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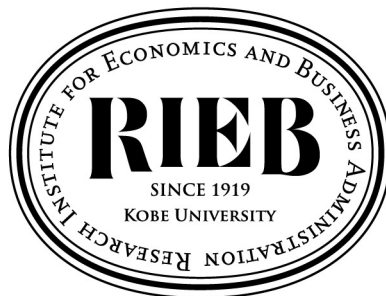
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and Migration in Post-NAFTA Mexico**

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Agglomeration, the Price-Index Effect, and Migration in Post-NAFTA Mexico *

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Abstract

This study examines how multiple agglomeration and dispersion forces shaped Mexico's regional economic geography during the early post-NAFTA period. When economic activity becomes geographically concentrated, consumers gain better access to differentiated varieties and face lower effective transport costs, reducing the local consumption price index and making a region more attractive as a migration destination. Building on this price-index mechanism from New Economic Geography, we focus on four spatial forces: proximity to the U.S. market, the manufacturing price-index effect, the service price-index effect, and density-related urban costs. Using bilateral interstate migration between 1995 and 2000, we proceed in two stages. First, we estimate the structural parameters of the model and recover state-level price indices for manufactured goods and services. Second, we examine how destination–origin differences in nominal wages, price indices, and urban costs are associated with migration across sectors, while controlling for the additional locational advantage of U.S. border states. The manufacturing price index is strongly and negatively associated with migration by manufacturing workers, whereas its cross-sector effects are more limited. By contrast, the service price index is negatively and significantly associated with migration across all sectors, indicating a broad domestic agglomeration force. Employment density is generally negatively associated with migration, consistent with urban costs acting as a centrifugal force, while real-wage differentials are positively associated with migration across most industries. Taken together, the findings suggest that post-NAFTA Mexico was shaped by the interaction of border-oriented manufacturing agglomeration, domestic service-sector agglomeration, and urban-cost-driven dispersion.

JEL classification: J61, O15, R12, R23

Keywords: Migration, Gravity equation, Supplier access, Price index, Real wage, Agglomeration

* The views expressed in the papers are solely those of the author, and neither represent those of the organization to which the author belongs nor the Research Institute of Economy, Trade and Industry.

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1. Introduction

Spatial concentration generates both benefits and costs. On the one hand, agglomeration improves access to markets, suppliers, and differentiated goods and services, thereby increasing the attractiveness of large regional economies. On the other hand, concentration can generate urban diseconomies associated with congestion, commuting, land scarcity, and other density-related costs. The spatial distribution of population and economic activity therefore reflects a balance between forces that encourage agglomeration and those that promote dispersion. This balance becomes particularly important when trade liberalization changes the relative attractiveness of locations, because greater access to external markets may alter industrial location without necessarily producing a corresponding decentralization of population or service-sector activity.

New Economic Geography (NEG) provides a natural framework for studying these opposing forces. In the core-periphery framework of Krugman (1991) and subsequent developments in Fujita et al. (1999) and Fujita and Thisse (2002), firms are attracted to locations with better market access, while workers are attracted to locations offering higher real income. One important consumer-side mechanism operates through the price index. When economic activity becomes geographically concentrated, consumers gain better access to differentiated varieties and face lower effective transport costs, reducing the local consumption price index. For a given nominal wage, a lower price index raises real purchasing power and makes a region more attractive as a migration destination. We refer to this mechanism as the price-index effect of agglomeration. At the same time, high employment density can generate urban costs that reduce regional attractiveness. Regional migration incentives therefore reflect not only wage differences but also the balance between consumer-side agglomeration economies and density-related urban diseconomies.

The price-index mechanism can be interpreted as a form of consumer-side market access. Redding and Sturm (2008) emphasize that better access to sources of differentiated goods lowers the CES consumption price index, while Handbury and Weinstein (2015) show that larger markets can provide consumers with access to a wider range of products and lower effective consumption costs. Importantly, this mechanism need not operate only within the sector in which agglomeration occurs. Manufacturing agglomeration can lower the effective cost of manufactured consumption goods for workers employed both inside and outside manufacturing. Likewise, service-sector agglomeration can improve access to locally supplied services consumed by workers across industries. Agglomeration in one sector may therefore affect migration in other sectors through a cross-sector consumer-price externality.

An important empirical question is whether this price-index mechanism is sufficiently strong to influence actual migration decisions. Crozet (2004) provides a seminal empirical test of the forward linkage predicted by NEG. Using bilateral migration flows for European countries, he structurally estimates a model derived

from Krugman (1991) and finds that better access to sources of supply attracts migrants through higher real wages. Subsequent studies have examined related mechanisms in different institutional and historical settings. Poncet (2006) investigates interprovincial migration and declining mobility barriers in China. Pons et al. (2007) and Paluzie et al. (2009) provide structural tests of the forward linkage using Spanish migration data. Kondo and Okubo (2015) show for Japan that interregional migration responds more systematically to real-wage than to nominal-wage differentials. In the Mexican context, Quintana and Salgado (2016) examine internal migration from an NEG perspective, although the specific price-index mechanism underlying migration remains less directly identified.

A closely related empirical NEG literature examines the effects of market access on nominal wages and migration (Head and Mayer 2004a, 2004b; Redding and Venables 2004; Brakman et al. 2004; Hanson 2005; Head and Mayer 2006; Niebuhr 2006; Fally et al. 2010; Hering and Paillacar 2016). Redding and Venables (2004) construct measures of access to markets and sources of supply from bilateral trade relationships and show that economic geography accounts for an important part of spatial income differences.¹ Hering and Poncet (2009) and Fally et al. (2010) extend this line of research to China and Brazil, respectively, using worker-level microdata. Hering and Paillacar (2016) examine whether access to foreign markets affects internal migration. Much of this literature emphasizes the market-access channel operating through labor demand and nominal wages. By contrast, the present study focuses on the complementary consumer-side channel through which supplier access affects the cost of living, real wages, and migration.

Mexico provides a particularly informative setting for studying the interaction of these mechanisms because its spatial reorganization after trade liberalization reflects several distinct forces. The implementation of NAFTA in 1994 reduced barriers to economic integration with the United States and increased the relative importance of proximity to the U.S. market. Krugman and Livas-Elizondo (1996), in a model explicitly motivated by Mexico, show that import substitution can strengthen forward and backward linkages around a large domestic metropolis, whereas greater trade openness weakens these domestic linkages and can induce decentralization away from the dominant city. Empirical evidence documented by Hanson (1997, 1998) is consistent with such a spatial reorientation. Manufacturing had historically been concentrated around Mexico City, whereas increasing integration with the United States was accompanied by a shift of manufacturing activity toward northern Mexico and the U.S.–Mexico border. The reduction in the relative cost of accessing the U.S. market therefore provided an external force favoring northern and border states.

Trade liberalization, however, represents only one component of this spatial adjustment. Within Mexico,

¹ Hanson (2005) derives a market-potential equation from an NEG model and estimates its structural parameters directly using nonlinear least squares or GMM.

manufacturing remains subject to opposing agglomeration and dispersion forces. Large urban concentrations such as Mexico City can impose substantial urban costs associated with high density, congestion, commuting, and scarce land. These costs act as a centrifugal force and can reduce the attractiveness of highly concentrated locations for manufacturing workers. At the same time, manufacturing agglomeration generates a countervailing centripetal force through the manufacturing price index. A larger concentration of manufacturing improves access to differentiated manufactured goods and lowers their effective consumption price. Once manufacturing activity becomes concentrated in locations with favorable access to the U.S. market, this price-index mechanism can reinforce the attractiveness of those locations to manufacturing workers. In this sense, the initial locational advantage created by greater access to the U.S. market can be accompanied by a self-reinforcing process of manufacturing agglomeration. The resulting spatial reorganization need not therefore be interpreted simply as firms relocating from Mexico City to the border; it may also involve cumulative agglomeration forces operating within emerging northern manufacturing centers.

A further and conceptually distinct agglomeration force arises from the service sector. Many services remain substantially less spatially tradable than manufactured goods and are produced and consumed within domestic markets. Service-sector agglomeration can therefore lower the local service price index and raise real purchasing power for workers employed across a wide range of sectors. Unlike the manufacturing price-index mechanism, whose strongest effect may be concentrated among manufacturing workers, the service price-index mechanism can operate broadly because workers in all industries consume locally supplied services. This provides a domestic source of agglomeration that can continue to support large metropolitan economies even while manufacturing becomes more strongly oriented toward northern Mexico and the U.S. market. The post-NAFTA spatial economy may consequently display a dual structure in which border-oriented manufacturing agglomeration coexists with persistent domestic agglomeration supported by large service markets.

This perspective implies that the spatial reorganization of Mexico should be understood as the joint outcome of several forces rather than as a simple northward relocation of manufacturing. Greater proximity to the U.S. market provides an external locational advantage following trade liberalization. Manufacturing supplier access can reinforce emerging manufacturing agglomerations through a lower manufacturing price index. Urban costs work in the opposite direction by reducing the attractiveness of highly concentrated locations. At the same time, service-sector supplier access provides a separate domestic agglomeration force through the service price index. The relative strength of these mechanisms can differ across sectors, implying that manufacturing, services, and population need not follow the same spatial adjustment process.

This study examines these mechanisms using interstate migration in Mexico between 1995 and 2000,

covering the first years following the implementation of NAFTA. Our empirical strategy proceeds in two stages. First, we structurally estimate a migration gravity equation derived from an NEG model and recover the parameters required to construct state-level price indices for manufactured goods and services. Second, we examine how destination–origin differences in nominal wages, manufacturing and service price indices, and urban costs are associated with migration across sectors. Because the theoretical model focuses primarily on domestic determinants of regional attractiveness, it does not explicitly incorporate the external advantage associated with proximity to the U.S. market. We therefore include a U.S. border-state dummy as an exogenous control for border-specific influences associated with access to the U.S. market and cross-border economic integration. The border dummy should consequently be interpreted as capturing an external dimension of regional attractiveness rather than as a direct causal estimate of NAFTA.

This study contributes to the literature in three main respects. First, it explicitly recovers the price-index component of real wages implied by an NEG framework and examines whether this consumer-side mechanism helps explain migration. This allows us to distinguish the cost-of-living channel from the market-access channel operating through nominal wages. Second, we distinguish between the price-index effects generated by manufacturing and service-sector agglomeration. This distinction is particularly important in the Mexican context because manufacturing became increasingly oriented toward northern border regions after trade liberalization, whereas many services remained tied to domestic and local markets. Third, we examine whether these agglomeration forces extend across sectors. Manufacturing agglomeration may affect workers outside manufacturing through the consumption price of manufactured goods, while service-sector agglomeration may provide an even more broadly shared consumer-side advantage through locally supplied services. Together with the urban-cost and border-state channels, this framework allows us to characterize the multiple forces underlying Mexico’s spatial reorganization.

The empirical results reveal substantial differences between these mechanisms. The manufacturing price index is strongly and negatively associated with migration by manufacturing workers, consistent with the conventional forward linkage predicted by NEG. Negative associations are also found for a limited number of service industries, including Information, Finance and Insurance, and Arts and Entertainment, but the cross-sector manufacturing price-index effect is substantially less pervasive. By contrast, the service price index is negatively and statistically significantly associated with migration in every sector examined, indicating that service-sector supplier access constitutes a broad domestic agglomeration force. Employment density generally has a negative association with migration after wages and price indices are taken into account, consistent with urban costs acting as a centrifugal force. When nominal wages and price indices are combined into the model-implied real wage, workers generally migrate toward states offering higher purchasing power. The U.S. border-state effect is particularly pronounced for Manufacturing and Information,

consistent with the greater importance of access to the U.S. market for relatively tradable activities.

Taken together, these findings suggest that the spatial reorganization of post-NAFTA Mexico reflects the interaction of multiple, partly opposing forces rather than a uniform shift of economic activity toward the U.S. border. Greater access to the U.S. market increased the relative attractiveness of northern border locations for manufacturing, while the manufacturing price-index mechanism provided an additional force capable of reinforcing manufacturing agglomeration in these areas. Urban costs created a countervailing dispersion force in highly concentrated locations. At the same time, the strong and pervasive service price-index effect provided an important domestic agglomeration mechanism, helping sustain the attractiveness of large internal markets despite the northward reorientation of manufacturing. These results help explain why trade integration can substantially reorganize manufacturing geography without necessarily eliminating the agglomeration forces supporting large domestic metropolitan economies.

The remainder of the paper is organized as follows. Section 2 develops the theoretical framework and derives the structural migration equation. Section 3 describes the migration, labor-market, and geographic data. Section 4 presents the structural parameter estimates and examines the manufacturing and service price-index effects, urban-cost effects, real-wage differentials, and U.S. border-state effects across sectors. Section 5 concludes.

2. Method

2.1. Theoretical Framework

Following the basic structure of Krugman (1991), Krugman and Livas-Elizondo (1996), Fujita et al. (1999), and Crozet (2004), we outline a multi-region core-periphery model. We consider an economy consisting of a fixed number of regions $s \in \{1, \dots, R\}$. Differentiated tradable goods and nontradable services are produced under increasing returns to scale and Dixit–Stiglitz monopolistic competition, with constant elasticities of substitution across varieties $\sigma^M > 1$ in the manufacturing sector M and $\sigma^S > 1$ in the service sector S . Trade in differentiated manufactured goods is subject to iceberg transport costs, whereby $T_{rs}^M > 1$ units must be shipped from region r to s in the manufacturing sector. Since services are locally produced and consumed, the corresponding transport cost is normalized to $T_{rs}^S = 1$. Goods in the traditional sector indexed by A are assumed to be homogeneous, produced under perfect competition, and traded costlessly across regions. Production of the homogeneous good uses immobile labor; therefore, its price and the wage of immobile labor are equalized across regions. We set the price of the homogeneous good as the numeraire.

There is a mass of representative consumers $L = L^M + L^S + L^A$ in the economy, with $L_s = L_s^M + L_s^S + L_s^A$ residing in region s . Workers in the manufacturing and service sectors, L_s^M and L_s^S , are assumed to be

mobile across regions within their respective sectors, but not across sectors in the short run. Workers in the traditional sector, L_s^A , are immobile. Each worker is endowed with one unit of labor, which is supplied inelastically. Mobile workers choose their region of residence according to differences in real income and migration costs. The spatial distribution of labor is therefore endogenously determined through interregional labor mobility.

Workers in region s have Cobb–Douglas preferences across manufactured goods, services, and a homogeneous good as follows:

$$U_s = (C_s^M)^\mu (C_s^S)^\theta (C_s^A)^{1-\mu-\theta} z_s^{-1}, \quad s = 1, \dots, R, \quad (1)$$

where $0 < \mu < 1$ and $0 < \theta < 1$ are the expenditure shares for manufactured goods and services, respectively, C_s^M and C_s^S are CES composites of differentiated manufactured goods and services, respectively, while C_s^A denotes consumption of the homogeneous good in region s . We introduce an urban congestion term, z_s^{-1} , which reduces utility as city size increases. While Krugman and Livas-Elizondo (1996) introduce commuting costs as a centrifugal force, our formulation captures more general urban diseconomies arising from the concentration of population.

Let W_s^M and W_s^S denote the nominal wage in the manufacturing sector and service sector, respectively. Standard utility maximization yields the indirect utility, expressed in real-wage terms, as follows:

$$\omega_s^j = \frac{W_s^j}{(P_s^M)^\mu (P_s^S)^\theta}, \quad (2)$$

where ω_s^j denotes the real wage in sector j , and P_s^M and P_s^S denote the price indices for the manufactured goods and services.

The price index for manufactured goods can be written as:

$$P_s^M = \chi^M \left[\sum_{r=1}^R L_r^M (W_r^M T_{rs}^M)^{1-\sigma^M} \right]^{1/(1-\sigma^M)}, \quad (3)$$

where the term χ^M collects parameters that are common across regions and therefore do not affect the estimation. For services, the corresponding price index is given by:

$$P_s^S = \chi^S [L_s^S (W_s^S)^{1-\sigma^S}]^{1/(1-\sigma^S)}, \quad (4)$$

where the term χ^S collects parameters that are common across regions and therefore do not affect the estimation. This specification treats service access as primarily local, consistent with the relatively limited spatial tradability of many service activities.

This price index structure shows that better access to sources of supply lowers the consumer price index and hence raises real income. Following Redding and Sturm (2008), consumer-side market access to

manufactured goods is expressed as follows:

$$CMA_s^M = \sum_{r=1}^R L_r^M (W_r^M T_{rs}^M)^{1-\sigma^M}. \quad (5)$$

Since $\sigma^M > 1$ and $1/(1 - \sigma^M) < 0$, greater supplier access therefore reduces the manufacturing price index. Similarly, consumer-side market access to services is expressed as follows:

$$CMA_s^S = L_s^S (W_s^S)^{1-\sigma^S}. \quad (6)$$

Since $\sigma^S > 1$ and $1/(1 - \sigma^S) < 0$, the same logic applies to services.

The mechanism is consumer-side rather than input-output based.² Hence, manufacturing agglomeration can in principle affect workers employed outside manufacturing because all workers consume manufactured goods. This feature motivates our subsequent analysis of cross-sector migration.

2.2. Migration Choice

Following the methodology of Tabuchi and Thisse (2002), Murata (2003), and Crozet (2004), the migration choice is modeled using an additive random utility framework. Focusing on manufacturing workers in the context of NAFTA, we consider a worker who initially resides in region r and chooses a destination region s to maximize utility. The utility that the worker obtains from choosing region s is given by

$$\tilde{V}_{rs} = V_{rs} + \xi_{rs}, \quad (7)$$

where $\tilde{V}_{rs}$ denotes the total utility, V_{rs} denotes the deterministic, observable component of utility, and ξ_s is an idiosyncratic stochastic component specific to destination s .

The observable component of utility, V_{rs} , is determined by the real wage available at the destination in Equation (2) and the cost of migration as follows:

$$V_{rs} = \log(\omega_s^M z_s^{-1}) - \log(\kappa_{rs}), \quad (8)$$

where $\kappa_{rs} \geq 1$ denotes the migration cost from region r to s that reduce utility. It is assumed that $\kappa_{rr} = 1$ if the worker decides to stay in the same region.

Although the stochastic total utility function is unobserved, whether a worker has migrated is observed. Thus, individual migration choice can be expressed as follows:

$$M_{rs} = \begin{cases} 1, & \text{if } \tilde{V}_{rs} = \max(\tilde{V}_{r1}, \tilde{V}_{r2}, \dots, \tilde{V}_{rR}) \\ 0, & \text{Otherwise,} \end{cases} \quad (9)$$

where $M_{rs} = 1$ denotes that the worker migrates from region r to s to maximize the total utility.

² Importantly for the present study, this mechanism does not require intermediate-input linkages: supplier access may refer to access to final consumption goods. This interpretation distinguishes the mechanism considered here from the input-output linkages emphasized in Krugman and Venables (1995, 1996), Venables (1996), Puga (1999), and Redding and Venables (2004).

Assuming that ξ_{rs} are independently and identically distributed with the Type-I extreme value distribution, the probability of migrating from region r to s and the probability that the worker stays in the region r , are expressed as follows, respectively (McFadden 1974):

$$\Pr(M_{rs} = 1) = \frac{\exp(V_{rs})}{\sum_{s=1}^R \exp(V_{rs})} \quad \text{and} \quad \Pr(M_{rr} = 1) = \frac{\exp(V_{rr})}{\sum_{s=1}^R \exp(V_{rs})}. \quad (10)$$

The aggregate migration flow from region r to s and the number of stayers in region r are obtained by multiplying the respective individual migration probabilities by the labor force in region r , as follows:

$$Mig_{rs}^M = L_r^M \Pr(M_{rs} = 1) \quad \text{and} \quad Mig_{rr}^M = L_r^M \Pr(M_{rr} = 1), \quad (11)$$

where $Mig_{rs,t}^M$ and Mig_{rr}^M denote the number of migrants from region r to s and the number of stayers in region r in the manufacturing sector, respectively. Dividing the number of migrants by the number of stayers in region r , the ratio of out-migrants from r to s to stayers can be obtained as follows:

$$\frac{Mig_{rs}^M}{Mig_{rr}^M} = \frac{\Pr(M_{rs} = 1)}{\Pr(M_{rr} = 1)} = \exp(V_{rs} - V_{rr}). \quad (12)$$

Taking the logarithm of Equation (12) and substituting the definition of indirect utility in Equations (8) and (10) yields the relationship between migration flows, the real wage, and migration costs as follows:

$$\log\left(\frac{Mig_{rs}^M}{Mig_{rr}^M}\right) = \log\left(\frac{\omega_s^M}{\omega_r^M}\right) - \log\left(\frac{z_s}{z_r}\right) - \log(\kappa_{rs}). \quad (13)$$

Using the real wage in Equation (2), the real wage term on the right hand side is decomposed as follows:

$$\log\left(\frac{Mig_{rs}^M}{Mig_{rr}^M}\right) = \log\left(\frac{W_s^M}{W_r^M}\right) - \mu \log\left(\frac{P_s^M}{P_r^M}\right) - \theta \log\left(\frac{P_s^S}{P_r^S}\right) - \log\left(\frac{z_s}{z_r}\right) - \log(\kappa_{rs}). \quad (14)$$

This expression makes the price-index effect, as well as the role of urban costs, transparent. Conditional on nominal wages and migration costs, workers are predicted to migrate toward regions with lower price indices and lower urban costs. Hence, the theoretical coefficients on the destination–origin differences in the manufacturing price index, service price index, and urban costs are all negative.

2.3. First Stage: Parameter Estimation by Gravity Equation

Our parameter estimation strategy follows the structural logic of Crozet (2004) but differs in its treatment of the origin region. Crozet (2004) absorbs origin-specific factors using origin fixed effects. In contrast, our bilateral formulation explicitly uses destination–origin differences in wages and price-index components. This preserves the comparative utility structure implied by the migration-choice model and allows observable conditions in both the origin and destination to enter directly. The model is estimated by nonlinear least squares (NLS) using manufacturing-sector migration.

An additional specification is required for the transport costs of manufactured goods. Transport costs for manufactured goods are assumed to increase with distance:

$$T_{rs}^M = D_{rs}^\delta, \quad (15)$$

where D_{rs} denotes the distance between regions r and s , and $\delta > 0$ denotes the distance elasticity of transport costs. As shown later, the distance elasticity of trade between regions is given by the composite parameter $\delta(1 - \sigma^M)$.

Migration costs are specified as a function of distance as follows:

$$\kappa_{rs} = D_{rs}^\lambda, \quad (16)$$

where $\lambda > 0$ denotes the distance elasticity of migration costs.

The urban-cost term, z_s , is specified as a function of employment density as follows:

$$z_s = (L_s/A_s)^\gamma, \quad (17)$$

where L_s/A_s denotes employment density in region s , A_s denotes the urban area of region s , and $\gamma > 0$ is the parameter governing the sensitivity of urban costs to employment density.

Table 1 summarizes the structural parameters in the model. To estimate these parameters, we derive the migration gravity equation by substituting the transport-cost, migration-cost, and urban-cost specifications in Equations (15)–(17):

$$\begin{aligned} \log\left(\frac{Mig_{rs,t}^M}{Mig_{rr,t}^M}\right) &= \log\left(\frac{W_{s,t-1}^M}{W_{r,t-1}^M}\right) - \frac{\mu}{1 - \sigma^M} \log\left(\frac{\sum_{k=1}^R L_{k,t-1}^M (W_{k,t-1}^M D_{ks}^\delta)^{1-\sigma^M}}{\sum_{k=1}^R L_{k,t-1}^M (W_{k,t-1}^M D_{rk}^\delta)^{1-\sigma^M}}\right) \\ &\quad - \frac{\theta}{1 - \sigma^S} \log\left(\frac{L_{s,t-1}^S (W_{s,t-1}^S)^{1-\sigma^S}}{L_{r,t-1}^S (W_{r,t-1}^S)^{1-\sigma^S}}\right) - \gamma \log\left(\frac{L_{s,t-1}/A_s}{L_{r,t-1}/A_r}\right) - \lambda \log(D_{rs}) \\ &\quad + \phi(US_s - US_r) + \psi \log\left(\frac{u_{s,t-1}}{u_{r,t-1}}\right) + e_{rs,t} \end{aligned} \quad (18)$$

where US_s denotes the U.S. border state dummy variable in region s , and $u_{s,t-1}$ is the unemployment rate in region s . Note that the expenditure shares μ and θ are specified exogenously and that the coefficient on log wage ratio is restricted to 1 in the parameter estimation.

Equation (18) additionally includes a U.S. border-state dummy to account for external influences that are not explicitly captured by the model. The theoretical framework primarily describes migration driven by domestic differences in wages, consumer prices, migration costs, and urban costs, and therefore does not directly incorporate the effect of proximity to the U.S. market following the implementation of NAFTA. To account for this omitted external dimension, we introduce the border-state dummy as an exogenous control for the additional locational advantages associated with access to the U.S. market and cross-border economic integration.

This is the first stage of the empirical analysis. The purpose is not simply to estimate a reduced-form migration gravity equation, but to recover the structural parameters necessary to construct region-specific consumer price indices. This two-stage logic is analogous to the broader empirical NEG literature, in which theoretically derived measures of market access are first recovered and subsequently related to wages or other regional outcomes.

An empirical concern is potential endogeneity in migration choice. Following Crozet (2004), the explanatory variables are constructed from lagged labor-market conditions. This temporal ordering mitigates the contemporaneous mechanical relationship between migration and local economic activity, although it does not fully eliminate potential endogeneity.

[Table 1]

2.4. Second Stage: Testing the Price-Index Effect on Cross-Sector Migration

The aim of this study is to examine whether industrial agglomeration affects cross-sector migration through the price-index channel predicted by NEG models. In the second stage, the structural parameter estimates are used to recover state-level price indices. Using the parameter estimates obtained in the first stage, the price indices of manufactured goods and services are recovered as follows, respectively:

$$\log(\hat{P}_s^M) = \frac{1}{1 - \hat{\sigma}^M} \log \left(\sum_{k=1}^R L_k^M (W_k^M D_{ks}^{\hat{\sigma}})^{1 - \hat{\sigma}^M} \right) \quad (19)$$

and

$$\log(\hat{P}_s^S) = \frac{1}{1 - \hat{\sigma}^S} \log (L_s^S (W_s^S)^{1 - \hat{\sigma}^S}). \quad (20)$$

Finally, we obtain the regression model at the second stage as follows:

$$\begin{aligned} \log \left(\frac{Mig_{rs,t}^j}{Mig_{rr,t}^j} \right) = & \beta_{1j} \log \left(\frac{W_{s,t-1}^j}{W_{r,t-1}^j} \right) + \beta_{2j} \log \left(\frac{\hat{P}_{s,t-1}^M}{\hat{P}_{r,t-1}^M} \right) + \beta_{3j} \log \left(\frac{\hat{P}_{s,t-1}^S}{\hat{P}_{r,t-1}^S} \right) + \beta_{4j} \log \left(\frac{L_{s,t-1}/A_s}{L_{r,t-1}/A_r} \right) \\ & + \beta_{5j} \log(D_{rs}) + \phi_j (US_s - US_r) + \psi_j \log \left(\frac{u_{s,t-1}}{u_{r,t-1}} \right) + e_{rs}^j, \end{aligned} \quad (21)$$

where $\beta_{1j} > 0$, $\beta_{2j} < 0$, $\beta_{3j} < 0$, $\beta_{4j} < 0$, and $\beta_{5j} < 0$ are expected to have signs predicted by the NEG model. In contrast to the real-wage calculation, where the coefficients on the price indices are fixed by the expenditure shares, the coefficients on the price indices in the migration equation are estimated flexibly from the data.

Our main parameters of interest are β_{2j} and β_{3j} , which capture the price-index effect of manufacturing and service agglomeration on cross-sector migration, respectively. For manufacturing workers, a negative β_2 captures the conventional forward linkage between manufacturing agglomeration and manufacturing

migration. For workers in service industries, however, a negative coefficient identifies a cross-sectoral price-index effect: manufacturing agglomeration makes a destination more attractive even to workers who are not employed in manufacturing because it reduces the cost of consuming manufactured goods. Similarly, a negative β_{3j} captures the forward linkage generated by service-sector agglomeration.

It should be noted that the interpretation of a negative employment-density coefficient, $\beta_{4j} < 0$, as evidence of urban costs is based on the modeling assumption adopted in this study. Empirically, however, employment density may also capture some benefits of agglomeration that are not fully reflected in wages and price indices. The estimated coefficient should therefore be interpreted as the net association between employment density and migration, rather than as a pure measure of urban diseconomies.

For robustness, we also directly estimate the impact of the real wage on migration in sector j as follows:

$$\begin{aligned} \log\left(\frac{Mig_{rs,t}^j}{Mig_{rr,t}^j}\right) = & \alpha_{1j} \log\left(\frac{\hat{w}_{s,t-1}^j}{\hat{w}_{r,t-1}^j}\right) + \alpha_{2j} \log\left(\frac{L_{s,t-1}/A_s}{L_{r,t-1}/A_r}\right) + \alpha_{3j} \log(D_{rs}) + \phi_j(US_s - US_r) \\ & + \psi_j \log\left(\frac{u_{s,t-1}}{u_{r,t-1}}\right) + e_{rs,t}^j \end{aligned} \quad (22)$$

where $\alpha_{1j} > 0$, $\alpha_{2j} < 0$, and $\alpha_{3j} < 0$ are expected to have the signs predicted from the NEG model. For a worker employed in sector j , the sector-specific real wage is constructed as follows:

$$\log(\hat{w}_s^j) = \log(W_s^j) - \bar{\mu} \log(\hat{P}_s^M) - \bar{\theta} \log(\hat{P}_s^S) \quad (23)$$

where the nominal wages vary across sectors but workers face the same price indices in region s . Note that expenditure shares of manufactured goods and services, $\bar{\mu}$ and $\bar{\theta}$, are exogenously fixed at the values used in the first-stage estimation.

Our approach is similar to that of Hering and Paillacar (2016). Their analysis of Brazil focuses on foreign market access, which raises local labor demand and attracts migrants through higher wages and employment opportunities. Our analysis instead focuses on consumer-side access to supply, which operates by lowering the cost of living. Thus, the two approaches examine complementary sides of NEG: the market-access channel works primarily through nominal income, whereas the price-index channel works through consumer purchasing power.

3. Data

3.1. Migration Variables

Data on labor migration are drawn from the 2000 Population and Housing Census (*Censo General de Población y Vivienda 2000*; hereafter, CGPV2000) conducted by INEGI (2000a). INEGI conducts the census every ten years to collect information on demographic conditions in Mexico. To provide updated

demographic information between decennial censuses, INEGI has also conducted mid-decade statistical exercises. In 1995 and 2005, these took the form of the Population and Housing Count (*Conteo de Población y Vivienda*), which collected more limited information than the full census.

CGPV2000 covered all Mexican and foreign residents living in Mexican territory. The census employed two types of questionnaires: a basic questionnaire and an extended questionnaire. The extended questionnaire contained additional questions beyond those included in the basic questionnaire and was administered to a randomly selected sample of approximately 2.2 million households.

Migration is identified using information on whether respondents had changed their state of residence during the previous five years and on their state of residence five years earlier. The extended questionnaire also collected information on the reasons for migration. According to INEGI (2000b), nationwide, 16.75% of migrants moved in search of employment, while 8.49% moved because of a change in workplace. Another 19.75% moved to live with family members, and 5.14% moved because of marriage, while approximately 3.56% migrated for educational purposes. U.S. border states such as Baja California and Chihuahua attracted relatively large numbers of migrants seeking employment opportunities.

Because migration decisions in the total population reflect a wide range of motives unrelated to employment, such as family formation and education, using all migrants may introduce substantial variation that is not directly relevant to the labor-market mechanism underlying the NEG model. To sharpen the identification of the structural parameters, we therefore restrict the migration sample to individuals who were employed at the time of the 2000 census. Workers are defined as individuals aged 12 or older who worked at least one hour per week and received income from employment. This restriction allows the empirical analysis to focus more closely on migration associated with labor-market incentives and regional differences in real wages.

An important advantage of the CGPV2000 is that employed migrants can be identified by both their state of residence and their industry of employment. This makes it possible to construct bilateral interstate migration flows separately by industry. The resulting data are particularly useful for our empirical strategy: manufacturing-sector migration is used in the first-stage structural estimation to maintain consistency with the NEG model, while migration flows for all industries are used in the second stage to examine whether the model-implied price-index effect extends beyond manufacturing to workers in other sectors.

3.2. Labor Market Variables

State-industry-level data on the labor force and wages are drawn from the 1990 Population and Housing Census (*Censo General de Población y Vivienda 1990*; hereafter, CGPV1990), conducted by INEGI (1990). Wages are measured as average hourly wages at the state-industry level. Ideally, wages would be adjusted

for worker characteristics such as education, age, and occupation, as in Hanson (2005); however, such adjustments are not made in this analysis. Following Harris and Todaro (1970), state unemployment rates are included to account for differences in employment opportunities and labor-market conditions across states.

3.3. Geographic Variables

The measurement of distance is discussed extensively in Head and Mayer (2010), who show that measurement error in distance can substantially affect empirical results. They also emphasize the importance of accounting for within-region transport costs.

To assess the robustness of the estimation results, we use both great-circle and road distances. Great-circle distances are calculated from the latitude and longitude of state capitals (INEGI 2007), while road distances between state capitals are obtained from "Point-to-Point Routes (*Rutas Punto a Punto*)" provided by the Mexican Ministry of Communications and Transport (*Secretaría de Comunicaciones y Transportes*). Intra-state distance is measured as $d_{ss} = 2/3\sqrt{Area_s/\pi}$, where $Area_s$ denotes the entire area of the state s and π is the mathematical constant. This measure corresponds to two-thirds of the radius of a circle with the same area as the state. Although we use both great-circle and road distances, the resulting estimates differ only slightly. We therefore use road distance as the baseline measure in the analysis (See Online Appendix for the additional results based on the great-circle distance).

We define a U.S. border-state dummy equal to one for states that share an international border with the United States and zero otherwise. Because the model incorporates only domestic determinants of regional attractiveness, it does not explicitly capture the influence of economic integration with the United States under NAFTA. We therefore include the U.S. border-state dummy to capture exogenously the additional locational advantage associated with proximity to the U.S. market and cross-border economic integration.

For employment density, urban area was calculated using geographic information system data provided by the INEGI (2001). Specifically, we used the INEGI land-use and vegetation shapefile and identified polygons classified as Urban Zone (*Zona Urbana*). These urban polygons were spatially intersected with state boundaries, and their surface areas were calculated in square kilometers for each state. The resulting measure represents the total land area classified as urban within each state.

3.4. Descriptive Statistics

Table 2 presents the descriptive statistics for the variables used in the empirical analysis. The dependent variable is the log of the migrants-to-stayers ratio, constructed for all sectors and separately for each industry. The log of the migrants-to-stayers ratio in the manufacturing sector (Sector 5) is used for the structural estimation. To ensure consistency with the NEG framework, the structural parameters are estimated using migration by manufacturing workers, since manufacturing is the sector in which increasing returns,

monopolistic competition, and interregional transport costs generate the agglomeration mechanism of the model. The estimated parameters are then used to recover the model-implied regional price indices. In the second stage, migration data for all sectors are used to examine whether these recovered price indices affect migration not only in manufacturing but also across other industries. This allows us to test whether the price-index effect generated by agglomeration extends beyond the sector used for the structural estimation.

For all sectors combined, the mean log migrants-to-stayers ratio is -7.450 , with a standard deviation of 1.324 . The corresponding sector-specific means range from -8.511 to -6.592 , indicating substantial heterogeneity in migration intensity across industries. The number of observations also varies across sectors, ranging from 652 to 990 because some sector-specific bilateral flows are zero, while the full bilateral sample contains 992 observations. Migration captures changes in state of residence between 1995 and 2000.

The explanatory variables include geographic characteristics and destination–origin differences in labor-market conditions. The mean log road distance is 6.835 . The destination–origin differences in log nominal wages, log urban density, log manufacturing employment, log service employment, the U.S. border-state dummy, and log unemployment rates are centered around zero. Because each state pair is observed symmetrically in both directions, the destination–origin difference for one observation is offset by the corresponding origin–destination difference in the reverse observation. As a result, the mean of these bilateral differences is mechanically equal to zero.

[Table 2]

4. Estimation Results

4.1. Parameter Estimation Results

Table 3 reports the NLS estimates of the structural parameters under alternative expenditure shares. The estimates satisfy the principal theoretical restrictions of the NEG model. The elasticity of substitution among manufactured goods, $\hat{\sigma}^M$, ranges from 1.900 to 3.414. In the prior literature, Crozet (2004) reports estimates ranging from 1.30 to 5.63, while Pons et al. (2007) report estimates between 2.81 and 4.17. Using Spanish data for 2000–2004, Paluzie et al. (2009) obtained estimates ranging from 1.76 to 1.97. Our estimates therefore lie within the range of values reported in the prior literature.

The elasticity of substitution among services, $\hat{\sigma}^S$, ranges from 1.629 to 2.852. Crozet (2004) obtains values between 1.41 and 1.93, while Pons et al. (2007) report an estimate of 1.49. Using Spanish data for 2000–2004, Paluzie et al. (2009) obtain an estimate of 1.44. The service-sector estimates are somewhat higher in some specifications but remain broadly comparable to those found in earlier structural migration studies.

Importantly, the no-black-hole conditions are satisfied for both sectors in every specification. For

manufacturing, $\hat{\sigma}^M(1 - \mu)$ ranges from 1.366 to 1.622, while the corresponding service-sector $\hat{\sigma}^S(1 - \theta)$ expression ranges from 1.141 to 1.357. Hence, the estimated parameters are consistent with an equilibrium in which agglomeration forces do not mechanically generate complete concentration.

The estimated distance elasticity of transport costs, $\hat{\delta}$, ranges from 0.749 to 2.043 and is positive and statistically significant. Accordingly, the implied distance elasticity of trade, $\hat{\delta}(1 - \hat{\sigma}^M)$, ranges from -1.838 to -1.808 , satisfying the theoretically predicted negative sign. Crozet (2004) reports substantial cross-country variation in distance elasticity of transport costs, $\hat{\delta}$, with estimates ranging from 0.46 to 3.76. Pons et al. (2007) report estimates between 1.79 and 2.12, while Paluzie et al. (2009) obtain estimates between 0.89 and 0.95 for Spain over 2000–2004.

The distance elasticity of migration costs, λ , is positive and highly statistically significant, with an estimate of 0.699 in every specification. Given the specification of migration costs, a positive λ implies that greater bilateral distance increases migration costs and therefore reduces interstate migration.

The urban-cost parameter, γ , is positive and highly statistically significant in every specification, ranging from 0.600 to 0.611. Because urban costs are specified as an increasing function of employment density, the estimates imply that a 1 percent increase in employment density raises the urban-cost term by approximately 0.6 percent.

The U.S. border-state differential also remains positive and highly significant, with coefficients between 0.887 and 0.898, whereas the coefficient on the unemployment rate is positive but not statistically significant. The positive and statistically significant U.S. border-state coefficient suggests that states bordering the United States had greater destination attractiveness even after controlling for regional differences in wages, consumer prices, and urban density. The particularly large coefficient for manufacturing is consistent with the increasing orientation of tradable activities toward the U.S. market during the post-NAFTA period.

[Table 3]

4.2. Recovering Price Indices and Real Wages

Figure 1 maps the geographical distribution of the main components of manufacturing workers' regional utility, using the parameter estimates in Column (5) of Table 3. Darker shades indicate a stronger positive contribution to utility. Panel (a) combines the model-implied real wage with the U.S. border-state effect and shows relatively high attractiveness in several northern states, reflecting both higher purchasing power and the additional advantage associated with proximity to the United States. Panel (b) shows that nominal wages are also relatively high in parts of northern Mexico. Panel (c) shows the spatial distribution of urban costs, which offsets some of the benefits of agglomeration in more densely concentrated locations. Panels (d)–(f) reveal a different spatial pattern for the cost-of-living and price-index components, with lower manufacturing

and service price indices tending to generate stronger utility gains in central and other large domestic markets. Taken together, the figure illustrates that regional attractiveness cannot be inferred from nominal wages alone: it reflects the combined effects of wages, consumer prices, density-related urban costs, and border-specific advantages.

Figure 2 illustrates the relationship between manufacturing-sector migration and the main components of regional utility after netting out non-real-wage factors. Panel (a) shows a clear positive relationship between the destination–origin difference in real wages and the migrants-to-stayers ratio, while Panel (b) shows a weaker but still positive association with nominal-wage differentials. In contrast to the model-implied urban-cost interpretation, Panel (c) does not display a clear negative relationship between migration and the density-related urban-cost component; the fitted relationship is nearly flat and slightly positive. However, the negative urban-cost effect becomes more apparent in the multivariate regressions reported below, where wages and price-index components are controlled for simultaneously. By contrast, Panels (d)–(f) show clear negative relationships between migration and the cost-of-living index, the manufacturing price index, and the service price index, respectively. These patterns are consistent with the consumer-side mechanism emphasized in the model: lower consumer prices increase purchasing power and make a destination more attractive to manufacturing workers.

Overall, Figures 1 and 2 provide a broader decomposition of the NEG migration mechanism than one based on wages and consumer prices alone. Higher nominal wages and lower price indices increase the incentive to migrate, whereas higher urban costs reduce the attractiveness of dense destinations. The observed positive relationship between migration and real wages therefore coexists with a negative urban-cost effect. These figures highlight that agglomeration generates countervailing forces: supplier access raises consumer purchasing power, while density-related urban diseconomies work in the opposite direction.

[Figures 1–2]

4.3. Price Indices and Cross-Sector Migration

Table 4 examines the separate associations of nominal wages, the manufacturing price index, the service price index, and employment density with migration, with employment density capturing the urban-cost channel. Figures 3–6 visualize the relationships between migration and nominal wages, the cost-of-living index, the manufacturing price index, and the service price index, respectively..

For manufacturing workers, the coefficient on the manufacturing price index is -0.623 and statistically significant at the 1 percent level. This finding is consistent with the central NEG prediction: conditional on nominal wages and urban costs, workers are more likely to migrate toward states where greater access to manufactured varieties results in a lower manufacturing price index. The magnitude and statistical precision

of the coefficient indicate that the consumer-side forward linkage remains economically important within manufacturing after density-related urban costs are taken into account.

In contrast, the manufacturing price-index effect is not pervasive across service industries. For all sectors combined, the coefficient is -0.015 and statistically insignificant. Among service sectors, theoretically consistent negative and statistically significant coefficients are found for Information (Sector 8, -0.139) at the 10 percent level, and for Finance and Insurance (Sector 9, -0.148) and Arts and Entertainment (Sector 15, -0.195) at the 5 percent level. The coefficient for Government Activities is negative but not longer statistically significant. Several other sectors show insignificant coefficients, while some display statistically significant coefficients with the opposite sign. Taken together, these findings provide evidence of a cross-sector migration externality generated by manufacturing supplier access exists for a limited subset of industries, but the pattern is much less pervasive than the within-manufacturing effect.

The pattern for the service price index is much stronger. Its coefficient is negative and statistically significant at the 1 percent level in every sector, including the aggregate specification. For all sectors, the coefficient is -0.214 , and the sector-specific estimates range from -0.102 to -0.301 . Thus, states with lower model-implied service price indices systematically attract more migrants. Figure 6 visually reinforces this result, with predominantly downward-sloping fitted relationships between migration and the destination–origin difference in the service price index across industries.

Employment density also has an important independent association with migration. The aggregate coefficient on log urban density is -0.205 and statistically significant at the 5 percent level, while the coefficient for manufacturing is -0.660 and significant at the 1 percent level. Negative and statistically significant density coefficients are found in ten sector-specific regressions, including Construction, Retail and Wholesale Trade, Finance and Insurance, Administrative and Support, Arts and Entertainment, Accommodation and Restaurants, and Other Services. This pattern is consistent with the urban-cost mechanism introduced in the model: densely concentrated destinations may offer agglomeration benefits through wages and supplier access, but these benefits are partly offset by urban diseconomies.

The contrast between manufacturing and service price indices remains important for understanding Mexican economic geography. Trade liberalization weakened the historical concentration of manufacturing around Mexico City and strengthened the relative position of northern Mexico, as documented by Hanson (1997, 1998). Nevertheless, many services remain oriented toward domestic and local demand. The strong and widespread service price-index effect is therefore consistent with continued advantages of large domestic agglomerations. At the same time, the negative density coefficients show that these agglomeration advantages are not costless: greater concentration also generates centrifugal forces through urban costs. In the terminology of Tabuchi and Thisse (2006), these different agglomeration and dispersion forces can coexist:

relatively tradable activities may become more geographically dispersed or specialized across regions, while less tradable services remain concentrated in large urban markets. Such a pattern is consistent with the continued importance of Mexico City as a large service-oriented metropolitan economy despite the northward reorientation of manufacturing activity.

Taken together, the results suggest that the spatial decentralization of manufacturing need not lead to a corresponding decentralization of population or the service economy. Manufacturing and service agglomerations generate distinct price-index effects, with the latter operating more broadly across workers. At the same time, higher employment density creates an additional urban-cost channel that reduces the attractiveness of highly concentrated locations in many sectors. The overall migration incentive therefore reflects a balance between consumer-side agglomeration economies and density-related urban diseconomies.

[Table 4; Figures 3–6]

4.4. Real Wages and Cross-Sector Migration

Table 5 recombines nominal wages and the two price indices into the model-implied real wage while retaining employment density as a separate measure of urban costs. The aggregate coefficient on the destination–origin real-wage difference is 0.589 and statistically significant at the 1 percent level. This indicates that interstate migration is systematically directed toward states offering higher purchasing power, even after controlling for density-related urban costs.

The positive real-wage relationship is broad across industries. Manufacturing has a coefficient of 0.965, while Information and Finance and Insurance have coefficients of 0.861 and 0.982, respectively; all are statistically significant at the 1 percent level. Positive and statistically significant coefficients are observed in every sector from Sector 3 through Sector 19. Agriculture has a small and statistically insignificant negative coefficient, whereas Mining is the notable exception, with a negative and statistically significant coefficient of -0.333 . Among Sectors 10–19, all real-wage coefficients are positive and significant at the 1 percent level, ranging from 0.440 for Government Activities to 0.880 for Administrative and Support.

The coefficient on log urban density provides complementary evidence on the urban-cost channel. For all sectors combined, the coefficient is -0.337 and statistically significant at the 1 percent level. The density coefficient is negative and statistically significant in 16 of the 19 sector-specific regressions; for manufacturing, it is -0.583 and significant at the 1 percent level. Agriculture and Government Activities have negative but statistically insignificant coefficients, while Mining has a positive but statistically insignificant coefficient (0.126). Overall, the results indicate that higher employment density generally reduces destination attractiveness after controlling for real-wage differences, consistent with urban diseconomies operating as a centrifugal force.

Figure 7 provides a graphical counterpart to the real-wage estimates. With the exceptions of Agriculture and Mining, the sector-specific fitted relationships are generally upward sloping, consistent with the predominantly positive real-wage coefficients reported in Table 5. Combined with the negative density coefficients, these results suggest that workers respond positively to regional differences in purchasing power, while high urban concentration can offset part of that attraction. The comparison between Tables 4 and 5 therefore reinforces the interpretation that real wages provide a more comprehensive measure of migration incentives than nominal wages alone, but that urban costs remain an additional and empirically important centrifugal force.

[Table 5; Figure 7]

4.5. Proximity to the U.S. Border and Cross-Sector Migration

The U.S. border-state coefficients reveal substantial sectoral heterogeneity in migration toward states bordering the United States. In the decomposed specification reported in Table 4, the border-state coefficient is positive and statistically significant for all sectors combined (0.208). Among individual industries, positive and significant coefficients are found for Manufacturing (0.962), Information (0.183), Administrative and Support (0.217), and Health Care and Social Assistance (0.135). The coefficient is also positive and significant for the unspecified-industry category (0.218). Manufacturing stands out in both magnitude and statistical significance, suggesting that the additional attractiveness of U.S. border states was particularly strong for manufacturing workers. Information also exhibits a positive border orientation, consistent with the possibility that relatively tradable activities benefited more from proximity to the U.S. market. By contrast, Arts and Entertainment has a negative and statistically significant coefficient, indicating substantial heterogeneity in border orientation across service industries.

The pattern becomes considerably broader in Table 5, where nominal wages and the manufacturing and service price indices are combined into the model-implied real wage. In this specification, positive and statistically significant border-state coefficients are found not only for Manufacturing and Information, but also for Mining, Electricity and Water Supply, Construction, Finance and Insurance, Professional Services, Administrative and Support, Health Care and Social Assistance, and Other Services, as well as for the unspecified-industry category. The aggregate border coefficient also increases from 0.208 in Table 4 to 0.310 in Table 5. Manufacturing nevertheless remains one of the sectors with the largest border coefficients, at 0.896, while Information also shows a relatively large coefficient of 0.334. These results indicate that an additional border-specific component of destination attractiveness remains even after regional differences in model-implied real wages are taken into account.

The difference between Tables 4 and 5 reflects the way in which domestic wage and price-index

components are incorporated into the migration equation. Table 4 estimates the coefficients on nominal wages, the manufacturing price index, and the service price index separately, allowing each component to have a flexible association with migration. Consequently, part of the spatial advantage associated with U.S. border states may be absorbed by these individual variables. Table 5 instead combines the three components into a single model-implied real-wage measure using the theoretically specified expenditure shares. This restriction changes how spatial variation is allocated between the real-wage component and the border-state dummy, leaving the latter to capture border-specific advantages that are not summarized by the theoretically constructed real wage. These may include proximity to the U.S. market, cross-border production networks, infrastructure, and other features associated with economic integration. The broader significance of the border dummy in Table 5 should therefore not be interpreted as evidence that the real-wage specification produces a stronger causal effect of NAFTA; rather, it indicates that the estimated border association depends partly on how domestic wage and price-index channels are modeled.

5. Conclusion

This study examines how multiple agglomeration and dispersion forces shaped interstate migration and regional attractiveness in Mexico during the early post-NAFTA period using bilateral interstate migration between 1995 and 2000. Rather than viewing the spatial reorganization of the Mexican economy simply as a northward relocation of manufacturing, we emphasize the interaction of external market access, consumer-side agglomeration economies, and density-related urban costs. Within an NEG framework, we distinguish the manufacturing price-index effect, the service price-index effect, and the urban-cost channel, while using a U.S. border-state dummy to capture additional border-specific influences associated with proximity to the U.S. market.

The results reveal important differences between manufacturing and service-sector agglomeration. The manufacturing price index is strongly and negatively associated with migration by manufacturing workers, consistent with the conventional forward linkage predicted by NEG. This suggests that manufacturing agglomeration can generate an additional consumer-side advantage by lowering the effective price of manufactured goods. In the post-NAFTA context, such a mechanism may reinforce the attractiveness of locations that already benefit from greater access to the U.S. market. At the same time, the cross-sector manufacturing price-index effect is considerably more limited. Negative coefficients are found for several service industries, including Information, Finance and Insurance, and Arts and Entertainment, but the effect is not pervasive across the service economy. By contrast, the service price-index effect is much broader. Lower service price indices are associated with larger migration flows in every sector examined. Because many services are locally produced and consumed, service-sector agglomeration generates a consumer-side

advantage that is shared by workers across industries.

The results also highlight the importance of centrifugal forces. Employment density generally has a negative association with migration after wages and price indices are taken into account, consistent with the urban-cost mechanism incorporated into the model. Dense metropolitan areas may provide agglomeration benefits through higher wages and improved supplier access, but these advantages can be partly offset by congestion, commuting costs, land scarcity, and other urban diseconomies. The Mexican spatial economy therefore reflects a balance between centripetal forces generated by supplier access and centrifugal forces generated by urban concentration.

Our findings shed light on a dual spatial structure in the Mexican economy following the implementation of NAFTA in 1994. Greater integration with the United States increased the attractiveness of northern and border regions for manufacturing and some tradable services, while domestic service agglomeration continued to generate strong consumer-side advantages in large metropolitan regions. These agglomeration advantages are partly offset by urban costs that rise with employment density. Trade integration can therefore decentralize some forms of production without necessarily eliminating the forces sustaining large domestic cities, while density-related diseconomies limit the extent of concentration.

Finally, several qualifications remain. The model-implied price indices depend on the structural assumptions of the NEG framework. The present framework is static and does not explicitly model the dynamic adjustment of migration, wages, price indices, and industrial agglomeration over time. Migration may itself alter regional labor supply, market size, and supplier access, thereby affecting future price indices and subsequent migration. Recent dynamic spatial models explicitly incorporate such feedback mechanisms and transition dynamics (Caliendo et al. 2019; Kleinman et al. 2023). Extending the present framework in this direction would allow us to examine how the price-index effect and migration jointly evolve over time following trade integration.

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CRedit Authorship Contribution Statement

Keisuke Kondo: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft, Writing - review & editing, Visualization, Funding acquisition, Project administration.

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The author has no competing interests to declare.

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Supplemental Material

The supplemental material is provided in [onlineappendix.pdf](#).

Table 1. Structural Parameters

Parameter	Description	Expected Sign
σ^S	Elasticity of substitution among service goods	$\sigma^S > 1$
σ^M	Elasticity of substitution among manufactured goods	$\sigma^M > 1$
δ	Distance elasticity of transport costs	$\delta > 0$
λ	Distance elasticity of migration costs	$\lambda > 0$
γ	Density elasticity of urban costs	$\gamma > 0$
μ	Expenditure share on manufactured goods	$\mu \in \{0.2, 0.3, 0.4, 0.5, 0.6\}$
θ	Expenditure share on service goods	$\theta \in \{0.6, 0.5, 0.4, 0.3, 0.2\}$
$\delta(1 - \sigma^M)$	Distance elasticity of trade	$\delta(1 - \sigma^M) < 0$
$\sigma^M(1 - \mu)$	No-black-hole condition	$\sigma^M(1 - \mu) > 1$
$\sigma^S(1 - \theta)$	No-black-hole condition	$\sigma^S(1 - \theta) > 1$

Note: Structural parameters are included in Equation (18). Expenditure shares on manufactured goods and services μ and θ are given exogenously.

Table 2. Descriptive Statistics

Variables	Obs.	Mean	SD	Min	P25	P50	P75	Max
log(Migrants-to-Stayers Ratio in All Sectors)	992	-7.450	1.324	-11.257	-8.418	-7.598	-6.627	-2.811
log(Migrants-to-Stayers Ratio in Sector 1)	937	-8.511	1.795	-12.975	-9.781	-8.694	-7.324	-2.583
log(Migrants-to-Stayers Ratio in Sector 2)	710	-6.592	1.343	-9.904	-7.590	-6.596	-5.702	-2.436
log(Migrants-to-Stayers Ratio in Sector 3)	652	-7.095	1.106	-10.002	-7.887	-7.256	-6.389	-2.809
log(Migrants-to-Stayers Ratio in Sector 4)	977	-7.585	1.418	-11.052	-8.582	-7.682	-6.709	-2.791
log(Migrants-to-Stayers Ratio in Sector 5)	984	-7.473	1.712	-11.989	-8.654	-7.501	-6.421	-1.959
log(Migrants-to-Stayers Ratio in Sector 6)	990	-7.457	1.348	-11.456	-8.398	-7.577	-6.618	-2.788
log(Migrants-to-Stayers Ratio in Sector 7)	943	-7.589	1.336	-10.720	-8.521	-7.727	-6.718	-2.618
log(Migrants-to-Stayers Ratio in Sector 8)	789	-6.840	1.253	-9.774	-7.694	-6.982	-5.955	-2.980
log(Migrants-to-Stayers Ratio in Sector 9)	796	-6.745	1.291	-9.948	-7.666	-6.838	-5.870	-2.768
log(Migrants-to-Stayers Ratio in Sector 10)	680	-6.654	1.157	-9.701	-7.508	-6.732	-5.921	-2.678
log(Migrants-to-Stayers Ratio in Sector 11)	907	-7.147	1.254	-10.511	-8.036	-7.296	-6.356	-3.120
log(Migrants-to-Stayers Ratio in Sector 12)	873	-6.947	1.503	-10.581	-7.908	-7.090	-6.007	-2.559
log(Migrants-to-Stayers Ratio in Sector 13)	970	-7.683	1.249	-10.935	-8.548	-7.762	-6.846	-3.179
log(Migrants-to-Stayers Ratio in Sector 14)	948	-7.405	1.254	-10.866	-8.243	-7.472	-6.621	-2.894
log(Migrants-to-Stayers Ratio in Sector 15)	806	-6.801	1.206	-9.467	-7.712	-6.847	-6.004	-3.045
log(Migrants-to-Stayers Ratio in Sector 16)	964	-7.161	1.444	-11.038	-8.151	-7.274	-6.274	-2.027
log(Migrants-to-Stayers Ratio in Sector 17)	974	-7.565	1.534	-11.107	-8.653	-7.745	-6.634	-2.320
log(Migrants-to-Stayers Ratio in Sector 18)	989	-6.785	1.140	-10.073	-7.592	-6.898	-6.053	-2.943
log(Migrants-to-Stayers Ratio in Sector 19)	925	-7.404	1.380	-10.636	-8.393	-7.471	-6.555	-2.557
log(Road Distance)	992	6.835	0.834	3.611	6.318	6.876	7.400	8.629
Destination-Origin Differences in log(Nominal Wages)	992	0.000	0.294	-0.868	-0.205	0.000	0.205	0.868
Destination-Origin Differences in log(Urban Density)	992	0.000	0.667	-1.764	-0.447	0.000	0.447	1.764
Destination-Origin Differences in log(Workers in Manu.)	992	0.000	1.580	-4.513	-1.082	0.000	1.082	4.513
Destination-Origin Differences in log(Workers in Service)	992	0.000	1.204	-3.474	-0.819	0.000	0.819	3.474
Destination-Origin Differences in US Border State Dummy	992	0.000	0.522	-1.000	0.000	0.000	0.000	1.000
Destination-Origin Differences in log(Unemp. Rates in 1996)	992	0.000	0.644	-1.792	-0.454	0.000	0.454	1.792

Note: Migration captures the residential reallocation between 1995 and 2000 (INEGI 2000). Nominal wages and workers are values in 1990 (INEGI 1990). Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table 3. Parameter Estimation Results

Variables	Dependent Variable: $\log(\text{Migrants-to-stayers ratio in the manufacturing sector})$				
	$\mu = 0.2, \theta = 0.6$	$\mu = 0.3, \theta = 0.5$	$\mu = 0.4, \theta = 0.4$	$\mu = 0.5, \theta = 0.3$	$\mu = 0.6, \theta = 0.2$
	(1)	(2)	(3)	(4)	(5)
σ^S (Elasticity of Substitution of Service)	2.852*** (0.253)	2.550*** (0.213)	2.246*** (0.172)	1.939*** (0.131)	1.629*** (0.088)
σ^M (Elasticity of Substitution of Manufactured Goods)	1.900*** (0.226)	2.313*** (0.320)	2.703*** (0.402)	3.070*** (0.474)	3.414*** (0.535)
δ (Distance Elasticity of Transport Costs)	2.043*** (0.320)	1.395*** (0.212)	1.071*** (0.158)	0.878*** (0.126)	0.749*** (0.104)
λ (Distance Elasticity of Migration Costs)	0.699*** (0.050)	0.699*** (0.050)	0.699*** (0.050)	0.699*** (0.050)	0.699*** (0.050)
γ (Density Elasticity of Urban Costs)	0.600*** (0.101)	0.602*** (0.101)	0.604*** (0.101)	0.607*** (0.101)	0.611*** (0.101)
U.S. Border State Dummy	0.898*** (0.104)	0.896*** (0.105)	0.893*** (0.105)	0.890*** (0.105)	0.887*** (0.105)
$\log(\text{Unemployment Rates in 1996})$	0.117 (0.082)	0.110 (0.081)	0.103 (0.079)	0.097 (0.078)	0.091 (0.077)
Distance Elasticity of Trade: $\delta(1 - \sigma^M) < 0$	-1.838	-1.832	-1.824	-1.816	-1.808
No Black Hole Condition in Manufacturing Sector: $\sigma^M(1 - \mu) > 1$	1.520	1.619	1.622	1.535	1.366
No Black Hole Condition in Service Sector: $\sigma^S(1 - \theta) > 1$	1.141	1.275	1.348	1.357	1.303
Number of Observations	984	984	984	984	984
Adjusted R^2	0.971	0.971	0.971	0.971	0.971
Sum of Squared Residuals	1687.520	1684.905	1682.550	1680.456	1678.622

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level.

Table 4. Migration and Decomposed Real Wage by Sector

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	All Sectors (1)	Sector 1 (2)	Sector 2 (3)	Sector 3 (4)	Sector 4 (5)	Sector 5 (6)	Sector 6 (7)	Sector 7 (8)	Sector 8 (9)	Sector 9 (10)
log(Nominal Wage)	0.387** (0.159)	-0.255** (0.122)	-1.084*** (0.163)	0.340* (0.187)	0.123 (0.179)	0.448* (0.236)	0.673*** (0.185)	0.416* (0.218)	1.111*** (0.190)	1.300*** (0.153)
log(Manufacturing Price Index)	-0.015 (0.074)	0.579*** (0.118)	0.542*** (0.113)	0.082 (0.084)	-0.051 (0.092)	-0.623*** (0.084)	-0.082 (0.076)	0.020 (0.089)	-0.139* (0.085)	-0.148** (0.072)
log(Service Price Index)	-0.214*** (0.022)	-0.146*** (0.033)	-0.102*** (0.034)	-0.227*** (0.023)	-0.191*** (0.026)	-0.212*** (0.028)	-0.238*** (0.021)	-0.215*** (0.026)	-0.240*** (0.023)	-0.282*** (0.022)
log(Urban Density)	-0.205** (0.086)	0.055 (0.131)	0.080 (0.124)	-0.201** (0.093)	-0.419*** (0.102)	-0.660*** (0.099)	-0.346*** (0.086)	-0.038 (0.093)	-0.062 (0.081)	-0.309*** (0.085)
U.S. Border State Dummy	0.208** (0.082)	-0.147 (0.127)	0.069 (0.116)	0.050 (0.087)	0.131 (0.096)	0.962*** (0.102)	-0.031 (0.080)	-0.070 (0.090)	0.183** (0.080)	-0.017 (0.078)
log(Distance)	-0.647*** (0.042)	-0.649*** (0.064)	-0.337*** (0.056)	-0.610*** (0.042)	-0.617*** (0.051)	-0.698*** (0.049)	-0.780*** (0.040)	-0.663*** (0.043)	-0.615*** (0.039)	-0.610*** (0.038)
log(Unemployment Rate)	0.101 (0.092)	-0.437*** (0.116)	0.372*** (0.098)	0.088 (0.065)	0.111 (0.088)	0.223** (0.101)	0.077 (0.074)	0.156* (0.086)	0.061 (0.068)	-0.062 (0.073)
Number of Observations	992	937	710	652	977	984	990	943	789	796
Adjusted R^2	0.311	0.169	0.117	0.367	0.216	0.418	0.372	0.286	0.456	0.481

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Nominal Wage), log(Manufacturing Price Index), log(Service Price Index), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table 4. Migration and Decomposed Real Wage by Sector (*Continued*)

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	Sector 10	Sector 11	Sector 12	Sector 13	Sector 14	Sector 15	Sector 16	Sector 17	Sector 18	Sector 19
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Nominal Wage)	1.266*** (0.162)	0.855*** (0.124)	1.380*** (0.150)	-0.081 (0.310)	0.616* (0.319)	0.826*** (0.137)	1.314*** (0.176)	0.609*** (0.161)	0.424*** (0.163)	0.919*** (0.162)
log(Manufacturing Price Index)	0.121 (0.081)	0.054 (0.069)	-0.016 (0.079)	-0.055 (0.079)	-0.024 (0.084)	-0.195** (0.084)	0.190** (0.084)	-0.087 (0.088)	-0.033 (0.066)	0.131* (0.074)
log(Service Price Index)	-0.183*** (0.023)	-0.245*** (0.022)	-0.251*** (0.024)	-0.221*** (0.022)	-0.210*** (0.022)	-0.228*** (0.022)	-0.228*** (0.024)	-0.251*** (0.024)	-0.151*** (0.020)	-0.301*** (0.022)
log(Urban Density)	-0.124 (0.097)	-0.037 (0.079)	-0.342*** (0.093)	-0.062 (0.079)	-0.109 (0.078)	-0.260*** (0.084)	-0.251*** (0.095)	-0.290*** (0.097)	0.048 (0.079)	-0.199** (0.089)
U.S. Border State Dummy	-0.125 (0.081)	-0.062 (0.074)	0.217** (0.089)	0.021 (0.077)	0.135* (0.081)	-0.208** (0.082)	-0.146 (0.090)	0.037 (0.092)	-0.026 (0.074)	0.218*** (0.082)
log(Distance)	-0.458*** (0.041)	-0.621*** (0.038)	-0.591*** (0.044)	-0.787*** (0.037)	-0.686*** (0.039)	-0.577*** (0.039)	-0.621*** (0.047)	-0.852*** (0.048)	-0.521*** (0.037)	-0.604*** (0.042)
log(Unemployment Rate)	0.059 (0.079)	0.102 (0.066)	0.325*** (0.077)	-0.002 (0.067)	0.121* (0.070)	0.001 (0.070)	0.139* (0.079)	0.279*** (0.083)	0.141** (0.062)	0.054 (0.081)
Number of Observations	680	907	873	970	948	806	964	974	989	925
Adjusted R^2	0.355	0.402	0.455	0.384	0.345	0.333	0.303	0.368	0.248	0.405

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Nominal Wage), log(Manufacturing Price Index), log(Service Price Index), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table 5. Migration and Real Wage by Sector

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	All Sectors (1)	Sector 1 (2)	Sector 2 (3)	Sector 3 (4)	Sector 4 (5)	Sector 5 (6)	Sector 6 (7)	Sector 7 (8)	Sector 8 (9)	Sector 9 (10)
log(Real Wage)	0.589*** (0.068)	-0.081 (0.090)	-0.333*** (0.096)	0.569*** (0.073)	0.524*** (0.077)	0.965*** (0.075)	0.744*** (0.069)	0.618*** (0.074)	0.861*** (0.066)	0.982*** (0.064)
log(Urban Density)	-0.337*** (0.077)	-0.115 (0.104)	0.126 (0.115)	-0.379*** (0.090)	-0.470*** (0.088)	-0.583*** (0.092)	-0.532*** (0.080)	-0.217*** (0.082)	-0.295*** (0.075)	-0.553*** (0.080)
U.S. Border State Dummy	0.310*** (0.082)	0.035 (0.123)	0.220** (0.111)	0.176** (0.082)	0.198** (0.093)	0.896*** (0.100)	0.091 (0.080)	0.046 (0.088)	0.334*** (0.076)	0.165** (0.076)
log(Distance)	-0.647*** (0.042)	-0.644*** (0.064)	-0.359*** (0.058)	-0.604*** (0.044)	-0.617*** (0.051)	-0.699*** (0.050)	-0.781*** (0.041)	-0.662*** (0.044)	-0.608*** (0.040)	-0.608*** (0.039)
log(Unemployment Rate)	-0.021 (0.077)	-0.581*** (0.115)	0.197** (0.096)	0.017 (0.064)	0.006 (0.083)	0.110 (0.081)	0.001 (0.066)	0.048 (0.073)	0.024 (0.058)	-0.073 (0.066)
Number of Observations	992	937	710	652	977	984	990	943	789	796
Adjusted R^2	0.293	0.142	0.071	0.334	0.205	0.415	0.353	0.268	0.430	0.448

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Real Wage), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table 5. Migration and Real Wage by Sector (*Continued*)

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	Sector 10 (1)	Sector 11 (2)	Sector 12 (3)	Sector 13 (4)	Sector 14 (5)	Sector 15 (6)	Sector 16 (7)	Sector 17 (8)	Sector 18 (9)	Sector 19 (10)
log(Real Wage)	0.581*** (0.069)	0.698*** (0.062)	0.880*** (0.066)	0.678*** (0.072)	0.627*** (0.074)	0.820*** (0.068)	0.619*** (0.080)	0.780*** (0.080)	0.440*** (0.066)	0.750*** (0.071)
log(Urban Density)	-0.412*** (0.082)	-0.293*** (0.074)	-0.675*** (0.085)	-0.205*** (0.077)	-0.292*** (0.075)	-0.415*** (0.073)	-0.679*** (0.086)	-0.455*** (0.087)	-0.060 (0.076)	-0.473*** (0.086)
U.S. Border State Dummy	0.098 (0.080)	0.120* (0.071)	0.431*** (0.086)	0.059 (0.071)	0.262*** (0.077)	-0.107 (0.078)	0.139 (0.090)	0.152* (0.090)	0.065 (0.070)	0.493*** (0.083)
log(Distance)	-0.443*** (0.043)	-0.619*** (0.039)	-0.581*** (0.045)	-0.786*** (0.038)	-0.688*** (0.039)	-0.575*** (0.040)	-0.619*** (0.049)	-0.852*** (0.048)	-0.522*** (0.038)	-0.600*** (0.044)
log(Unemployment Rate)	0.135* (0.075)	0.049 (0.065)	0.325*** (0.074)	-0.123** (0.059)	0.056 (0.063)	-0.047 (0.067)	0.119 (0.079)	0.183** (0.078)	0.100* (0.060)	-0.009 (0.075)
Number of Observations	680	907	873	970	948	806	964	974	989	925
Adjusted R^2	0.296	0.362	0.418	0.368	0.325	0.320	0.244	0.353	0.237	0.352

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Real Wage), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

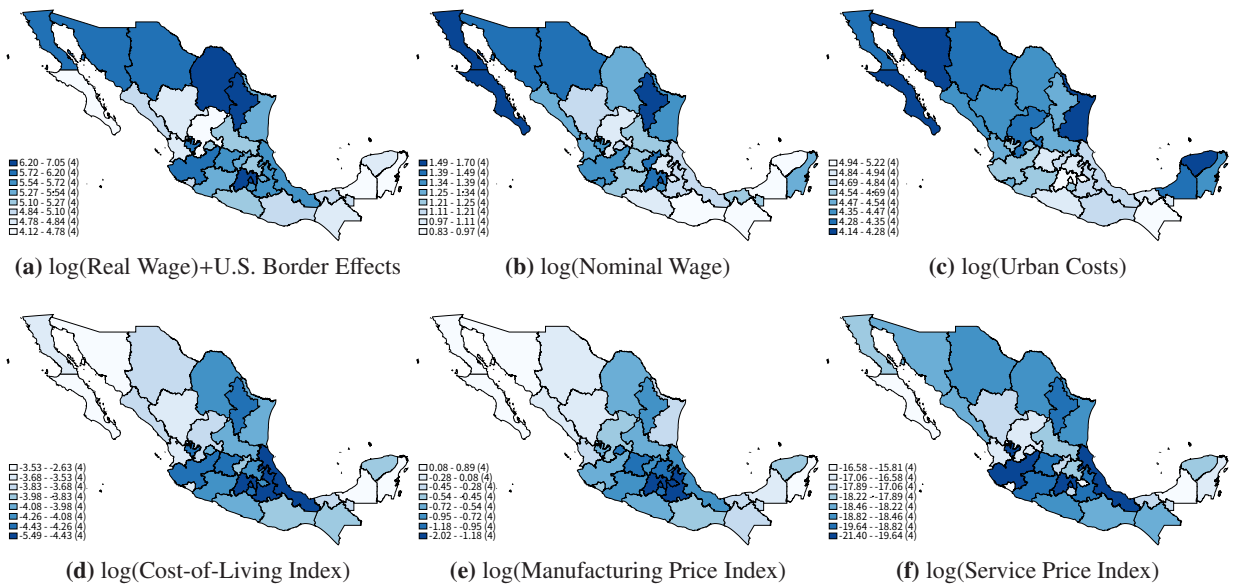


Figure 1. Geographical Distribution of Estimated Real Wages and Price Indices

Note: Author's creation. The nominal wage in the manufacturing sector is used. Parameters in Column (5) of Table 3 are used. Darker colors indicate a stronger positive effect on utility.

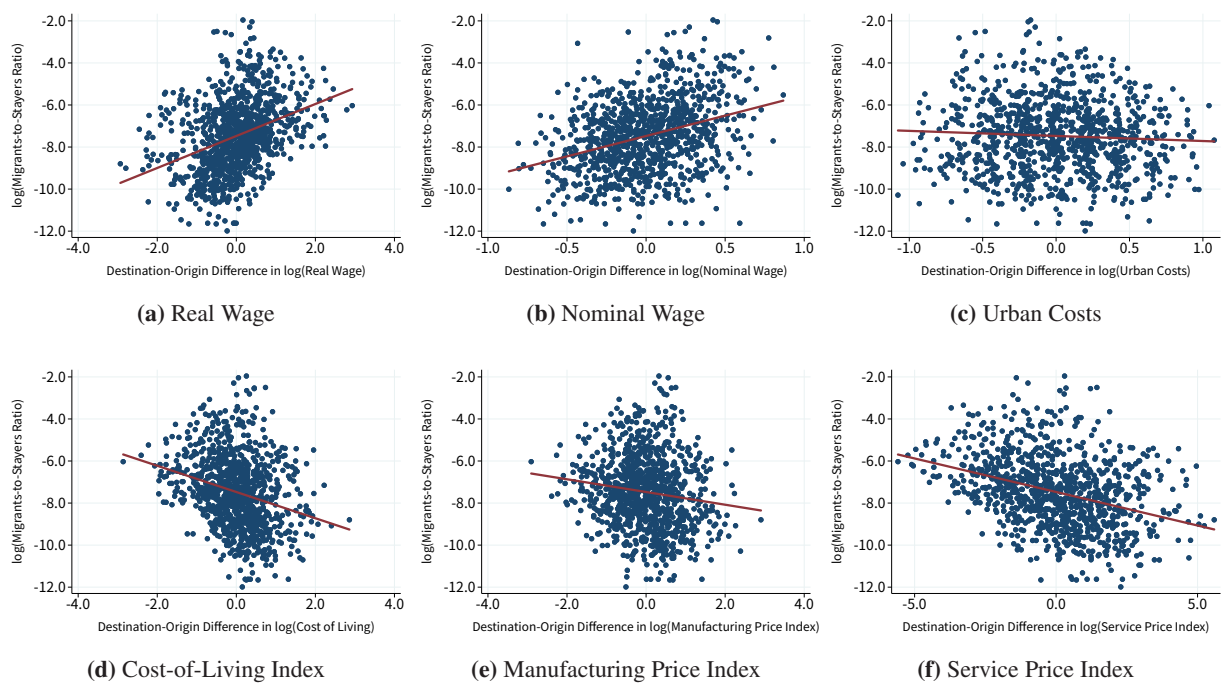


Figure 2. Migration and Estimated Real Wages and Price Indices in the Manufacturing Sector

Note: Author's creation. The nominal wage in the manufacturing sector is used. Parameters in Column (5) of Table 3 are used.

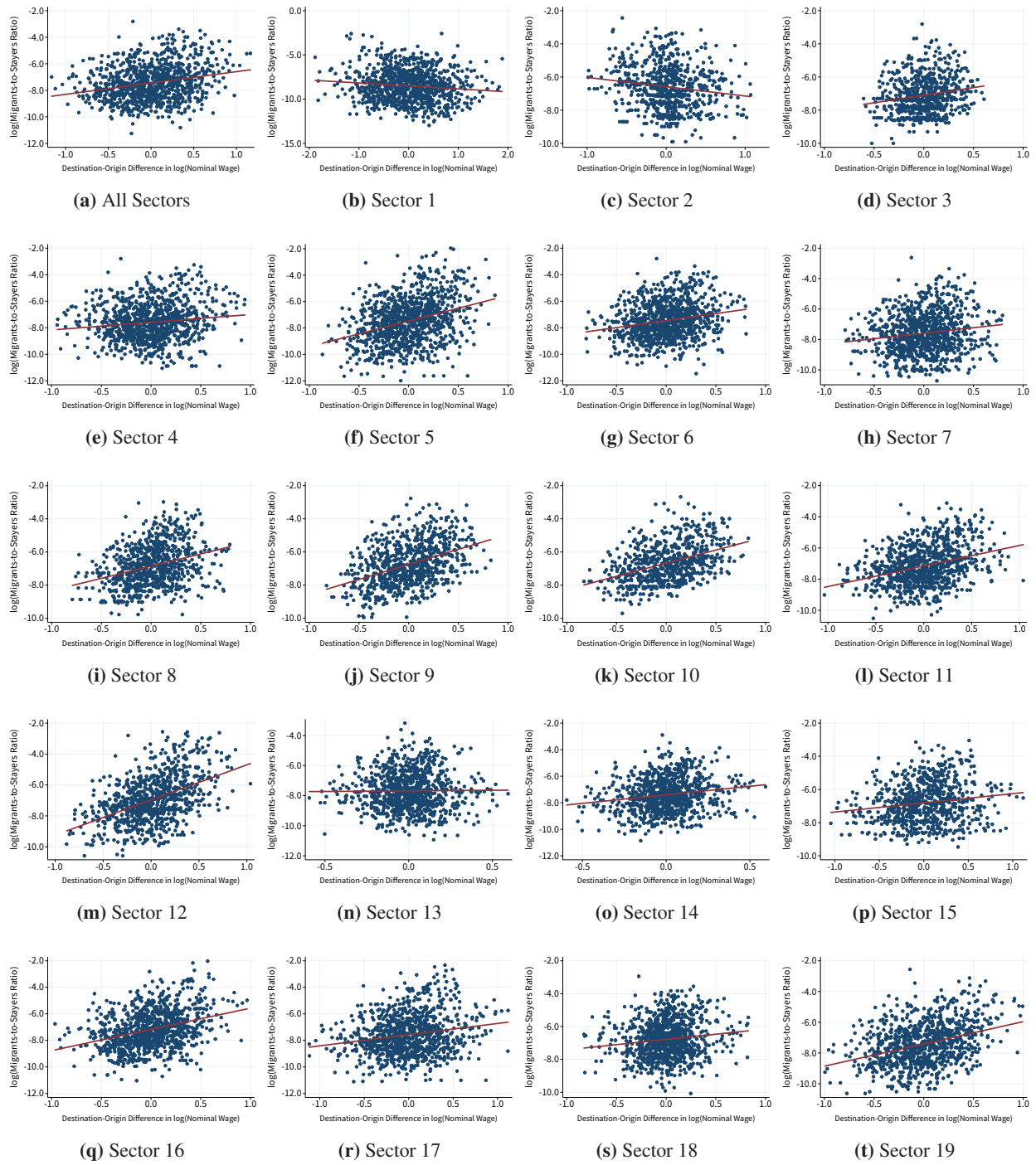


Figure 3. Migration and Nominal Wage by Sector

Note: Author's creation. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

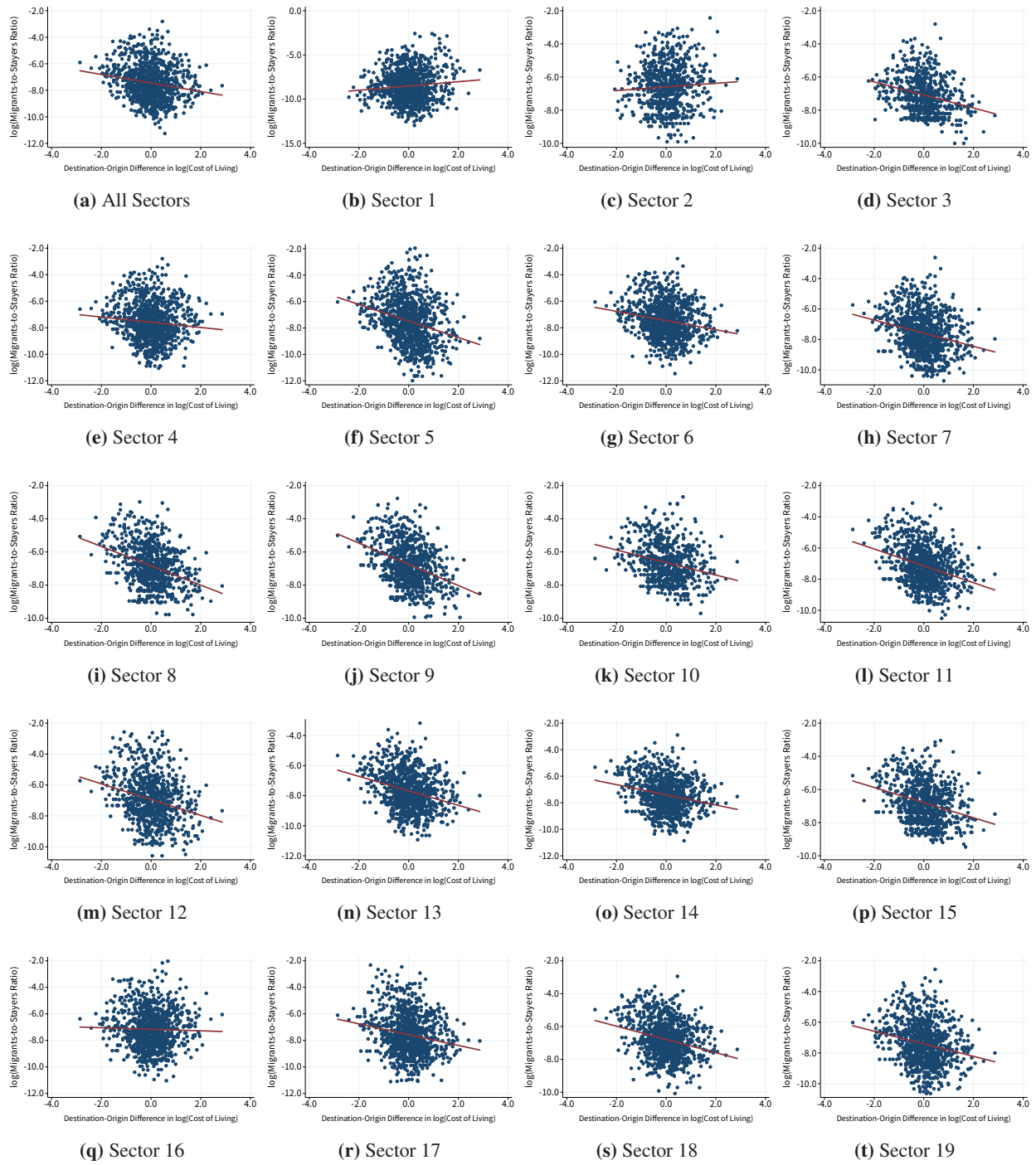


Figure 4. Migration and Cost-of-living Index by Sector

Note: Author's creation. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

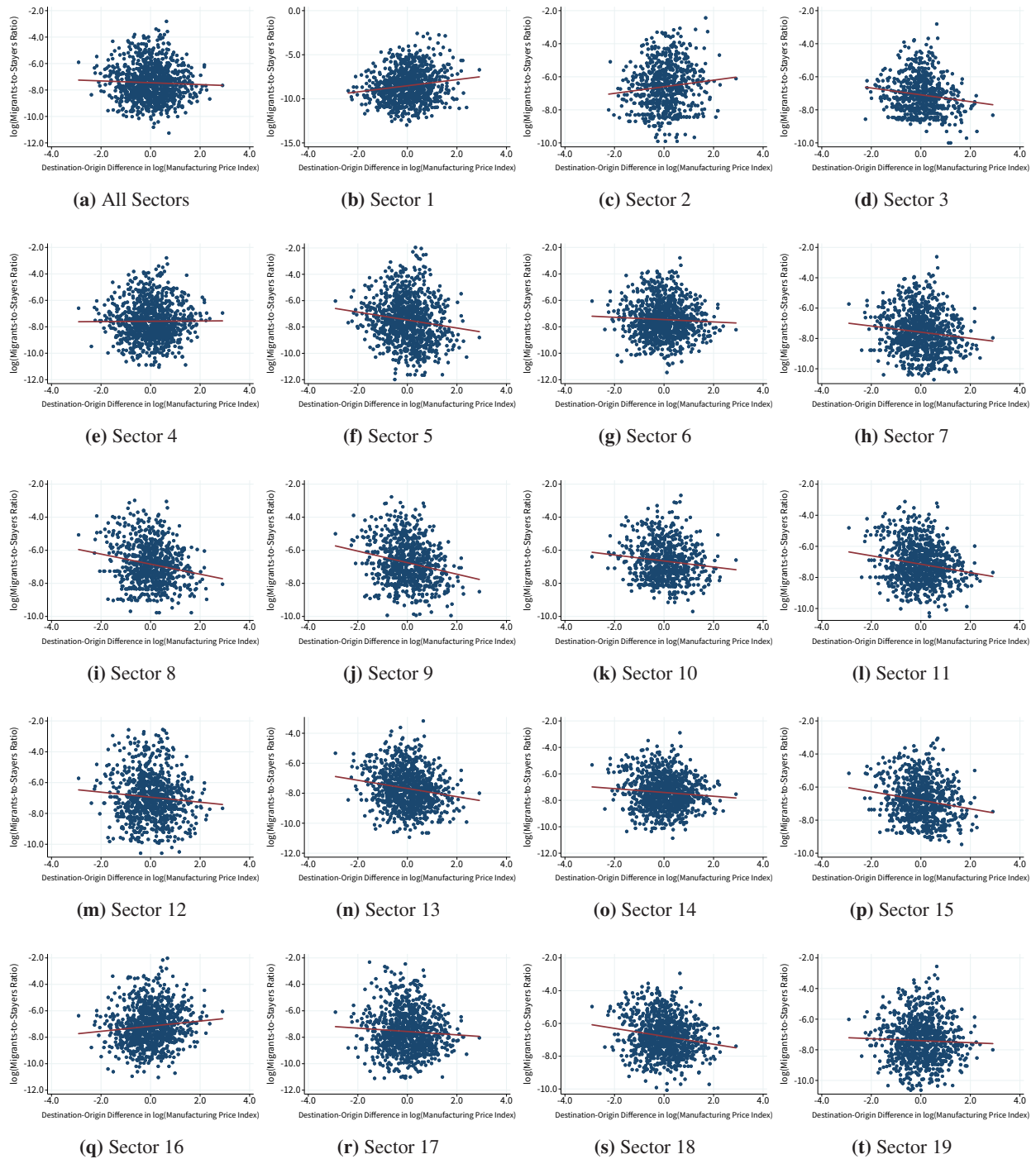


Figure 5. Migration and Manufacturing Price Index by Sector

Note: Author's creation. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

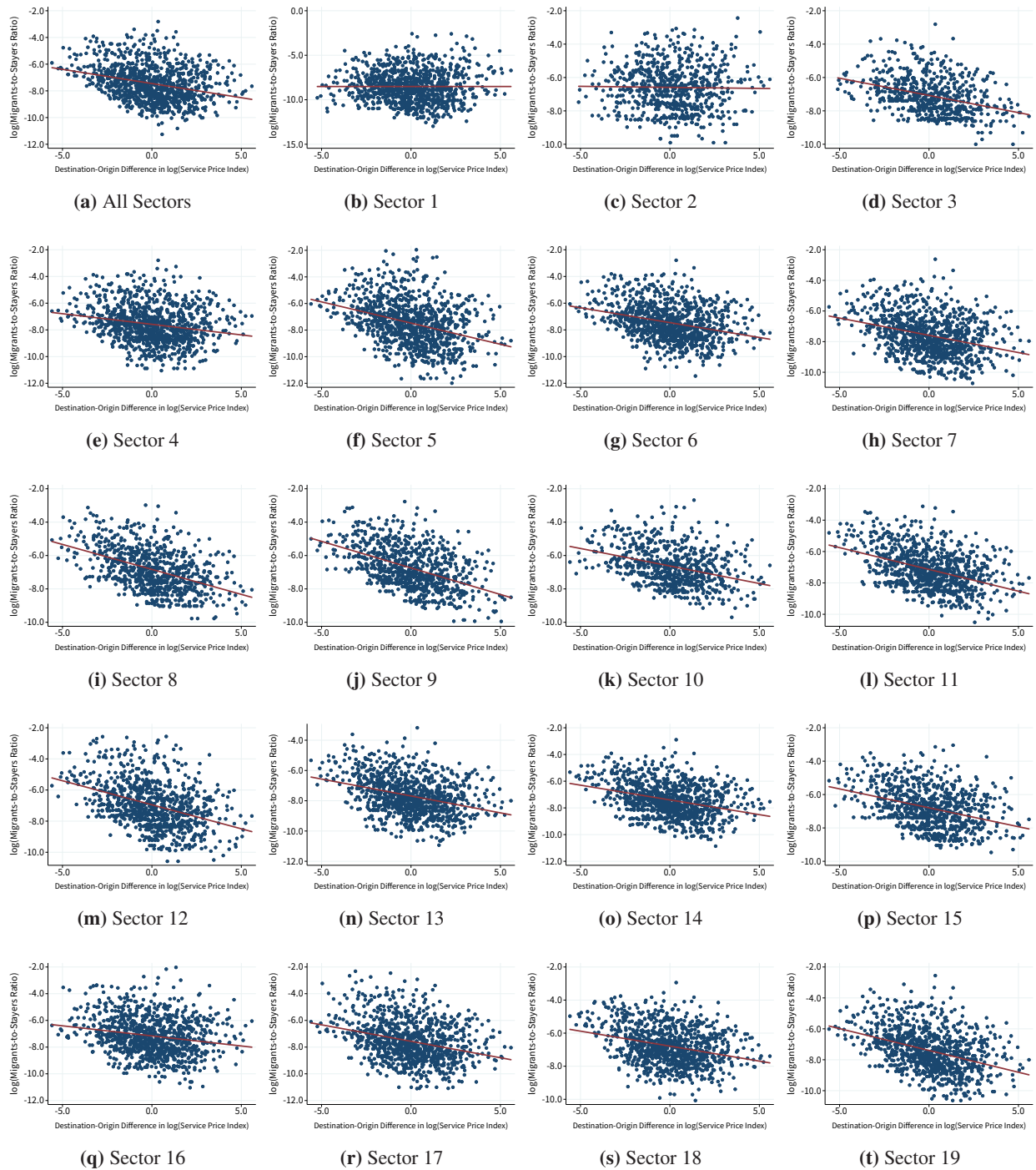


Figure 6. Migration and Service Price Index by Sector

Note: Author's creation. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

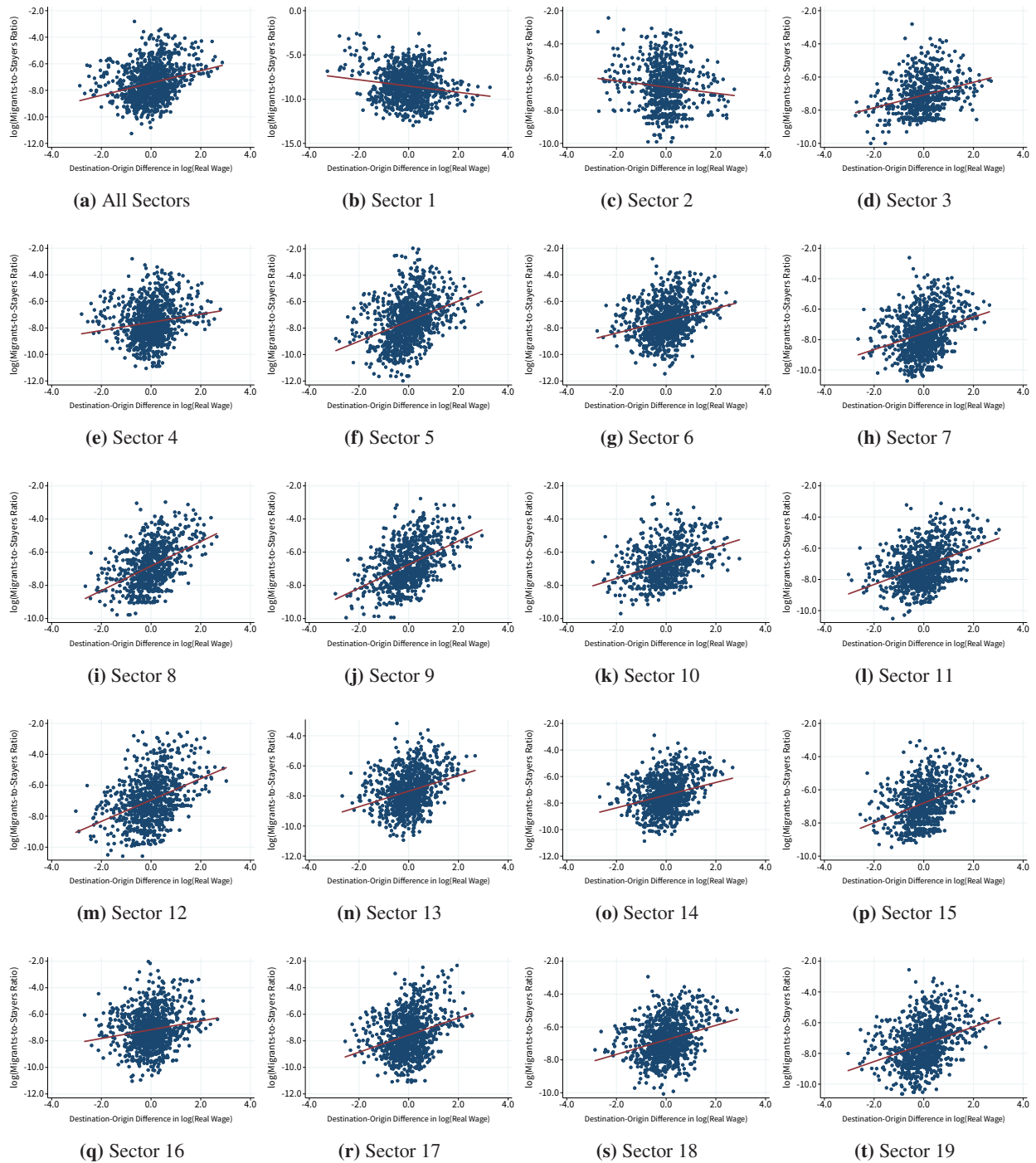


Figure 7. Migration and Real Wage Discounted by Urban Costs by Sector

Note: Author's creation. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Online Appendix for
**Agglomeration, the Price-Index Effect, and Migration in Post-NAFTA
Mexico**

Keisuke Kondo[†]
RIETI & Kobe University

Table of Contents

Appendix A	Reference Points for Bilateral Distance.....	2
Appendix B	Parameter Estimation Results.....	3
Appendix C	Price Indices and Cross-Sector Migration.....	4
Appendix D	Real Wages and Cross-Sector Migration.....	5

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Appendix A Reference Points for Bilateral Distance

Table A.1 lists the reference points used to construct the alternative bilateral distance measure. For each state, the state capital is used as the reference point, and great-circle distances are calculated from the latitude and longitude reported by INEGI (2007). The use of great-circle distance provides a robustness check on the baseline specification based on road distance by measuring geographic separation independently of the road network.

[Table A.1]

Appendix B Parameter Estimation Results

Table B.1 reports the structural parameter estimates when road distance is replaced by great-circle distance. The results are qualitatively very similar to the baseline estimates. The elasticity of substitution among services ranges from 1.629 to 2.852, while that among manufactured goods ranges from 1.900 to 3.414. The estimated distance elasticity of transport costs is positive and statistically significant, ranging from 0.749 to 2.043, while the implied distance elasticity of trade remains negative, ranging from -1.838 to -1.808 . The no-black-hole conditions are satisfied in both sectors under all expenditure-share specifications. The distance elasticity of migration costs is estimated at 0.699 and is statistically significant at the 1 percent level in every specification.

The density elasticity of urban costs is also positive and statistically significant at the 1 percent level in every specification, ranging from 0.600 to 0.611. These estimates are very close to the baseline road-distance estimates, indicating that the estimated density-related urban-cost channel is not sensitive to the choice of bilateral distance measure. The U.S. border-state coefficient also remains positive and statistically significant at the 1 percent level, ranging from 0.887 to 0.898, and is very similar to the baseline estimates.

Figures B.1 and B.2 show the corresponding model-implied spatial patterns and bivariate relationships. Figure B.1 indicates that replacing road distance with great-circle distance leaves the broad geographic distribution of real wages, urban costs, and the two price indices largely unchanged. Figure B.2 shows positive bivariate relationships between migration and both real-wage and nominal-wage differentials, and negative relationships between migration and the cost-of-living index and both the manufacturing and service price indices. Panel (c) also shows a weak negative relationship between migration and urban costs, although the fitted relationship is considerably flatter than those for the price-index components. Overall, the main wage, price-index, and urban-cost relationships remain qualitatively similar under the alternative distance measure.

[Table B.1; Figures B.1–B.2]

Appendix C Price Indices and Cross-Sector Migration

Table C.1 reports the cross-sector migration regressions using the price indices recovered from the great-circle distance specification. The overall pattern is close to that obtained with road distance. For manufacturing workers, the coefficient on the manufacturing price index is -0.639 and statistically significant at the 1 percent level. Negative and statistically significant coefficients on the manufacturing price index are also found for Information (-0.170) at the 10 percent level, Finance and Insurance (-0.152) at the 5 percent level, and Arts and Entertainment (-0.216) at the 5 percent level, whereas the aggregate coefficient is small and statistically insignificant. These estimates closely mirror the baseline pattern: the strong within-manufacturing price-index effect is robust, while the cross-sector association between manufacturing supplier access and migration remains limited to a small subset of service industries.

By contrast, the coefficient on the service price index remains negative and statistically significant at the 1 percent level in every sector. The sector-specific coefficients range from -0.082 to -0.266 , consistent with a broad role for service-sector agglomeration in attracting migrants through lower consumer prices. Employment density also retains a clear negative association with migration. The aggregate coefficient is -0.212 and statistically significant at the 5 percent level, and negative and statistically significant coefficients are found in ten individual sectors. Overall, the decomposed real-wage results are highly robust to replacing road distance with great-circle distance.

[Table C.1]

Appendix D Real Wages and Cross-Sector Migration

Table D.1 reports the real-wage specification using great-circle distance. The aggregate coefficient on the destination–origin real-wage difference is 0.596 and statistically significant at the 1 percent level, almost identical to the baseline estimate. The positive relationship is also widespread across industries. With the exception of Agriculture and Mining, the estimated real-wage coefficients are positive and statistically significant in every sector; across Sectors 3–19, they range from 0.437 to 0.973. Mining again has a negative and statistically significant coefficient of -0.328 , while Agriculture remains statistically insignificant. These results indicate that the positive association between real wages and interstate migration is not sensitive to the measurement of bilateral distance.

The employment-density results are similarly robust. The aggregate coefficient on urban density is -0.340 and statistically significant at the 1 percent level. Negative and statistically significant coefficients are found in sixteen of the nineteen individual sectors, including Manufacturing, suggesting that higher employment density is generally associated with lower destination attractiveness after real-wage differences are taken into account. Agriculture and Government Activities show negative but statistically insignificant coefficients, while Mining has a positive but statistically insignificant coefficient. Taken together, the results in Table D.1 reinforce the baseline finding that higher real wages are associated with greater migration, whereas higher employment density is generally associated with lower destination attractiveness.

[Table D.1]

Table A.1. Locations for Bilateral Distances

State	Municipality	Latitude	Longitude
Aguascalientes	Aguascalientes, Ags.	21.880556	−102.298056
Baja California	Mexicali, BC	32.666667	−115.450000
Baja California Sur	La Paz, BCS	24.150000	−110.305833
Campeche	Campeche, Camp.	19.846389	−90.537222
Coahuila de Zaragoza	Saltillo, Coah.	25.443611	−100.989444
Colima	Colima, Col.	19.241389	−103.729722
Chiapas	Tuxtla Gutiérrez, Chis.	16.755556	−93.112778
Chihuahua	Chihuahua, Chih.	28.636667	−106.078333
Distrito Federal	Ciudad de México, DF	19.433056	−99.132778
Durango	Victoria de Durango, Dgo.	24.025278	−104.669722
Guanajuato	Guanajuato, Gto.	21.016944	−101.255556
Guerrero	Chilpancingo de los Bravo, Gro.	17.551667	−99.501111
Hidalgo	Pachuca de Soto, Hgo.	20.128889	−98.731667
Jalisco	Guadalajara, Jal.	20.675556	−103.385833
Mexico	Toluca de Lerdo, Méx.	19.292500	−99.660556
Michoacan de Ocampo	Morelia, Mich.	19.701667	−101.193611
Morelos	Cuernavaca, Mor.	18.918889	−99.234167
Nayarit	Tepic, Nay.	21.513056	−104.895000
Nuevo Leon	Monterrey, NL	25.669722	−100.307222
Oaxaca	Oaxaca de Juárez, Oax.	17.061944	−96.721667
Puebla	Heroica Puebla de Zaragoza, Pue.	19.041667	−98.196667
Queretaro	Santiago de Querétaro, Qro.	20.593333	−100.386389
Quintana Roo	Chetumal, Q. Roo	18.494167	−88.298889
San Luis Potosi	San Luis Potosí, SLP	22.152778	−100.977222
Sinaloa	Culiacán Rosales, Sin.	24.793333	−107.372222
Sonora	Hermosillo, Son.	29.074722	−110.960000
Tabasco	Villahermosa, Tab.	17.984722	−92.919167
Tamaulipas	Ciudad Victoria, Tamps.	23.735000	−99.130833
Tlaxcala	Tlaxcala de Xicohtécatl, Tlax.	19.317778	−98.235833
Veracruz de Ignacio de la Llave	Xalapa Enríquez, Ver.	19.526389	−96.914167
Yucatan	Mérida, Yuc.	20.966667	−89.621944
Zacatecas	Zacatecas, Zac.	22.775000	−102.579167

Note: INEGI (2007). The latitude and longitude are expressed in decimal degrees, with negative longitude values indicating west longitude.

Table B.1. Parameter Estimation Results

Variables	Dependent Variable: log(migrants-stayers ratio)				
	$\mu = 0.2, \theta = 0.6$	$\mu = 0.3, \theta = 0.5$	$\mu = 0.4, \theta = 0.4$	$\mu = 0.5, \theta = 0.3$	$\mu = 0.6, \theta = 0.2$
	(1)	(2)	(3)	(4)	(5)
σ^S (Elasticity of Substitution of Service)	2.852*** (0.253)	2.550*** (0.213)	2.246*** (0.172)	1.939*** (0.131)	1.629*** (0.088)
σ^M (Elasticity of Substitution of Manufactured Goods)	1.900*** (0.226)	2.313*** (0.320)	2.703*** (0.402)	3.070*** (0.474)	3.414*** (0.535)
δ (Distance Elasticity of Transport Costs)	2.043*** (0.320)	1.395*** (0.212)	1.071*** (0.158)	0.878*** (0.126)	0.749*** (0.104)
λ (Distance Elasticity of Migration Costs)	0.699*** (0.050)	0.699*** (0.050)	0.699*** (0.050)	0.699*** (0.050)	0.699*** (0.050)
γ (Density Elasticity of Urban Costs)	0.600*** (0.101)	0.602*** (0.101)	0.604*** (0.101)	0.607*** (0.101)	0.611*** (0.101)
U.S. Border State Dummy	0.898*** (0.104)	0.896*** (0.105)	0.893*** (0.105)	0.890*** (0.105)	0.887*** (0.105)
log(Unemployment Rates in 1996)	0.117 (0.082)	0.110 (0.081)	0.103 (0.079)	0.097 (0.078)	0.091 (0.077)
Distance Elasticity of Trade: $\delta(1 - \sigma^M) < 0$	-1.838	-1.832	-1.824	-1.816	-1.808
No Black Hole Condition in Manufacturing Sector: $\sigma^M(1 - \mu) > 1$	1.520	1.619	1.622	1.535	1.366
No Black Hole Condition in Service Sector: $\sigma^S(1 - \theta) > 1$	1.141	1.275	1.348	1.357	1.303
Number of Observations	984	984	984	984	984
Adjusted R^2	0.971	0.971	0.971	0.971	0.971
Sum of Squared Residuals	1687.520	1684.905	1682.550	1680.456	1678.622

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level.

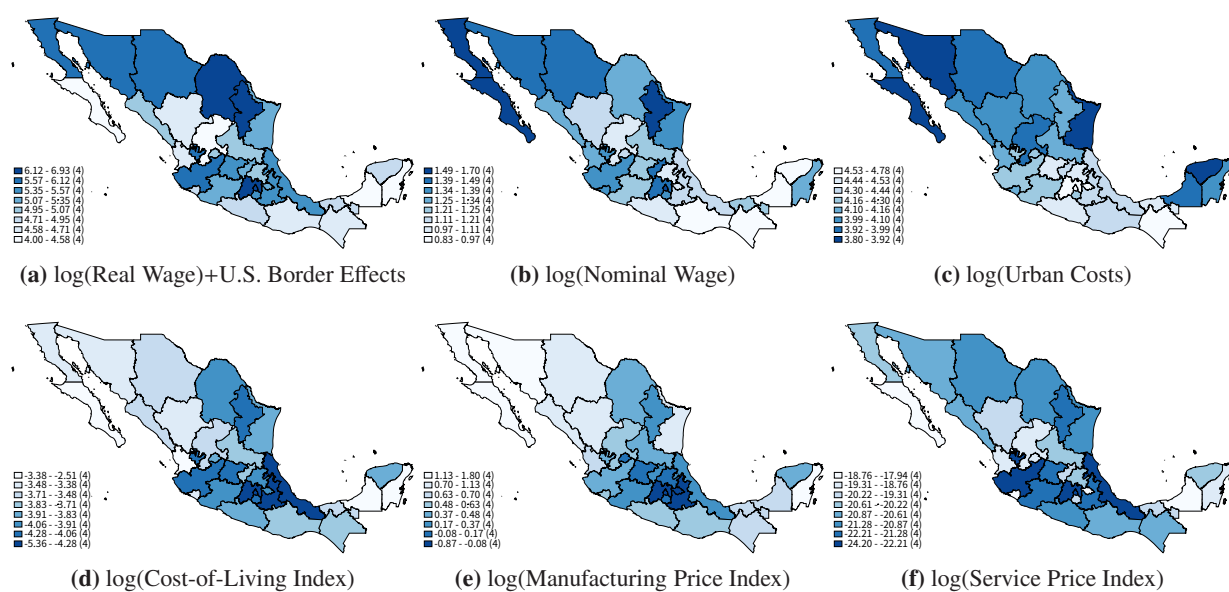


Figure B.1. Geographical Distribution of Estimated Real Wages and Price Indices

Note: Author's creation. Great-circle distance is used. The nominal wage in the manufacturing sector is used. Parameters in Column (5) of Table B.1 are used. Darker colors indicate a stronger positive effect on utility.

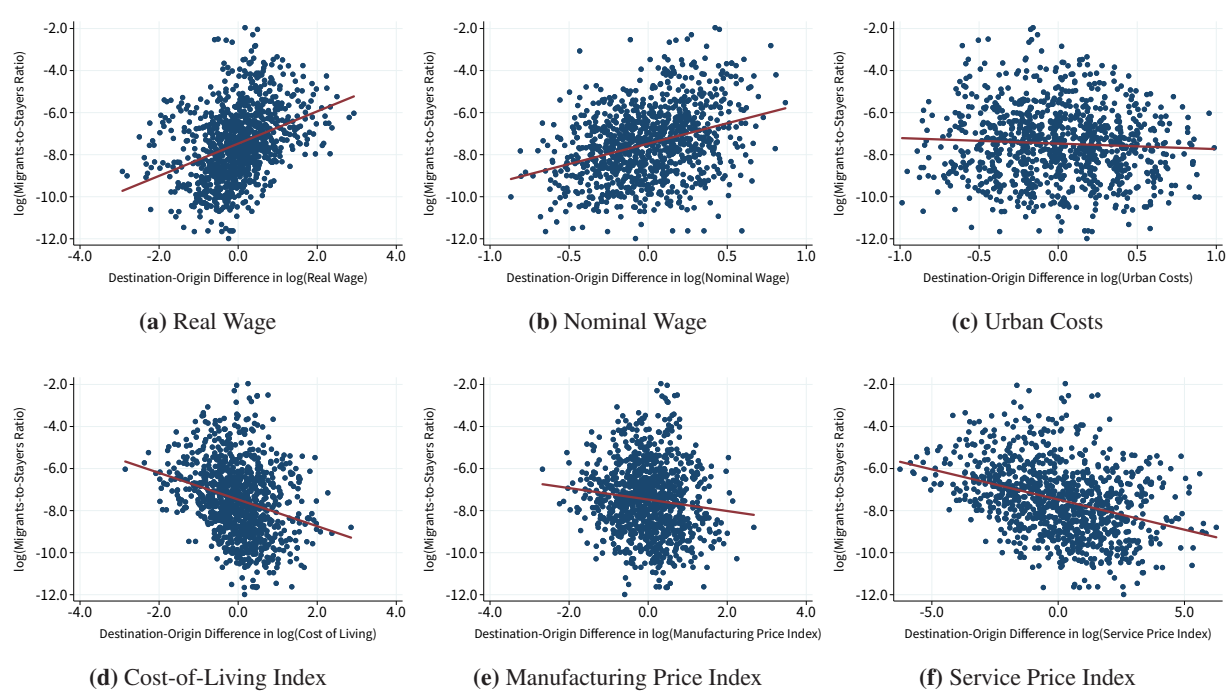


Figure B.2. Migration and Estimated Real Wages and Price Indices in the Manufacturing Sector

Note: Author's creation. Great-circle distance is used. The nominal wage in the manufacturing sector is used. Parameters in Column (5) of Table B.1 are used.

Table C.1. Migration and Decomposed Real Wage by Sector

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	All Sectors	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8	Sector 9
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log(Nominal Wage)	0.377** (0.165)	-0.260** (0.124)	-1.119*** (0.159)	0.290* (0.171)	0.103 (0.183)	0.475* (0.243)	0.665*** (0.192)	0.376* (0.226)	1.079*** (0.194)	1.263*** (0.153)
log(Manufacturing Price Index)	-0.026 (0.077)	0.596*** (0.121)	0.560*** (0.117)	0.049 (0.086)	-0.051 (0.095)	-0.639*** (0.090)	-0.098 (0.081)	0.024 (0.095)	-0.170* (0.091)	-0.152** (0.073)
log(Service Price Index)	-0.190*** (0.019)	-0.119*** (0.029)	-0.082*** (0.030)	-0.203*** (0.020)	-0.172*** (0.022)	-0.201*** (0.024)	-0.212*** (0.018)	-0.192*** (0.022)	-0.217*** (0.020)	-0.255*** (0.019)
log(Urban Density)	-0.212** (0.086)	0.062 (0.131)	0.098 (0.125)	-0.212** (0.093)	-0.421*** (0.101)	-0.652*** (0.100)	-0.353*** (0.086)	-0.038 (0.093)	-0.079 (0.081)	-0.308*** (0.086)
U.S. Border State Dummy	0.208** (0.082)	-0.136 (0.126)	0.090 (0.116)	0.074 (0.084)	0.129 (0.096)	0.950*** (0.103)	-0.031 (0.080)	-0.067 (0.089)	0.195** (0.081)	-0.017 (0.077)
log(Distance)	-0.748*** (0.045)	-0.779*** (0.067)	-0.375*** (0.059)	-0.669*** (0.043)	-0.760*** (0.051)	-0.784*** (0.055)	-0.880*** (0.043)	-0.765*** (0.046)	-0.661*** (0.041)	-0.683*** (0.038)
log(Unemployment Rate)	0.099 (0.093)	-0.448*** (0.115)	0.369*** (0.097)	0.070 (0.063)	0.110 (0.087)	0.222** (0.104)	0.073 (0.075)	0.156* (0.087)	0.055 (0.070)	-0.057 (0.071)
Number of Observations	992	937	710	652	977	984	990	943	789	796
Adjusted R^2	0.337	0.193	0.124	0.389	0.257	0.426	0.394	0.311	0.464	0.498

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Nominal Wage), log(Manufacturing Price Index), log(Service Price Index), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table C.1. Migration and Decomposed Real Wage by Sector (*Continued*)

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	Sector 10 (1)	Sector 11 (2)	Sector 12 (3)	Sector 13 (4)	Sector 14 (5)	Sector 15 (6)	Sector 16 (7)	Sector 17 (8)	Sector 18 (9)	Sector 19 (10)
log(Nominal Wage)	1.240*** (0.162)	0.844*** (0.126)	1.352*** (0.154)	-0.147 (0.312)	0.585* (0.320)	0.809*** (0.139)	1.301*** (0.180)	0.616*** (0.168)	0.406** (0.165)	0.892*** (0.164)
log(Manufacturing Price Index)	0.119 (0.084)	0.006 (0.071)	-0.058 (0.082)	-0.045 (0.083)	-0.029 (0.089)	-0.216** (0.087)	0.169* (0.088)	-0.131 (0.091)	-0.016 (0.070)	0.150*** (0.076)
log(Service Price Index)	-0.161*** (0.020)	-0.215*** (0.019)	-0.224*** (0.021)	-0.199*** (0.019)	-0.188*** (0.019)	-0.208*** (0.019)	-0.198*** (0.020)	-0.224*** (0.021)	-0.137*** (0.018)	-0.266*** (0.019)
log(Urban Density)	-0.113 (0.098)	-0.065 (0.079)	-0.366*** (0.095)	-0.057 (0.079)	-0.117 (0.078)	-0.272*** (0.083)	-0.274*** (0.095)	-0.316*** (0.097)	0.059 (0.080)	-0.180** (0.089)
U.S. Border State Dummy	-0.110 (0.079)	-0.050 (0.073)	0.230*** (0.089)	0.020 (0.074)	0.132* (0.080)	-0.204** (0.081)	-0.142 (0.089)	0.039 (0.093)	-0.031 (0.073)	0.223*** (0.082)
log(Distance)	-0.532*** (0.040)	-0.705*** (0.039)	-0.668*** (0.046)	-0.890*** (0.038)	-0.765*** (0.041)	-0.644*** (0.041)	-0.742*** (0.048)	-0.970*** (0.050)	-0.593*** (0.038)	-0.681*** (0.044)
log(Unemployment Rate)	0.055 (0.078)	0.081 (0.065)	0.313*** (0.076)	0.002 (0.067)	0.120* (0.071)	-0.001 (0.068)	0.128 (0.079)	0.264*** (0.082)	0.145** (0.061)	0.056 (0.081)
Number of Observations	680	907	873	970	948	806	964	974	989	925
Adjusted R^2	0.379	0.420	0.467	0.413	0.362	0.350	0.331	0.394	0.265	0.421

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Nominal Wage), log(Manufacturing Price Index), log(Service Price Index), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table D.1. Migration and Real Wage by Sector

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	All Sectors (1)	Sector 1 (2)	Sector 2 (3)	Sector 3 (4)	Sector 4 (5)	Sector 5 (6)	Sector 6 (7)	Sector 7 (8)	Sector 8 (9)	Sector 9 (10)
log(Real Wage)	0.596*** (0.066)	-0.063 (0.089)	-0.328*** (0.094)	0.579*** (0.071)	0.522*** (0.074)	0.949*** (0.075)	0.752*** (0.066)	0.622*** (0.071)	0.867*** (0.064)	0.973*** (0.061)
log(Urban Density)	-0.340*** (0.076)	-0.116 (0.103)	0.144 (0.114)	-0.380*** (0.089)	-0.468*** (0.086)	-0.568*** (0.092)	-0.535*** (0.078)	-0.215*** (0.081)	-0.297*** (0.074)	-0.546*** (0.079)
U.S. Border State Dummy	0.295*** (0.083)	0.036 (0.123)	0.245** (0.111)	0.177** (0.081)	0.187** (0.094)	0.879*** (0.102)	0.072 (0.082)	0.035 (0.089)	0.321*** (0.077)	0.147* (0.075)
log(Distance)	-0.748*** (0.045)	-0.777*** (0.068)	-0.384*** (0.061)	-0.667*** (0.044)	-0.760*** (0.051)	-0.785*** (0.055)	-0.880*** (0.044)	-0.764*** (0.047)	-0.658*** (0.041)	-0.683*** (0.039)
log(Unemployment Rate)	-0.022 (0.074)	-0.595*** (0.113)	0.188** (0.095)	0.007 (0.062)	0.008 (0.080)	0.122 (0.080)	0.002 (0.064)	0.047 (0.070)	0.020 (0.057)	-0.067 (0.063)
Number of Observations	992	937	710	652	977	984	990	943	789	796
Adjusted R ²	0.321	0.166	0.073	0.362	0.247	0.423	0.379	0.296	0.444	0.470

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Real Wage), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.

Table D.1. Migration and Real Wage by Sector (Continued)

Variables	Dependent Variable: log(Migrants-to-stayers ratio)									
	Sector 10 (1)	Sector 11 (2)	Sector 12 (3)	Sector 13 (4)	Sector 14 (5)	Sector 15 (6)	Sector 16 (7)	Sector 17 (8)	Sector 18 (9)	Sector 19 (10)
log(Real Wage)	0.590*** (0.066)	0.719*** (0.059)	0.896*** (0.064)	0.669*** (0.069)	0.632*** (0.072)	0.823*** (0.066)	0.648*** (0.076)	0.801*** (0.077)	0.437*** (0.064)	0.755*** (0.068)
log(Urban Density)	-0.410*** (0.082)	-0.303*** (0.072)	-0.681*** (0.084)	-0.197*** (0.075)	-0.298*** (0.074)	-0.416*** (0.071)	-0.700*** (0.084)	-0.466*** (0.085)	-0.059 (0.075)	-0.471*** (0.085)
U.S. Border State Dummy	0.094 (0.079)	0.104 (0.071)	0.414*** (0.087)	0.044 (0.072)	0.244*** (0.078)	-0.121 (0.079)	0.117 (0.090)	0.129 (0.092)	0.055 (0.071)	0.479*** (0.084)
log(Distance)	-0.527*** (0.042)	-0.705*** (0.040)	-0.663*** (0.047)	-0.889*** (0.038)	-0.767*** (0.041)	-0.642*** (0.042)	-0.741*** (0.050)	-0.971*** (0.050)	-0.594*** (0.038)	-0.682*** (0.046)
log(Unemployment Rate)	0.122* (0.072)	0.035 (0.062)	0.316*** (0.072)	-0.118** (0.057)	0.059 (0.061)	-0.046 (0.064)	0.110 (0.076)	0.177** (0.076)	0.104* (0.059)	-0.012 (0.073)
Number of Observations	680	907	873	970	948	806	964	974	989	925
Adjusted R ²	0.327	0.390	0.439	0.398	0.345	0.340	0.278	0.383	0.254	0.371

Note: Heteroskedasticity-robust standard errors are in parentheses. * denotes statistical significance at the 10 % level, ** at the 5 % level, and *** at the 1 % level. For log(Real Wage), log(Urban Density), and log(Unemployment Rate), the differences between the destination and origin states are taken. For the U.S. Border State Dummy, the corresponding difference between the destination and origin states is used. Sector 1 Agriculture, Livestock, Forestry, Fishing and Hunting. Sector 2 Mining. Sector 3 Electricity and Water Supply. Sector 4 Construction. Sector 5 Manufacturing. Sector 6 Retail and Wholesale Trade. Sector 7 Transportation, Postal Services and Warehousing. Sector 8 Information. Sector 9 Finance and Insurance. Sector 10 Real Estate and Rental and Leasing. Sector 11 Professional Services. Sector 12 Administrative and Support. Sector 13 Educational Services. Sector 14 Health Care and Social Assistance. Sector 15 Arts and Entertainment. Sector 16 Accommodation and Restaurants. Sector 17 Other Services (except Government Activities). Sector 18 Government Activities. Sector 19 No Specified.