{ij}^{1-\sigma} P_j^{\sigma-1} \left(\frac{Y_j}{Y_i}\right)$$

$$P_i^{1-\sigma} = \sum_{j=1}^{N} \tau_{ji}^{1-\sigma} p_j^{1-\sigma}$$

An immediate application of Theorem 3 of Allen, Arkolakis, and Li (2016) tells us that there exists a unique (to-scale) set of $p_i^{1-\sigma}$ and $P_i^{1-\sigma}$ consistent with observed trade costs $\left\{\tau_{ij}^{1-\sigma}\right\}$ and incomes $\{Y_i\}$.

Identifying amenities proceeds in a similar way. Define $W_i^{n,s} \equiv \frac{w_i^{n,s}}{P_i} u_i^{n,s}$ as the welfare of worker of type $\{n, s\}$ in location i. Rearranging equation (7) then yields:

$$\left(W_i^{n,s}\right)^{-\theta^{n,s}} = \sum_{j \in \mathcal{N}} \left(\mu_{ji}^{n,s}\right)^{-\theta^{n,s}} \left(\Pi_j^{n,s}\right)^{-\theta^{n,s}} \frac{L_{j,0}^{n,s}}{L_i^{n,s}}$$

$$\left(\Pi_i^{n,s}\right)^{\theta^{n,s}} = \sum_{j \in \mathcal{N}} \left(\mu_{ij}^{n,s}\right)^{-\theta^{n,s}} \left(W_j^{n,s}\right)^{\theta^{n,s}}$$

Again, an immediate application of Theorem 3 of Allen, Arkolakis, and Li (2016) tells us that there exists a unique (to-scale) set of $\left(W_i^{n,s}\right)^{\theta^{n,s}}$ and $\left(\Pi_i^{n,s}\right)^{\theta^{n,s}}$ consistent with observed migration costs $\left\{\left(\mu_{ij}^{n,s}\right)^{-\theta^{n,s}}\right\}$ and populations $\left\{\frac{L_{j,0}^{n,s}}{L_i^{n,s}}\right\}$.

A.4 Proof of Proposition 1

We express the (unobserved) productivities of each type of labor as a function of the local factor price (which from above can be recovered from the data using the market clearing condition). First, taking ratios of United States and Mexican born workers, Equation (3) implies:

$$\frac{A_i^{M,s}}{A_i^{U,s}} = \left(\frac{w_i^{M,s}}{w_i^{U,s}}\right)\left(\frac{L_i^{M,s}}{L_i^{U,s}}\right)^{\frac{1}{\rho_s}} \quad \forall s \in \{h,l\},$$

so that given observed relative wages and populations (along with the known elasticity of substitution ρ_s), relative productivities of United States to Mexican workers of the same skill group within location are observed. Hence, once the productivity of U.S. workers of a skill group is recovered, we can immediately deduce the productivity of Mexican workers in that skill group.

We proceed by identifying the price and quantity of skilled workers within a location (an identical derivation holds for low-skilled workers). Using the CES aggregate of the price of high-skill workers, we have:

$$\begin{aligned}
\left(p_i^h\right)^{1-\rho_h} &= \left(A_i^{M,h}\right)^{\rho_h}\left(w_i^{M,h}\right)^{1-\rho_h} + \left(A_i^{U,h}\right)^{\rho_h}\left(w_i^{U,h}\right)^{1-\rho_h} \iff \\
\left(p_i^h\right)^{1-\rho_h} &= \left(A_i^{U,h}\right)^{\rho_h}\left(\left(\frac{A_i^{M,h}}{A_i^{U,h}}\right)^{\rho_h}\left(w_i^{M,h}\right)^{1-\rho_h} + \left(w_i^{U,h}\right)^{1-\rho_h}\right) \iff \\
p_i^h &= \left(A_i^{U,h}\right)^{-\frac{\rho_h}{\rho_h-1}}\left(\left(\frac{A_i^{M,h}}{A_i^{U,h}}\right)^{\rho_h}\left(w_i^{M,h}\right)^{1-\rho_h} + \left(w_i^{U,h}\right)^{1-\rho_h}\right)^{\frac{1}{1-\rho_h}} \iff \\
p_i^h &= \left(A_i^{U,h}\right)^{-\frac{\rho_h}{\rho_h-1}}\tilde{p}_i^h,
\end{aligned}$$

where $\tilde{p}_i^h \equiv \left(\left(\frac{A_i^{M,h}}{A_i^{U,h}}\right)^{\rho_h}\left(w_i^{M,h}\right)^{1-\rho_h} + \left(w_i^{U,h}\right)^{1-\rho_h}\right)^{\frac{1}{1-\rho_h}}$ can be recovered from observed data. That is, the high-skill price is identified up to the United States high skilled productivity in a location.

Similarly, using the CES aggregate of the quantity of high-skill, we have:

$$\begin{aligned}
Q_i^h &= \left(A_i^{U,h}\right)^{\frac{\rho_h}{\rho_h-1}}\left(\frac{A_i^{M,h}}{A_i^{U,h}}\left(L_i^{M,h}\right)^{\frac{\rho_h-1}{\rho_h}} + \left(L_i^{U,h}\right)^{\frac{\rho_h-1}{\rho_h}}\right)^{\frac{\rho_h}{\rho_h-1}} \iff \\
Q_i^h &= \left(A_i^{U,h}\right)^{\frac{\rho_h}{\rho_h-1}}\tilde{Q}_i^h,
\end{aligned}$$

where $\tilde{Q}_i^h \equiv \left(\frac{A_i^{M,h}}{A_i^{U,h}}\left(L_i^{M,h}\right)^{\frac{\rho_h-1}{\rho_h}} + \left(L_i^{U,h}\right)^{\frac{\rho_h-1}{\rho_h}}\right)^{\frac{\rho_h}{\rho_h-1}}$ can be recovered from observed data. Combining the above expressions for prices and quantity yields:

$$p_i^h\left(Q_i^h\right)^{\frac{1}{\rho}} = \tilde{p}_i^h\left(A_i^{U,h}\right)^{\frac{\rho_h}{-\rho_h-1}} \times \left(\left(A_i^{U,h}\right)^{\frac{\rho_h}{\rho_h-1}}\tilde{Q}_i^h\right)^{\frac{1}{\rho}} \iff$$

$$p_i^h\left(Q_i^h\right)^{\frac{1}{\rho}} = \tilde{p}_i^h\left(\tilde{Q}_i^h\right)^{\frac{1}{\rho}}\left(A_i^{U,h}\right)^{\left(\frac{\rho_h}{\rho_h-1}\right)\left(\frac{1}{\rho}-1\right)}$$

Since the same expression holds for low-skill workers, we can combine these results with the first order condition $p_i^h\left(Q_i^h\right)^{\frac{1}{\rho}} = p_i^l\left(Q_i^l\right)^{\frac{1}{\rho}}$ to yield:

$$\tilde{p}_i^h\left(\tilde{Q}_i^h\right)^{\frac{1}{\rho}}\left(A_i^{U,h}\right)^{\left(\frac{\rho_h}{\rho_h-1}\right)\left(\frac{1}{\rho}-1\right)} = \tilde{p}_i^l\left(\tilde{Q}_i^l\right)^{\frac{1}{\rho}}\left(A_i^{U,l}\right)^{\left(\frac{\rho_l}{\rho_l-1}\right)\left(\frac{1}{\rho}-1\right)} \iff$$

$$\frac{\left(A_i^{U,h}\right)^{\left(\frac{\rho_h}{\rho_h-1}\right)\left(1-\frac{1}{\rho}\right)}}{\left(A_i^{U,l}\right)^{\left(\frac{\rho_l}{\rho_l-1}\right)\left(1-\frac{1}{\rho}\right)}} = \frac{\tilde{p}_i^h\left(\tilde{Q}_i^h\right)^{\frac{1}{\rho}}}{\tilde{p}_i^l\left(\tilde{Q}_i^l\right)^{\frac{1}{\rho}}}$$

Finally, we define $x_i \equiv \frac{\left(A_i^{U,h}\right)^{\left(\frac{\rho_h}{\rho_h-1}\right)\left(1-\frac{1}{\rho}\right)}}{\left(A_i^{U,l}\right)^{\left(\frac{\rho_l}{\rho_l-1}\right)\left(1-\frac{1}{\rho}\right)}} = \left(\frac{\left(A_i^{U,h}\right)^{\left(\frac{\rho_h}{\rho_h-1}\right)}}{\left(A_i^{U,l}\right)^{\left(\frac{\rho_l}{\rho_l-1}\right)}}\right)^{-(1-\rho)\frac{1}{\rho}}$ (which can be recovered from data using the above expression) and use the CES aggregate expression for prices to derive an expression for the United States high skilled workers:

$$p_i^{1-\rho} = \left(p_i^h\right)^{1-\rho} + \left(p_i^l\right)^{1-\rho} \iff$$

$$p_i^{1-\rho} = \left(\left(A_i^{U,h}\right)^{-\frac{\rho_h}{\rho_h-1}} \times \tilde{p}_i^h\right)^{1-\rho} + \left(\left(A_i^{U,l}\right)^{-\frac{\rho_l}{\rho_l-1}} \times p_i^l\right)^{1-\rho} \iff$$

$$p_i^{1-\rho} = \left(\left(A_i^{U,h}\right)^{-\frac{\rho_h}{\rho_h-1}} \times \tilde{p}_i^h\right)^{1-\rho} + \left(\left(A_i^{U,l}\right)^{-\frac{\rho_l}{\rho_l-1}} \times p_i^l\right)^{1-\rho} \iff$$

$$p_i^{1-\rho} = \left(A_i^{U,h}\right)^{-\frac{\rho_h}{\rho_h-1}(1-\rho)}\left(\left(\tilde{p}_i^h\right)^{1-\rho} + \left(\frac{\left(A_i^{U,h}\right)^{\frac{\rho_h}{\rho_h-1}}}{\left(A_i^{U,l}\right)^{\frac{\rho_l}{\rho_l-1}}}\right)^{(1-\rho)}\left(p_i^l\right)^{1-\rho}\right) \iff$$

$$p_i^{1-\rho} = \left(A_i^{U,h}\right)^{-\frac{\rho_h}{\rho_h-1}(1-\rho)}\left(\left(\tilde{p}_i^h\right)^{1-\rho} + x_i^{-\rho}\left(\tilde{p}_i^l\right)^{1-\rho}\right) \iff$$

$$A_i^{U,h} = \left(\left(\left(\left(\tilde{p}_i^h\right)^{1-\rho} + x_i^{-\rho}\left(\tilde{p}_i^l\right)^{1-\rho}\right)^{\frac{1}{1-\rho}}\right)/p_i\right)^{\frac{\rho_h-1}{\rho_h}}$$

Finally, we recover $A_i^{U,l}$ in all locations:

$$\left(\frac{\left(A_i^{U,h}\right)^{\left(\frac{\rho_h}{\rho_h-1}\right)\left(1-\frac{1}{\rho}\right)}}{x_i}\right)^{\frac{1}{\left(\frac{\rho_l}{\rho_l-1}\right)\left(1-\frac{1}{\rho}\right)}} = \left(A_i^{U,l}\right).$$

As a result, we have recovered the productivity of all labor types solely as a function of observables and model elasticities. Note that because the factor price is only recovered up to scale (see Lemma 1), each productivity is only recovered up to scale.

Identifying amenities is simpler. Recall that $W_i^{n,s} \equiv \frac{w_i^{n,s}}{P_i} u_i^{n,s}$ is the welfare of worker of type $\{n, s\}$ in location i. From Lemma 1, there exists a unique (to-scale) set of $\left(W_i^{n,s}\right)^{\theta^{n,s}}$ consistent with observed migration costs $\left\{\left(\mu_{ij}^{n,s}\right)^{-\theta^{n,s}}\right\}$ and populations $\left\{\frac{L_{j,0}^{n,s}}{L_i^{n,s}}\right\}$. Since $w_i^{n,s}$ is observable in the data and P_i is uniquely (to-scale) recovered from the data (see Lemma 1), the amenity of each type of worker is immediately recovered from the following expression:

$$u_i^{n,s} = W_i^{n,s} / \left(\frac{w_i^{n,s}}{P_i}\right),$$

as required.

B Data appendix

B.1 United States Data

We follow the replication files provided by Ottaviano and Peri (2012) and Borjas, Grogger, and Hanson (2012) and define our sample variables in the same way:

- Our primary sample is all individuals aged 18-64 (inclusive).
- We drop people in group quarters (**inlist(gq,0,3,4)**)
- We define education as low education if the person has complete high school or less (educ variable less than or equal to category 6). We define education as high education if the person has completed some college (educ variable greater than or equal to category 7).
- We define experience as age minus first time worked, where we assume first time worked is 17 for workers with no HS degree, 19 for HS graduates, 21 for workers with some college, and 23 for college graduates. We then drop if **experience <1 | experience > 40**.
- We use the CPI - U variable to deflate the wage variables into constant year 2000 dollars
- We calculate the usual hours of work per week. Before 1980 and from 2008, we use the midpoint of the aggregated variable wkswork2. For the other years, we use the value reported in the variable hrswork2.
- We sum the variable PERWT to get the total counts of individuals.

Further sample selection rules

- We include both males and females in the analysis. Ottaviano and Peri (2012)and Borjas, Grogger, and Hanson (2012) consider only males
- For computing population counts, we drop self-employed people (**classwkrd<20 | classwkrd>28**). We keep people who did not work the last week (this is in contrast to B/OP who drop this. We are interested in employment as an outcome)
- For computing average wages, we drop self-employed people, those with zero wage income, and those who with 0 hours of regular work. Average income is weighted by the number of hours worked.

B.2 Mexican data

We follow the same definitions as above as closely as possible to define analgous variables in the Mexican Census.

B.3 Geographic concordances

We are restricted to using geographical variables that are available in the public use files. The primary variable is the PUMA (public use microdata areas). PUMAS are redefined after each Census year. We use the IPUMS variable cpuma0010, which provides consistent groupings of PUMAS from 2000-2015 for our primary analysis.

B.4 Matrícula Database

One of the data sets used in this study was constructed from the administrative records of the Mexican Matrícula Consular. The original source did not provide numeric identifiers for place of birth or residency, but the names of these locations. In this appendix we describe how we constructed our data set from this records. We will do so in two parts: first merging places of residency to PUMAs in the United States and then merging place of birth to GEOLEV2 locations in Mexico[29]

Place of residency in the United States

The raw data gives us two pieces of information regarding place of residency, "Current State" and "Current Municipality". The field "Current Municipality" is vague and was interpreted by applicants in different ways, some providing a county, others a city. Furthermore, it is common to use unofficial names, e.g. "LA" for "Los Angeles". To match theses localities to PUMAs, we made use of a crosswalk provided by the Missouri Census Data Center.[30] It contains the names of all counties, minor civil divisions, cities, villages, towns, etc. in the United States We matched these with the Matrícula data set using the Stata function *reclink*. After this, we hand-coded the unmatched localities with the highest numbers of Matrículas cards. One example of such location is "LA", which the algorithm could not recognize as being "Los Angeles". This procedure yields the following results: 92% of the Matrículas Consularess were matched to a PUMA, 7% did not have place of residency in the raw data and 1% were not matched.

Place of birth in Mexico

The raw data gives us two pieces of information regarding place of birth, "State of Birth" and "Municipality of Birth". Again, the field "Municipality of Birth" was interpreted by applicants in different ways. To match these to Municipality codes, we used a list of all geographical divisions of Mexico provided by the *Instituto Nacional de Estadistica y Geografia*[31] and the Stata function *reclink*. As above, we hand-coded the unmatched localities with the highest numbers of Matrículas cards. Finally we used the dictionaries provides by IPUMS to aggregate municipalities to GEOLEV2 areas. This procedure yields the following results:

[29]PUMAs and GEOLEV2 are time-invariant geographical divisions provided by IPUMS, which are comparable to counties, but usually larger. More details in https://usa.ipums.org/usa/

[30]http://mcdc.missouri.edu/websas/geocorr2k.html

[31]See "Catálogo de Claves de Entidades Federativas y Municipios" in http://www.inegi.org.mx/default.aspx.

86% of the Matrículas Consularess were matched to a GEOLEV2, 7% did not have place of birth in the data and 7% were not matched.

B.5 Verification of Matrícula database

First, we show that the Matrícula counts correlate with measures of migrants from the ACS. Because the stock of migrants at a point in time depends on both the inflows of new migrants and the outflows of pre-existing migrants, we consider three different measures, shown in Appendix Table 2. The first panel considers the elasticity of migrant stocks in the ACS to the number of Matrículas Consularess. We find an elasticity of 6.1 (across all migrants) and an elasticity of 7.7 (for low-educated migrants in the ACS). We then do the same exercise considering a fixed cohort of individuals, born between 1940-1987, to hold constant population growth. We find similar elasticities of 4.6 and 6.1. The second panel considers the correlation between the stock of migrants in levels and the number of Matrículas in levels. We find that each additional Matrícula is associated with an increase of between 0.4 migrants in the ACS[32] and 0.42 for the stock of lower-educated migrants. Considering only male migrants and Matrículas issued to males, we find a point estimate of 0.60. The point estimates using the fixed cohort are larger, at 0.48, 0.52, and 0.77 respectively. The third panel considers the change in the stock of migrants and the level of Matrículas. We find that each additional Matrícula is associated with a net change in the stock of between 0.03-0.07 migrants, although the point estimates are smaller for the fixed cohort estimates.

Next, we repeat the same exercise using Mexican Census data. The population growth rate in Mexico is about twice that of the United States and so we focus on the fixed cohort numbers, although both are included in the table for completeness. Appendix Table **??** shows that the number of Matrículas Consularess correlates negatively with population stocks in the Mexican Census. This is the expected direction because migrants are people who are not living in Mexico. We find that each additional Matrícula is associated with between 14-24 fewer working age people (Panel b) and a change in the stock of Mexican working-age population of between 0.6-1.5 (Panel c) in an Mexican municipality.

[32]We should expect this value to be less than one: demographers estimate that the ACS and the Census under-count unauthorized migration by 8-13% Passel and Cohn (2016).

Appendix Table 1: Geographical location of migrants: ACS and Matrícula

	2005/2006			2010-2012		
	Matricula	ACS	ACS: recent	Matricula	ACS	ACS: recent
Demographics						
Female	0.362	0.332	0.263	0.395	0.358	0.288
High education	0.035	0.000	0.000	0.039	0.000	0.000
Destinations						
California	0.379	0.374	0.251	0.313	0.355	0.249
Texas	0.154	0.181	0.162	0.216	0.186	0.188
Illinois	0.093	0.068	0.050	0.075	0.068	0.052
Arizona	0.036	0.049	0.061	0.030	0.037	0.025
Nevada	0.029	0.021	0.023	0.021	0.021	0.014
Georgia	0.027	0.028	0.049	0.030	0.027	0.038
Florida	0.025	0.030	0.050	0.028	0.026	0.031
Colorado	0.022	0.023	0.027	0.024	0.022	0.021
North Carolina	0.022	0.025	0.042	0.037	0.027	0.040
Washington	0.021	0.021	0.025	0.011	0.024	0.026
New Mexico	0.012	0.010	0.009	0.013	0.011	0.008
All other states	0.182	0.170	0.250	0.203	0.196	0.309
N (average per year)	887,564	5,928,770	1,291,722	841,503	5,627,935	573,386

Notes: Table shows share of migrants in each state. Data source: Matrícula Consular database, 2005, 2006, 2010; ACS 2005-2012. Only migrants with high-school education or lower included from ACS.

Appendix Table 2: Comparing Matrículas and ACS Mexican-born

	All			Fixed cohort (born 1940-1987)		
	(1)	(2)	(3)	(4)	(5)	(6)
	All ACS	Low-ed ACS	Male ACS	All ACS	Low-ed ACS	Male ACS
Panel (a): Log-Log						
Log num matr	0.061	0.077		0.046	0.061	
	0.021**	0.022***		0.021*	0.022**	
Log num male matr			0.030			0.021
			0.020			0.020
N	8287	7856	8057	8251	7802	8005
yearFE	yes	yes	yes	yes	yes	yes
cpumaFE	yes	yes	yes	yes	yes	yes
Panel (b): Level-Level						
Num matr	0.402	0.419		0.482	0.517	
	0.017***	0.017***		0.021***	0.022***	
Num male matr			0.598			0.766
			0.024***			0.030***
N	11858	11858	11858	11858	11858	11858
yearFE	yes	yes	yes	yes	yes	yes
cpumaFE	yes	yes	yes	yes	yes	yes
Panel (c): First diff-level						
Num matr	0.053	0.031		0.008	-0.021	
	0.018**	0.017		0.018	0.017	
Num male matr			0.069			0.004
			0.024**			0.024
N	10780	10780	10780	10780	10780	10780
yearFE	yes	yes	yes	yes	yes	yes
cpumaFE	yes	yes	yes	yes	yes	yes

Notes: Data compares Matrículas and Mexican-born population in the ACS. Period: 2005-2010;2012-2015.

Appendix Table 3: Comparing Matrículas and Mexican census

	All			Fixed cohort (born 1940-1987)		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	Male	Low-ed	All	Male	Low-ed
Panel (a): Log-Log						
Log num matr	0.017	0.026		-0.009	-0.004	
	0.008*	0.008**		0.009	0.008	
Log num male matr			0.002			-0.017
			0.007			0.007*
N	6046	6046	6371	6012	6012	6353
yearFE	yes	yes	yes	yes	yes	yes
geolev2FE	yes	yes	yes	yes	yes	yes
Panel (b): Level-Level						
Num matr	17.442	0.607		-18.126	-22.878	
	0.624***	0.447		0.627***	0.685***	
Num male matr			13.776			-14.472
			0.507***			0.594***
N	6054	6046	6379	6020	6012	6361
yearFE	yes	yes	yes	yes	yes	yes
geolev2FE	yes	yes	yes	yes	yes	yes
Panel (c): First diff-sum of level						
5-year sum matr	-0.188	-0.194		-0.614	-1.374	
	0.034***	0.035***		0.035***	0.037***	
5-year sum male matr			-0.299			-0.587
			0.033***			0.032***
N	4662	4644	4662	4662	4644	4662
yearFE	yes	yes	yes	yes	yes	yes
geolev2FE	yes	yes	yes	yes	yes	yes

Notes: Data compares Matrículas and population in Mexican Census. Mexican Census data from 2005 and 2010. Matrícula data from 2005-2010.

Appendix Table 4: Comparison: Pew Matrícula applicants vs ACS Mexican-born

	Pew	2005 ACS (all)	2005 ACS (6 states)
Share male	0.59	0.54	0.52
Age	31.29	36.26	36.96
High school educ or less	0.94	0.87	0.86
Married	0.46		
In U.S. for less than 5 years	0.39	0.21	0.17
Avg weekly earnings	334.51	441.71	451.07
No. obs (unweighted)	4836	62871	45683

Notes: Data source: Pew Matrícula survey. Pew survey conducted in CA, NY, IL, GA, TX, NC, between July 2004-Jan 2005.

Appendix Table 5: Gravity equations: Matrícula data (robustness: unweighted)

	OLS		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
	Log(x)	Log(1+x)	Log(x)	Log(1+x)	Log(x)	Log(1+x)
	b/se	b/se	b/se	b/se	b/se	b/se
Post x change log traveltime	-0.029	-0.219			-0.311	-0.375
	0.060	0.009***			0.193	0.023***
Post x change log travel time (pred)			-0.214	-0.301		
			0.133	0.019***		
N	451074	4969692	451074	4969692	451074	4969692
First-stage F stat					753.28	4968.09
Mean change travel time var.	0.036	0.018	0.017	0.018	0.036	0.018
Destination-year FE	yes	yes	yes	yes	yes	yes
Origin-year FE	yes	yes	yes	yes	yes	yes
Pair FE	yes	yes	yes	yes	yes	yes
SE clustered at:	no	no	no	no	no	no
whatSE	pair	pair	pair	pair	pair	pair

Notes: Data: 2006 and 2010 Matrícula database. Each observation is an origin (Mexican municipality) - destination (U.S. PUMA) pair. Log change travel time is the log change in travel time for the least-cost path between the origin and destination pair. Log change travel time (pred) is the change in travel time for the predicted wall expansion.

Appendix Table 6: First stage for gravity equations: Matrícula data

Dep var: Post x change log travel time	(1) $x > 0$ b/se	(2) All b/se
Post x change log travel time (pred)	0.656	0.797
	0.034***	0.027***
N	451074	4969692
First-stage F stat	382.87	858.60
Mean change travel time var.	0.017	0.018
Destination-year FE	yes	yes
Origin-year FE	yes	yes
Pair FE	yes	yes
WLS	yes	yes
whatSE	pair	pair

Notes: Data: 2006 and 2010 Matrícula database. Each observation is an origin (Mexican municipality) - destination (U.S. PUMA) pair. Log change travel time is the log change in traveltime for the least-cost path between the origin and destination pair. Log change travel time (pred) is the change in travel time for the predicted wall expansion.

Appendix Table 7: Fence expansion and choice of crossing location (EMIF data)

	(1)
Indicator crossing location	b/se
Log distance to destination	-0.046
	0.022**
Log distance to origin	-0.014
	0.015
Fence Expansion	-0.030
	0.017*
Origin-destination FE	568378
Crossing location FE	0.059
IndividualFE	Yes
CrossLocFE	Yes

Notes: This table estimates a choice model at the individual level (holding constant the origin and destination) of which of the 17 EMIF border crossing points to chose. The standard errors are multi-way clustered in each of the included fixed effects.

Appendix Table 8: Effect of the wall on population (Simple instrument)

	All migrants				Recent migrants			Established migrants		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	US	Mex	Latino	Non-Latino	Mex	Latino	Non-Latino	Mex	Latino	Non-Latino
Dep. var: $log(x_t/x_{t-1})$	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Change between 2000-2010										
Wall (pred. 1% change in migrants)	-4.635	-14.088	-11.657	25.484	-18.009	-9.930	57.336	-14.663	-13.505	12.004
	1.288***	1.933***	1.576***	11.636*	11.231	9.456	18.155**	3.305***	2.132***	15.783
State-year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
WLS	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Change between 2000-2005										
Wall (pred. 1% change in migrants)	-4.864	-12.132	-9.282	16.816	-26.602	-13.322	46.438	-9.065	-7.639	12.173
	1.927*	1.691***	1.075***	12.551	7.209***	10.526	41.759	3.261**	3.091*	11.261
State-year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
WLS	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Change between 2005-2010										
Wall (pred. 1% change in migrants)	0.348	0.160	-1.044	14.740	6.924	3.158	46.343	-4.301	-4.420	5.836
	2.324	1.949	2.252	4.122***	10.386	6.193	21.186*	1.800*	2.716	9.380
State-year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
WLS	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Data: 20000 Census, 2005 ACS, 2010 ACS. Using network instrument. Recent migrant is a migrant who has been in the U.S. for five years or less. Established migrants have been in the U.S. for longer than five years. Latino migrants are all migrants born in Central or South America. Non-Latino migrants are migrants not born in Central or South America. Controls for log distance to border, population growth between 1990-2000, industry share in 2000 for agriculture, manufacturing, and construction, and the Mian/Sufi housing shock included. Standard errors clustered by state.

Appendix Table 9: Effect of the wall on population (Network instrument)

	All migrants				Recent migrants			Established migrants		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	US	Mex	Latino	Non-Latino	Mex	Latino	Non-Latino	Mex	Latino	Non-Latino
Dep. var: $log(x_t/x_{t-1})$	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se	b/se
Change between 2000-2010										
Wall (pred. 1% change in migrants)	-0.556	-6.225	-5.909	9.133	-4.324	-5.526	14.548	-7.259	-7.001	5.756
	1.014	0.770***	0.592***	3.362**	3.847	3.058	19.769	0.820***	0.657***	4.603
State-year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
WLS	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Change between 2000-2005										
Wall (pred. 1% change in migrants)	-1.994	-5.743	-5.564	12.254	-6.586	-3.415	27.946	-5.245	-5.641	7.954
	0.561***	0.896***	0.727***	6.084*	1.648***	1.194**	18.265	1.056***	0.975***	5.677
State-year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
WLS	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Change between 2005-2010										
Wall (pred. 1% change in migrants)	1.519	0.940	0.663	1.731	2.476	-0.419	1.708	-0.714	-0.084	2.967
	1.433	0.673	0.724	5.078	4.048	3.442	12.984	0.600	0.758	4.507
State-year FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
WLS	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

Notes: Data: 20000 Census, 2005 ACS, 2010 ACS. Using network instrument. Recent migrant is a migrant who has been in the U.S. for five years or less. Established migrants have been in the U.S. for longer than five years. Latino migrants are all migrants born in Central or South America. Non-Latino migrants are migrants not born in Central or South America. Controls for log distance to border, population growth between 1990-2000, industry share in 2000 for agriculture, manufacturing, and construction, and the Mian/Sufi housing shock included. Standard errors clustered by state.

Appendix Table 10: Predicting pop change in Mexico: three measures (rf)

Dep var: $log(N_{dt}/N_{dt-1})$	(1) b/se	(2) b/se	(3) b/se
Low-educ pop			
Simple	-14.641		
	48.810		
Network		0.901	
		1.987	
GE Network			2.086
			2.931
F (inst)	0.090	0.206	0.506
No. of migrants in US			
Simple	241.330		
	514.441		
Network		-5.207	
		13.263	
GE Network			11.973
			19.998
F (inst)	0.220	0.154	0.358
Return migrants			
Simple	453.961		
	500.064		
Network		-17.880	
		8.565**	
GE Network			-7.468
			16.022
F (inst)	0.824	4.358	0.217
N	2328	2328	2328
State FE	yes	yes	yes
controls	Pop growth	Pop growth	Pop growth
whatSE	State	State	State
WLS	yes	yes	yes

Notes: Standard errors clustered at the state level. Sample is 2000 and 2010 Mexican Censuses.

Appendix Table 11: Migration rate: ENOE data

Dep var: rate per 10,000	Out b/se	In b/se	Net b/se	Out b/se	In b/se	Net b/se	Out b/se	In b/se	Net b/se
Post X wall (pred. 1% change in migrants)	0.510	0.583	-0.073	0.269	0.182	0.087	0.330	0.171	0.159
	0.300*	0.197***	0.260	0.272	0.203	0.100	0.272	0.202	0.106
Post X log dist border							0.003	-0.001	0.004
							0.002	0.002	0.001***
N	4941	4941	4941	4931	4931	4931	4931	4931	4931
clusterSE	state	state	state	state	state	state	state	state	state
stateYrFE	no	no	no	yes	yes	yes	yes	yes	yes

Notes: Data: 2005/2006 (pre) and 2010-2012 (post) ENOE household data. Measure of wall shock is the network instrument. Migration rates computed from the ENOE following the Mexican Statistical Agency methodological guidelines (INEGI (2012)). If the wall reduced migration out of Mexico then we expect a negative coefficient.

Appendix Table 12: Bilateral gravity estimation (iv spec)

	Mexico		US	
	(1)	(2)	(3)	(4)
	Log(x)	Log(1+x)	Log(x)	Log(1+x)
	b/se	b/se	b/se	b/se
Post X change log traveltime	-0.295	-0.237		
	0.043***	0.010***		
N	510434	15836814	182178	2272712

Notes: Each observation is a geolev2-cpuma0010-year pair. Maximum sample size is 2331 Mexican origins * (2331 Mexican destinations + 1066 US destinations) * 2 years = 15.8 million for Mexico, and 1066 US origins*1066 US destinations * 2 years = 2.3 million for the US. We do not observe US to Mexico flows. Within-U.S. migration flows are not affected by the wall and so there is no estimated coefficient for the U.S., the regressions are included for completeness and to show the sample size.

Appendix Table 13: Correlation of pair fixed effects with geographical variables

	Baseline		RF		IV	
	(1)	(2)	(3)	(4)	(5)	(6)
	Log(x)	Log(1+x)	Log(x)	Log(1+x)	Log(x)	Log(1+x)
	b/se	b/se	b/se	b/se	b/se	b/se
Log distance	-0.253	-0.365	-0.253	-0.365	-1.803	-1.471
	0.000***	0.002***	0.000***	0.002***	0.001***	0.005***
Cross border	0.292	0.414	0.268	0.386	-6.773	3.121
	0.011***	0.053***	0.011***	0.053***	0.048***	0.130***
Cross border X log distance	0.042	-0.323	0.045	-0.319	1.594	0.784
	0.002***	0.007***	0.002***	0.007***	0.007***	0.018***
N	9054763	346306	9054763	346306	9054763	346306

Notes: Each observation is a geolev2-cpuma0010-year pair. Maximum sample size is 2331 Mexican origins * (2331 Mexican destinations + 1066 US destinations) + 1066 US origins*1066 US destinations = 9.05 million. We do not observe US to Mexico flows. Log distance overland is the log overland distance between an origin and destination. We assign the log average distance within an origin for non-migrants (moves between the same origin and destination).

Appendix Table 14: Gravity equations: Trade data

	(1)	(2)
Post x change log traveltime	0.171 (0.673)	
Log overland distance		-1.249*** (0.032)
Log overland distance * international		-0.564*** (0.153)
Constant		3.922*** (0.207)
Origin-year FE	Yes	Yes
Destination-year FE	Yes	Yes
Origin-destination FE	Yes	No
R-squared	0.978	0.968
Observations	6422	7011

Notes: Each observations is a U.S. state to U.S./Mexico state pair in either 2007 or 2012. The dependent variable is the log value of trade flows in column 1 and the log value of trade flows normalized by own trade flows in column 2. (The normalized trade flows imply the origin-year and destination-year fixed effects are the same and allow the recovery of the constant). Overland distance is the distance along the shortest overland route between origin and destination. Traveltime is the distance along the shortest overland route that avoids a border wall. Both overland distance and traveltime are averaged across all locations (Mexican municipalities and U.S. PUMAs) within the state-year pair. Standard errors clustered by origin-destination pair. Stars indicate statistical significance: * p<.10 ** p<.05 *** p<.01.

Appendix Table 15: Estimation of production function elasticities: First stage

	Mex./U.S.: Low skill (1)	Mex./U.S.: High skill (2)	High/low skill (3)
Simple average wall exposure			
Simple average wall exposure	33.874*	15.541	-18.481**
	(18.625)	(15.871)	(7.675)
...X Mexico	-153.877	-235.757	-116.782
	(209.293)	(283.587)	(191.707)
F-statistic	1.820	0.782	3.149
Network wall exposure			
Network wall exposure	15.430**	7.937*	-8.907***
	(5.928)	(4.350)	(2.204)
...X Mexico	-30.055***	-29.842***	-7.274
	(10.367)	(10.158)	(12.484)
F-statistic	4.866	4.512	9.036
GE network wall exposure			
GE network wall exposure	19.569**	9.986	-10.968***
	(8.620)	(6.818)	(3.365)
...X Mexico	-40.802***	-40.532***	-0.728
	(13.250)	(11.759)	(11.250)
F-statistic	4.803	6.155	5.906
Controls	None	None	None
Fixed Effects	State	State	State
Standard Errors	State clusters	State clusters	State clusters
Weighting	Pre-pop.	Pre-pop.	Pre-pop.
Sample	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.
Observations	3392	3392	3392

Notes: Ordinary least squares. Each observation is a (log) difference in a U.S. or Mexico location pre- and post- the SFA. Pre- and post- data come from the 2000 and 2010 censuses in Mexico, respectively; pre- data in the U.S. comes from the 2000 census and post-data come from an average of the 2010-2012 ACS. The dependent variable is the change in the relative population shares. The independent variable (the instrument) is either a *simple average fence exposure* which is the unweighted average fence exposure across all origins; a *network wall exposure* which is a weighted average fence exposure across all origins, where the weights are the pre-period migration flows; or a *GE network wall exposure* which in addition to weighting flows by pre-period mirgation flows also accounts for substitution in migration across different destinations by correcting for each orgin's market access; see the text for details. Standard errors are reported in parentheses. Stars indicate statistical significance: * p<.10 ** p<.05 *** p<.01.

Appendix Table 16: Estimation of migration elasticities: First stage

	(1) Mex Low Skill	(2) Mex High Skill	(3) U.S. Low Skill	(4) U.S. High Skill	(5) Pooled
Simple average wall exposure					
Simple average wall exposure	-23.537***	-12.559	-3.686	-0.050	-5.027
	(5.708)	(12.922)	(4.208)	(5.965)	(4.991)
...X Mexico	-3.195	-55.140	177.362	287.775*	-23.385
	(81.381)	(97.026)	(151.998)	(146.874)	(79.459)
F-statistic	8.555	0.720	1.037	1.922	0.571
Network wall exposure					
Network wall exposure	-7.838***	-2.926	-1.790	0.380	-1.869**
	(1.194)	(2.823)	(1.452)	(0.960)	(0.715)
...X Mexico	4.402	-0.211	0.796	2.514	-1.493
	(2.918)	(5.584)	(10.555)	(4.836)	(2.944)
F-statistic	22.372	0.749	0.765	0.265	4.111
GE network wall exposure					
GE network wall exposure	-9.248***	-3.275	-1.251	1.050	-1.463
	(1.291)	(3.187)	(1.885)	(0.961)	(0.975)
...X Mexico	5.386	1.551	1.799	0.408	-2.064
	(3.596)	(7.263)	(12.429)	(5.569)	(3.810)
F-statistic	26.322	0.563	0.221	0.632	1.584
Controls	None	None	None	None	None
Fixed Effects	State	State	State	State	State*Type
Standard Errors	State clusters	State clusters	State clusters	State clusters	State clusters
Weighting	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.
Sample	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.
Observations	3392	3392	3392	3392	13568

Notes: Ordinary least squares. Each observation is a (log) difference in a U.S. or Mexico location pre- and post- the SFA. Pre- and post- data come from the 2000 and 2010 censuses in Mexico, respectively; pre- data in the U.S. comes from the 2000 census and post-data come from an average of the 2010-2012 ACS. The dependent variable is the (log) change in the real wage, where the nominal wages are observed and the price indices are calculated from the trade destination fixed effect and the estimated trade elasticity. The independent variable (the instrument) is either a *simple average fence exposure* which is the unweighted average fence exposure across all origins; a *network wall exposure* which is a weighted average fence exposure across all origins, where the weights are the pre-period migration flows; or a *GE network wall exposure* which in addition to weighting flows by pre-period mirgation flows also accounts for substitution in migration across different destinations by correcting for each orgin's market access; see the text for details. Standard errors are reported in parentheses. Stars indicate statistical significance: * p<.10 ** p<.05 *** p<.01.

Appendix Table 17: Robustness of estimated structural parameters: Simple instrument

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EoS between Mex. and	3.715***	3.515***	3.130***	3.962	3.724***	3.808***	4.685	3.203***	3.938***	3.305***
U.S. low skill (ρ_l)	(0.853)	(1.241)	(1.050)	(4.768)	(0.931)	(1.093)	(10.195)	(0.623)	(0.846)	(0.615)
EoS between Mex. and	24.912	-5.575	-6.792	-2.935	8.297	361.748	-1.567	2.288***	7.559	2.480***
U.S. high skill (ρ_h)	(265.660)	(22.164)	(34.024)	(5.627)	(22.830)	(6.5e+04)	(2.535)	(0.391)	(13.328)	(0.590)
EoS between high and	1.693***	1.182***	1.578*	1.565***	1.698***	1.578***	0.956**	1.539***	1.984***	1.556***
low skill (ρ)	(0.416)	(0.299)	(0.807)	(0.341)	(0.381)	(0.271)	(0.397)	(0.325)	(0.676)	(0.349)
EoS between goods	1.373***	0.964***	1.179***	1.348***	1.256***	1.574***	1.010***	2.216***	1.754	2.107***
produced in different locations (σ)	(0.390)	(0.105)	(0.387)	(0.353)	(0.293)	(0.460)	(0.049)	(0.696)	(2.533)	(0.525)
Mex. Low skill	-0.949	0.118	-0.596*	-0.421**	-0.753*	-0.858*	-0.005	-1.329	-1.685	-1.268
migration elasticity (θ_l^M)	(0.583)	(0.166)	(0.308)	(0.182)	(0.425)	(0.439)	(0.011)	(0.884)	(1.667)	(0.837)
Mex. High skill	0.994	-0.289	0.634	0.802	0.755	1.365	0.053*	1.391	1.540	1.110
migration elasticity (θ_h^M)	(1.103)	(0.191)	(0.615)	(0.677)	(0.838)	(1.519)	(0.029)	(2.514)	(3.840)	(2.957)
U.S. Low skill	0.173	0.014	0.003	1.264	-0.024	0.516	-0.146	-1.430	-4.713	-1.019
migration elasticity (θ_l^U)	(0.986)	(0.100)	(0.658)	(1.912)	(0.497)	(1.342)	(0.343)	(6.096)	(14.563)	(3.712)
U.S. High skill	0.260	-0.184**	1.149	0.208	2.176	-2.038	0.012	-2.534	-1.888***	-2.666
migration elasticity (θ_h^U)	(1.049)	(0.088)	(1.133)	(0.984)	(2.847)	(2.589)	(0.043)	(2.334)	(0.500)	(2.655)
Pooled migration	0.057	-0.034	-0.119	-0.470	0.053	0.210	-0.009	0.861	-0.961	0.939
elasticity ($\bar{\theta}$)	(0.582)	(0.031)	(0.352)	(0.410)	(0.368)	(1.008)	(0.023)	(4.779)	(1.476)	(4.843)
Controls:										
1990-2000 pop. growth (by type)	No	**Yes**	No	No	No	No	**Yes**	No	No	No
2000-2005 pop. growth (by type)	No	No	**Yes**	No	No	No	**Yes**	No	No	No
Distance to border (log)	No	No	No	**Yes**	No	No	**Yes**	No	No	No
2000 U.S. Ag. employ. share	No	No	No	No	**Yes**	No	**Yes**	No	No	No
Housing shock	No	No	No	No	No	**Yes**	**Yes**	No	No	No
IV construction:										
IV interacted with..	Country	Country	Country	Country	Country	Country	Country	**None**	Country	None
Wall location used..	Predicted	Predicted	Predicted	Predicted	Predicted	Predicted	Predicted	Predicted	**Actual**	Predicted
Sample	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	**U.S. only**
Fixed Effects	State	State	State	State	State	State	State	State	State	State
Weighting	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.
Standard errors	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters

Notes: This table shows the estimated structural parameters for under a variety of alternative specifications. Every row is a result from a different regression; in each regression, each observation is a (log) difference in a U.S. or Mexico location pre- and post-the SFA. Pre- and post- data come from the 2000 and 2010 censuses in Mexico, respectively; pre- data in the U.S. comes from the 2000 census and post-data come from an average of the 2010-2012 ACS. Column (1) summarize the preferred results presented in Tables 5, 6, and 7. Columns (2) - (7) include additional control variables including the 1990-2000 population growth rate of each of the four types of labor, the 2000-2005 population growth rate of each of the four types of labor, the (log) distance to the border, the year 2000 agricultural employment share of each U.S. location, and a measure of the housing shock from Mian and Sufi (2014). Column (8) requires the instrument to have the same impact in the U.S. and Mexico by removing the country interaction. Column (9) constructs the instrument using the actual location of the border wall expansion (instead of the predicted location due to geography along the border). Column (10) restricts the analysis to U.S. locations only. Standard errors are reported in parentheses. Stars indicate statistical significance: * p<.10 ** p<.05 *** p<.01.

Appendix Table 18: Robustness of estimated structural parameters: Network instrument

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
EoS between Mex. and	4.492***	3.949***	3.707**	4.267	4.217***	4.651**	2.873	3.467**	4.920***	3.975***
U.S. low skill (ρ_l)	(1.513)	(1.476)	(1.615)	(5.348)	(1.006)	(1.819)	(2.423)	(1.353)	(0.847)	(0.666)
EoS between Mex. and	8.797	-10.945	35.493	-27.584	5.048	9.666	-4.463	1.613	4.369	2.612*
U.S. high skill (ρ_h)	(11.884)	(15.961)	(228.280)	(106.803)	(4.013)	(15.122)	(3.738)	(1.382)	(2.785)	(1.349)
EoS between high and	1.930***	1.575***	1.831**	2.028**	1.946***	1.840***	1.448*	1.442***	1.711***	1.668***
low skill (ρ)	(0.529)	(0.567)	(0.898)	(0.919)	(0.496)	(0.466)	(0.834)	(0.118)	(0.264)	(0.266)
EoS between goods	2.977***	1.087***	2.140***	3.158***	2.708***	3.024***	1.022**	3.940	2.149***	2.501***
produced in different locations (σ)	(0.420)	(0.333)	(0.485)	(0.399)	(0.570)	(0.151)	(0.429)	(5.069)	(0.604)	(0.304)
Mex. Low skill	-1.096**	-0.335	-1.045**	-0.789**	-1.339*	-1.002**	-0.033	-1.111*	-0.155	-1.092**
migration elasticity (θ_l^M)	(0.513)	(0.363)	(0.507)	(0.337)	(0.686)	(0.465)	(0.028)	(0.610)	(0.274)	(0.550)
Mex. High skill	1.193	0.913	1.144	1.185	0.841	1.253	0.160	1.218	2.149	0.670
migration elasticity (θ_h^M)	(1.806)	(1.197)	(1.773)	(1.665)	(1.158)	(1.888)	(0.101)	(1.823)	(1.657)	(1.050)
U.S. Low skill	1.187	0.177	0.897	-0.959	1.229	1.503	0.021	1.189	2.082	1.209
migration elasticity (θ_l^U)	(1.828)	(0.259)	(1.933)	(0.835)	(1.271)	(2.450)	(0.211)	(1.961)	(2.111)	(1.756)
U.S. High skill	-11.653	0.633**	-8.406	4.698	-4.947	-10.355	0.171	-11.408	-9.754	-31.514
migration elasticity (θ_h^U)	(22.237)	(0.272)	(27.219)	(16.269)	(9.386)	(15.942)	(0.173)	(18.611)	(7.569)	(149.214)
Pooled migration	-0.389	0.074	-0.557	-0.390	-0.359	-0.397	-0.014	-0.158	0.546	1.156
elasticity ($\bar{\theta}$)	(0.512)	(0.143)	(0.492)	(0.386)	(0.719)	(0.529)	(0.051)	(0.573)	(0.595)	(0.781)
Controls:										
1990-2000 pop. growth (by type)	No	**Yes**	No	No	No	No	**Yes**	No	No	No
2000-2005 pop. growth (by type)	No	No	**Yes**	No	No	No	**Yes**	No	No	No
Distance to border (log)	No	No	No	**Yes**	No	No	**Yes**	No	No	No
2000 U.S. Ag. employ. share	No	No	No	No	**Yes**	No	**Yes**	No	No	No
Housing shock	No	No	No	No	No	**Yes**	**Yes**	No	No	No
IV construction:										
IV interacted with..	Country	Country	Country	Country	Country	Country	Country	**None**	Country	None
Wall location used..	Predicted	Predicted	Predicted	Predicted	Predicted	Predicted	Predicted	Predicted	**Actual**	Predicted
Sample	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	U.S. and Mex.	**U.S. only**
Fixed Effects	State	State	State	State	State	State	State	State	State	State
Weighting	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.	Pre-pop.
Standard errors	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters	State clusters

Notes: This table shows the estimated structural parameters for under a variety of alternative specifications. Every row is a result from a different regression; in each regression, each observation is a (log) difference in a U.S. or Mexico location pre- and post- the SFA. Pre- and post- data come from the 2000 and 2010 censuses in Mexico, respectively; pre- data in the U.S. comes from the 2000 census and post-data come from an average of the 2010-2012 ACS. Column (1) summarize the preferred results presented in Tables 5, 6, and 7. Columns (2) - (7) include additional control variables including the 1990-2000 population growth rate of each of the four types of labor, the 2000-2005 population growth rate of each of the four types of labor, the (log) distance to the border, the year 2000 agricultural employment share of each U.S. location, and a measure of the housing shock from Mian and Sufi (2014). Column (8) requires the instrument to have the same impact in the U.S. and Mexico by removing the country interaction. Column (9) constructs the instrument using the actual location of the border wall expansion (instead of the predicted location due to geography along the border). Column (10) restricts the analysis to U.S. locations only. Standard errors are reported in parentheses. Stars indicate statistical significance: * p<.10 ** p<.05 *** p<.01.

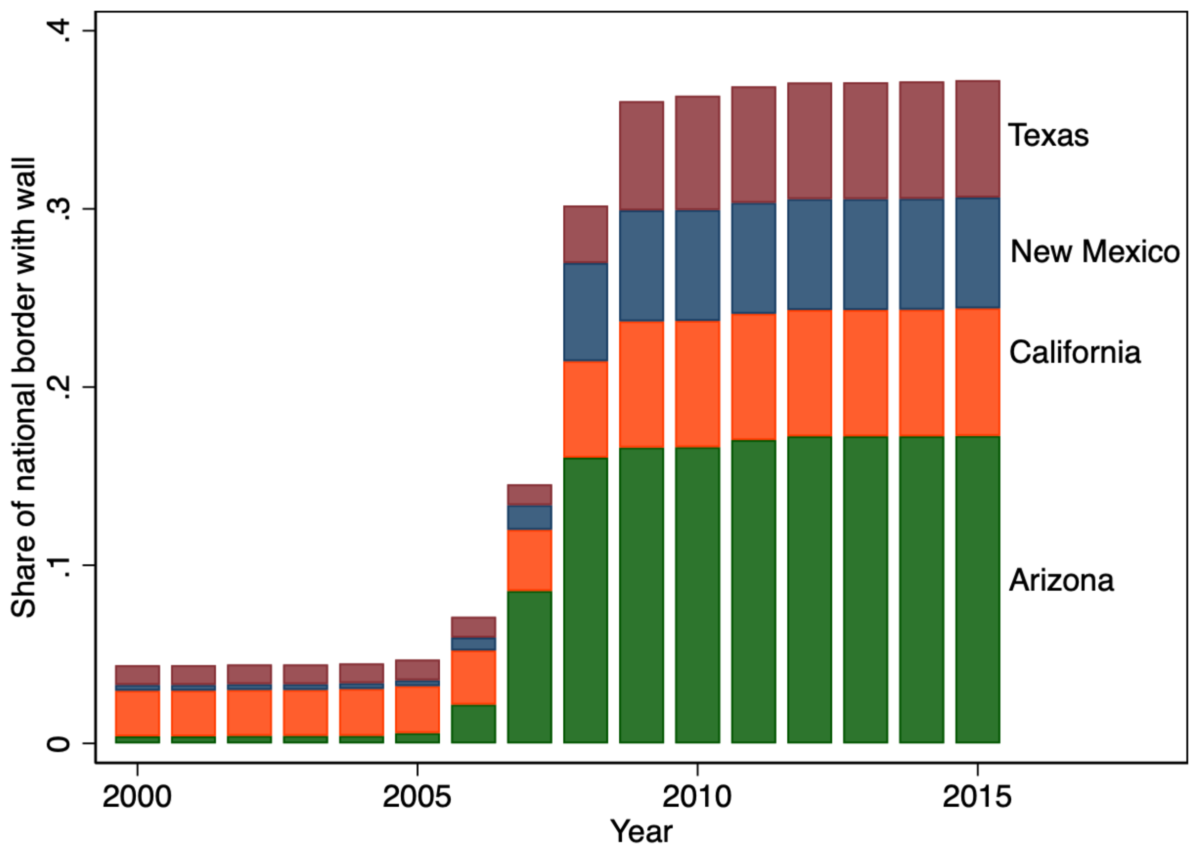
Appendix Figure 1: Example of border walls

(a) Pedestrian Fence

(b) Vehicular Fence

Notes: Source: (a) https://www.memphisflyer.com/memphis/against-the-wall/Content?oid=4602862; (b) http://mexicowall.net/gallery/

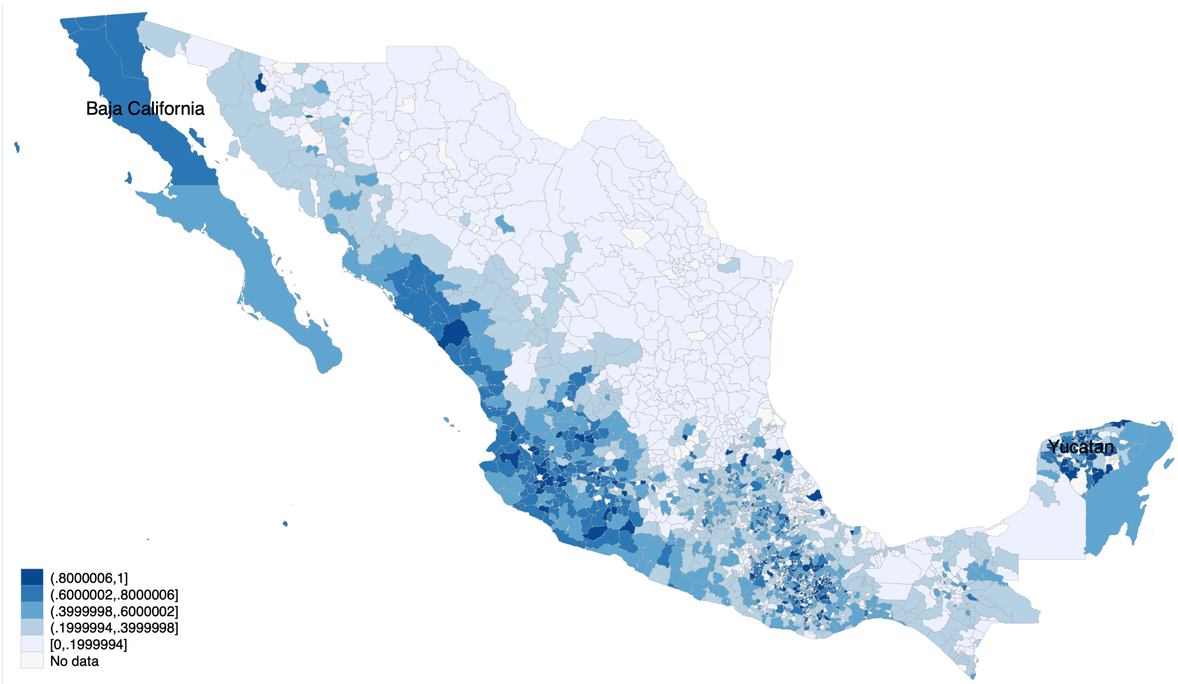
Appendix Figure 2: Wall expansion by year



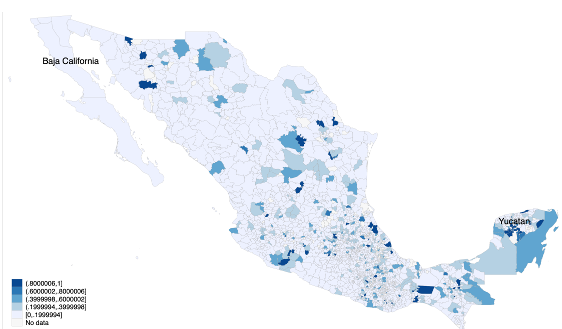
Notes: Source: Data shared by Guerrero and Castañeda (2017).

Appendix Figure 3: Matrícula database: Migration to CA

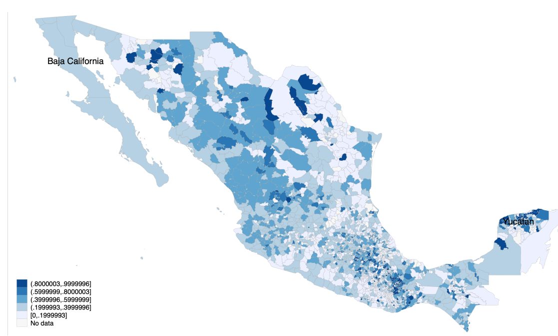
(a) Destination: California



(b) Destination: Bay Area



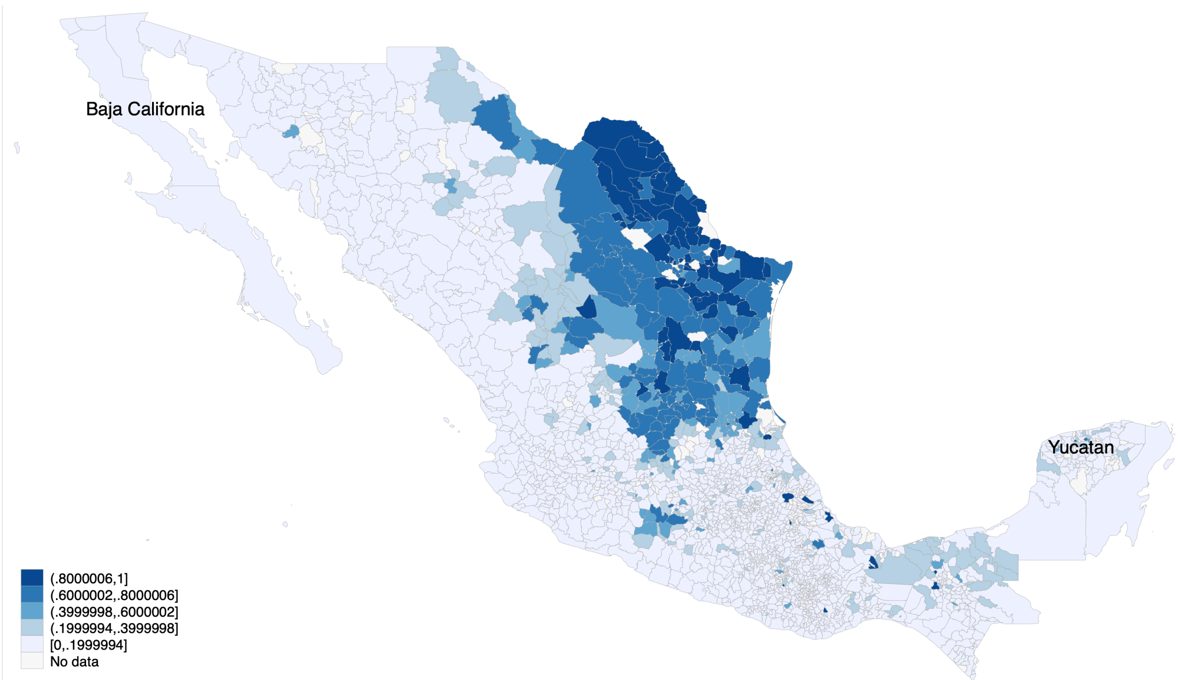
(c) Destination: Los Angeles



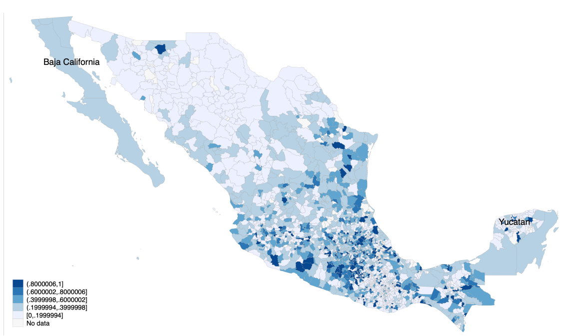
Notes: Source: 2006 Matrícula Consular database.

Appendix Figure 4: Matrícula database: migration to Texas

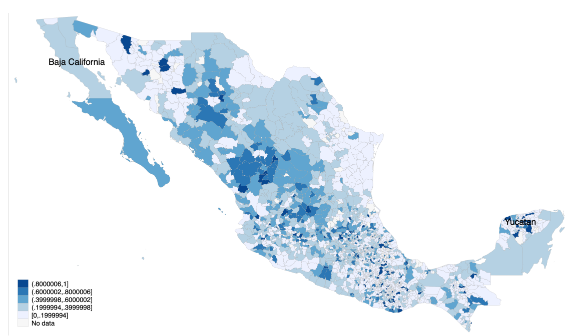
(a) Destination: Texas



(b) Destination: Houston



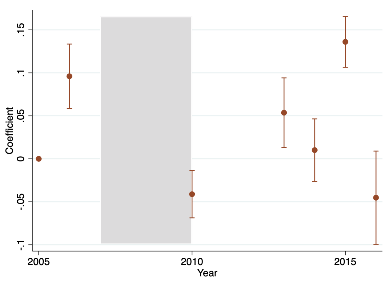
(c) Destination: Dallas



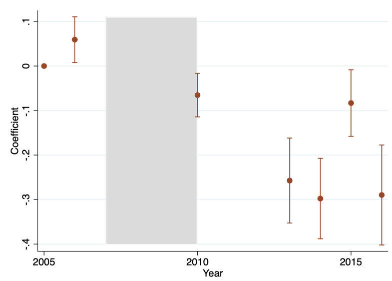
Notes: Source: 2006 Matrícula Consular database.

Appendix Figure 5: Matrícula gravity: Event study

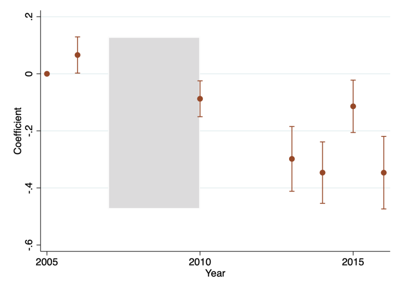
(a) Log(1+x): OLS



(b) Log(1+x): RF



(c) Log(1+x): IV

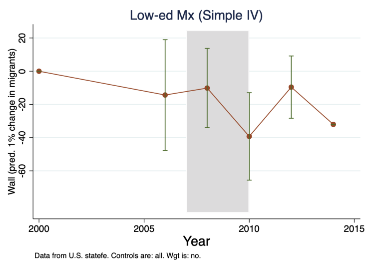


Notes: Data: 2005, 2006, 2010, 2012-2015 Matrícula database. Figure plots the coefficient, by year, on log change travel time from a gravity regression. Regression weighted by flows. Standard errors clustered at the pair level.

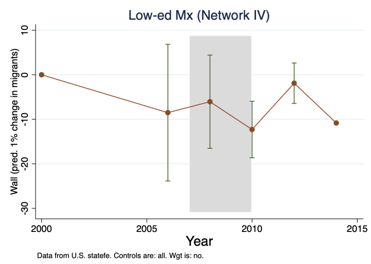
Appendix Figure 6: Event studies (unweighted)

Panel (i): United States

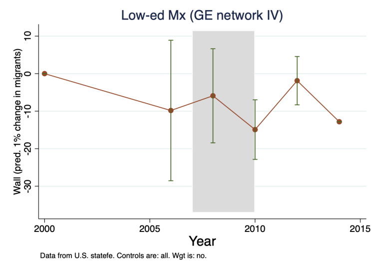
(a) Simple instrument



(b) Network instrument

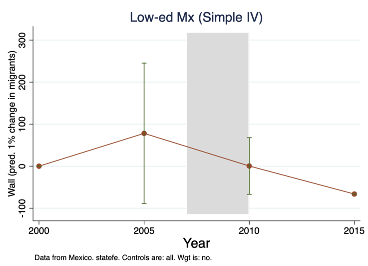


(c) GE network instrument

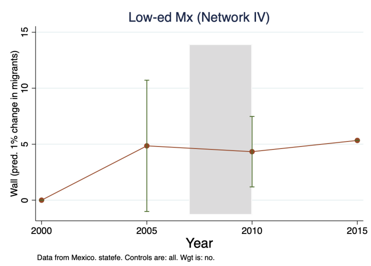


Panel (ii): Mexico

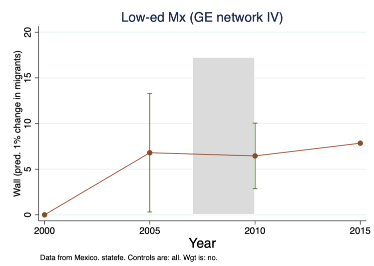
(d) Simple instrument



(e) Network instrument



(f) GE network instrument

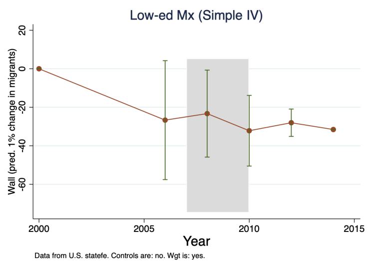


Notes: Figure shows the predicted change in low-skill Mexican born for each of the three instruments. Panel (i) considers the effect on destinations in the United States. Panel (ii) considers the effect on origins in Mexico. Instruments defined in text.

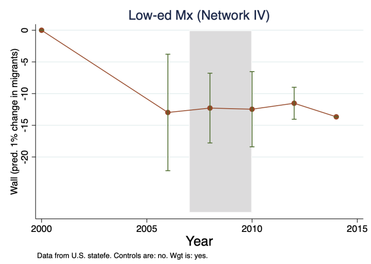
Appendix Figure 7: Event studies (no controls)

Panel (i): United States

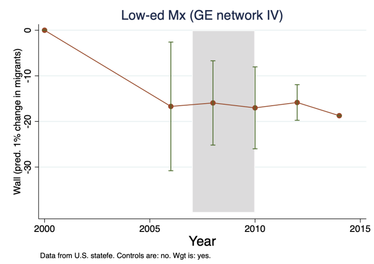
(a) Simple instrument



(b) Network instrument

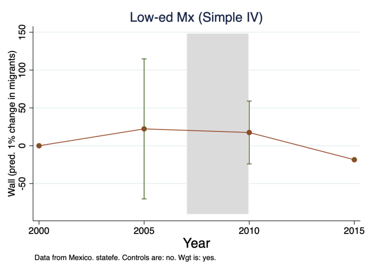


(c) GE network instrument

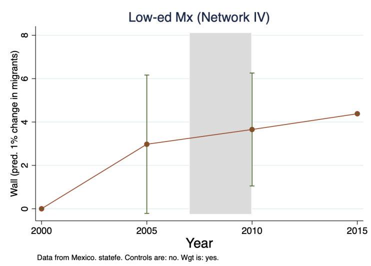


Panel (ii): Mexico

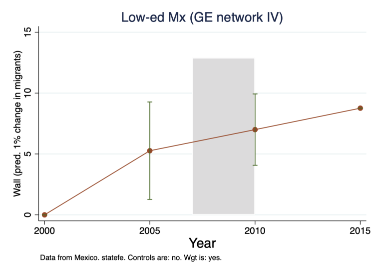
(d) Simple instrument



(e) Network instrument

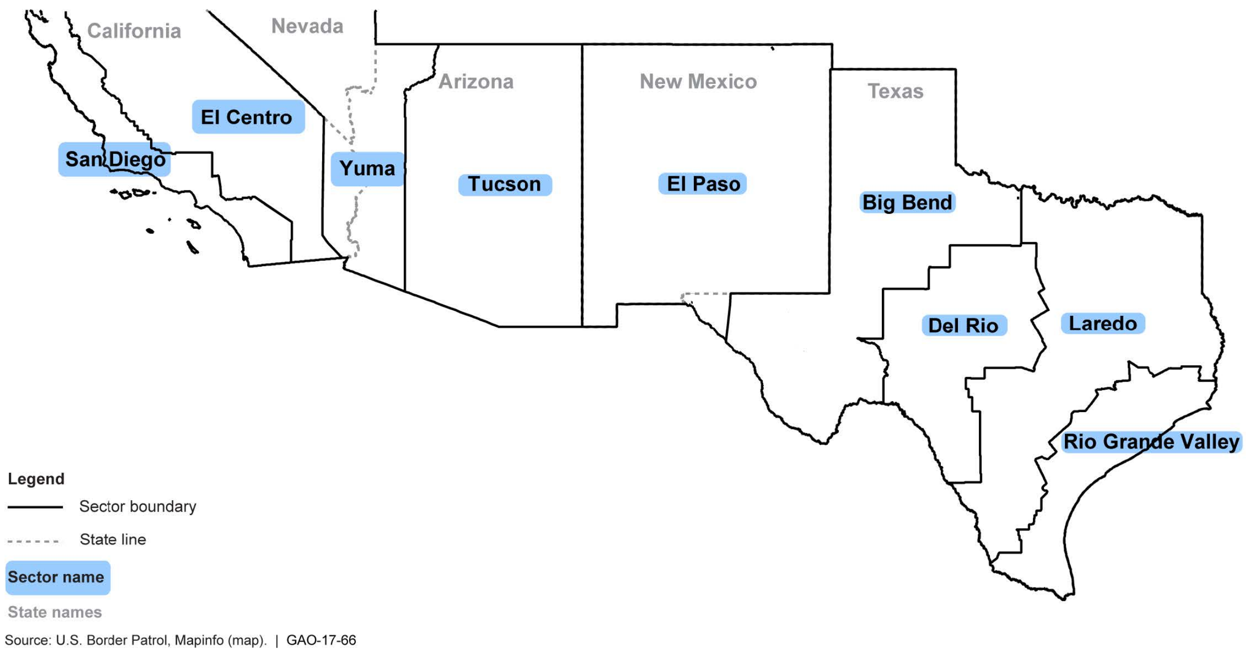


(f) GE network instrument



Notes: Figure shows the predicted change in low-skill Mexican born for each of the three instruments. Panel (i) considers the effect on destinations in the United States. Panel (ii) considers the effect on origins in Mexico. Instruments defined in text.

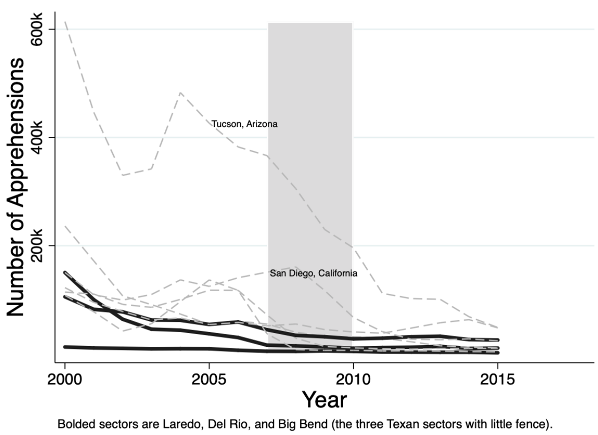
Appendix Figure 8: Border Patrol Sectors



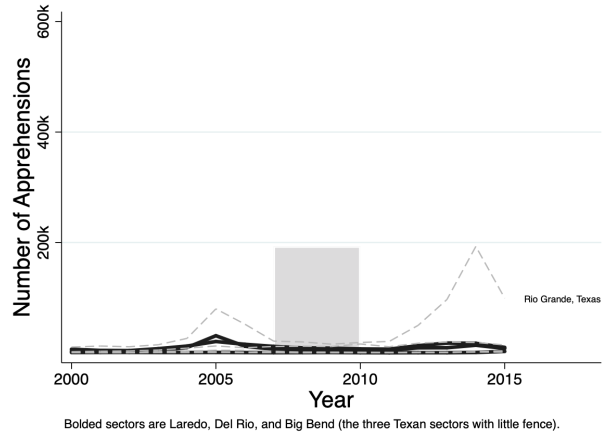
Notes:Source:United States Government Accountability Office (2017a)

Appendix Figure 9: Apprehensions of Mexican and non-Mexican nationals by border sector

(a) Mexican nationals



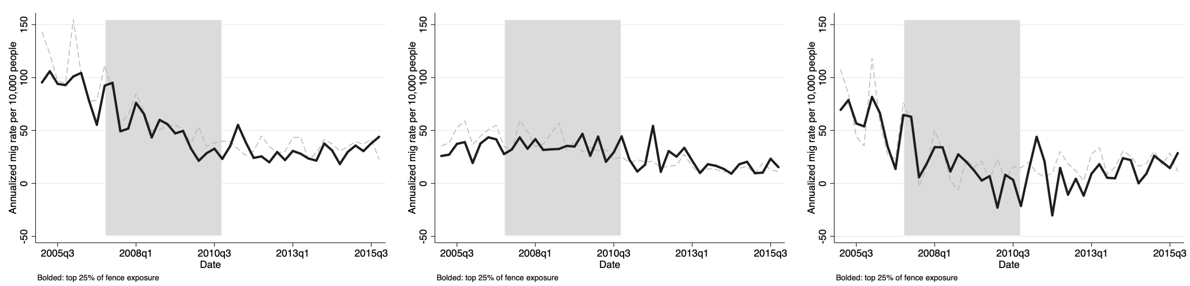
(b) Non-Mexican nationals



Notes: Figure shows apprehensions of Mexican and non-Mexican nationals on the United States-Mexico border between 2000 and 2015 fiscal year for each of the nine border sectors. The three Texan border sectors with little wall are bolded. Data source: United States Customs and Border Patrol. Downloaded: 1/14/2018.https://www.cbp.gov/sites/default/files/assets/documents/2017-Dec/BP%20Total%20Apps%2C%20Mexico%2C%20OTM%20FY2000-FY2017.pdf

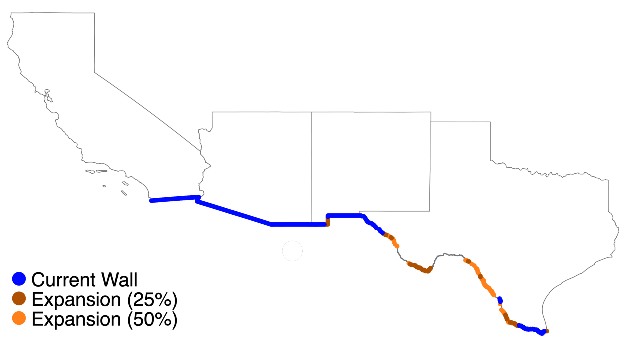
Appendix Figure 10: Migration rates from ENOE

(a) Outflow (b) Inflow (c) Netflow



Notes: Data source: ENOE survey. Wall exposure is measured by the network instrument. Migration rates computed from the ENOE following the Mexican Statistical Agency methodological guidelines (INEGI (2012)).

Appendix Figure 11: Counterfactual wall expansion



Notes: Figure shows the expansion of the wall. We fill in the wall based on our geographical prediction of where the wall was built, filling in the next 25% and 50% of the remaining pixels.