Spatial Development and Mobility Frictions in Latin America: Theory-Based Empirical Evidence

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Abstract

Using fine-grained spatial data and a dynamic spatial general equilibrium model, this paper assesses the magnitude of mobility frictions in Latin America as well as the effects of their reduction on spatial development in the region. The results suggest that in most Latin American countries, migration frictions calibrated based on spatially differentiated initial utility are on average smaller and less dispersed than those obtained assuming uniform within-country initial utility. A reduction in trade costs due to optimal investments in road infrastructure in most Latin American countries increases the present discounted value of real per capita income on average in the region by 15.1 percent. This effect is larger than the effects obtained with static quantitative trade models because of substantial dynamic gains. By contrast, a reduction in migration entry costs in the most productive and more populous locations in the Latin American countries has a negligible effect on the present discounted value of the region's real per capita income, reflecting the relatively small dispersion in domestic migration frictions and their relatively low levels in top locations. In both counterfactuals, the welfare increases are significantly larger than the increases in real per capita output because the reductions in mobility frictions allow people to relocate to areas with better amenities and therefore derive higher utility. These results suggest that trade costs, not migration barriers, represent a major constraint to the efficient spatial distribution of economic activity and growth in Latin America.

Keywords: economic geography, Latin America, mobility frictions, trade costs, migration frictions, quantitative trade models

JEL Codes: F11, F22, F43, O10, O40, O54, R42

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1. Introduction

What is the effect of mobility frictions in the form of transportation costs and barriers to migration on the long-term spatial development in Latin America? Which type of mobility frictions – trade costs or migration entry barriers – represent a bigger obstacle to the efficient spatial allocation of economic activity and growth in the region? Mobility frictions play an important role in understanding spatial differences in income because they affect the distribution of economic activity and people and therefore the productivity differences within and across countries and their changes over time. Trade costs stand for transportation costs, which reflect the geography of locations, the condition and availability of infrastructure networks for different modes of transportation, and the cost of different modes of transportation.[1] Migration entry costs include information and psychological costs, the cost of getting to a location and settling there, and any legal migration restrictions. A mix of policies and external shocks influence mobility frictions. Trade costs respond to changes in infrastructure and transportation policies, technological improvements in transportation services, telecommunications shocks, as well as shocks to commodity prices and other sectors of the economy. Migration entry costs are influenced by immigration policies, information campaigns, urban planning, public service provision, credit markets, and shocks related to natural and man-made disasters.

Since cross-border migration frictions are greater than those within countries, productivity convergence is expected to be faster within rather than across countries. However, even within countries, productivity differences across regions may persist or increase with time. In a fully integrated economy, divergence in regional productivity may occur due to the concentration of economic activity and people in high-productivity agglomerations, where firms benefit from sharing, matching, and learning and larger markets, and workers earn higher real wages. From an economic efficiency perspective, such a market-driven productivity divergence is not a cause for concern as it corresponds to an efficient spatial allocation of resources within the economy. Yet, when persistently high mobility frictions slow down progress toward convergence or adjustment to shocks (e.g. trade liberalization, economic crises), economic growth suffers, political instability rises, and policy interventions that can speed up economic adjustment and growth may be warranted.

[1] As in Desmet et al. (2018) trade costs do not include cross-border trade policy measures such as tariff and non-tariff barriers.

In Latin America, the process of catching up to the standards of living in advanced economies has been a slow one. In 2017, Latin America's real per capita income was only about a quarter of the one in the US, compared to a fifth in 1960 (Cavallo and Powell, 2018). Spatial convergence of mean household incomes between the mid-1990s and mid-2000s was also slow (Modrego and Berdegue, 2015). Unsurprisingly, within-country spatial inequality remained high in most Latin American countries (Acemoglu and Dell, 2010). Using census data mostly from the 2000s, Acemoglu and Dell (2010) show that the between-municipality differences in labor income within countries were twice the size of the between-country differences within Latin America. They attribute these differences to differences in human capital and inequality in proximity to paved roads. In a series of studies on Peru, Escobal and Torrero (2005) also empirically connect poor local road infrastructure to higher transaction costs, lower market participation, and reduced household income.

This regional context elevates the importance and policy relevance of the questions posed in the opening paragraph of this paper. To answer these questions, we adopt the state-of-the-art dynamic global spatial general equilibrium framework of Desmet, Nagy, and Rossi-Hansberg (2018). It is well-suited for the task at hand as it differentiates the effects of mobility frictions from those of other forces that shape the spatial patterns of economic activity and welfare in a dynamic, global context. It also offers a way of estimating the mobility frictions and tracing the effect of changes in these frictions on economic activity in the long run. We follow Desmet et al. (2018), who identify trade frictions with transportation costs, and Allen and Arkolakis (2014), who compute bilateral transportation costs using a least-cost route algorithm between any two cells. This way the costs reflect the geography of locations, the availability of different types of connectivity infrastructure, and the prices of different transportation service modes. Migration frictions capture moving costs into and out of a location due to multiple factors, including institutional restrictions, imperfect information, moving costs, and social norms or idiosyncratic preferences for a given location. Desmet et al. (2018) estimate the cost of moving in and out of each location in 2000 using initial technology, amenities, and utility as well as the change in population between 2000 and 2005. Then, they identify migration costs between two locations as the product of an origin- and a destination-specific cost. They proxy initial utility in all locations in each country with the average Cantril Ladder score available for the country from the Gallup World Poll.[2] Thus, if productivity increases due to innovation in a high initial utility location,

[2] Desmet et al. (2018) assume uniform utility within countries only in the initial period. After the initial period, utility varies both across and within countries.

but population does not increase much in the same location, the location must be a hard place to move to. By contrast, if there is only a small decline in population in a low initial utility location, the place may be difficult to leave for any of the reasons mentioned above. By proxying initial utility in all locations within a country with the average country-wide subjective well-being (SWB) score, Desmet et al. (2018) assume that population changes in the location can be attributed either to differences in initial technology or fundamental amenities. In such a model, a situation of lower real wages in a location with similar population density to other parts of the country will be explained with much better fundamental amenities, when in fact people may have lower initial welfare and may not be able to leave the location due to institutional restrictions on their mobility or other reasons, including idiosyncratic preferences.

The assumption of uniform initial utility within countries is appropriate in smaller or advanced economies, where spatial convergence of welfare might hold. However, in many developing countries this may not be the case. Regional differences in welfare may be substantial, when proxied by differences in self-reported well-being (Burger, Hendriks, and Ianchovichina, 2021) or when proxied with differences in per capita consumption (Gollin, Kirchberger, and Lagakos, 2017). These differences in welfare might reflect higher mobility frictions in these developing economies (Bryan and Morten, 2019), differences in non-monetary amenities (Gollin, Kirchberger, and Lagakos, 2017), or idiosyncratic preferences for living in a certain place (Chauvin, Glaeser, Ma, and Tobio, 2017). In line with this evidence, one of the contributions of this paper is that we relax the assumption of uniform initial utility in the case of the Latin American countries. Using geo-coded data on subjective well-being, which we obtain from multiple survey rounds of the Gallup World Poll and Latinobarómetro, we compute the average subnational (level-1 administrative region) subjective well-being scores in each large Latin American country and assign the same initial utility only to locations within the same subnational region. This way domestic migration costs between any two locations in different subnational level-1 administrative regions could be different not only due to differences in initial technology or amenities, but also to different initial welfare levels. Then, a small change in population in a location with low initial utility relative to other parts of the country can be correctly attributed to migration frictions restricting the movement of people out of this location rather than with good fundamental amenities in the location.

This modification allows us to assess more precisely the size of domestic migration frictions circa 2000. Our results suggest that in most Latin American countries the adjusted migration entry costs are substantially lower and less dispersed than the ones calibrated using uniform initial utility; this is particularly the case in Bolivia, Guatemala, the República Bolivariana de Venezuela, and Chile (Desmet et al. 2018). International comparisons suggest that the adjusted migration frictions are also smaller on average in Latin America than those in advanced economies, but this is not the case for trade frictions.

We also perform two counterfactuals which allow us to investigate the relative importance of trade and migration frictions for economic growth in Latin America. We show that a reduction in trade costs due to the optimal expansions in the domestic road networks in most Latin American countries (obtained from Gorten and Ianchovichina (2021)) increases the present discounted value of real per capita income in the region on average by 15.1%, but the results vary by country. The magnitude of this effect is much larger than the one obtained with static quantitative trade models, including the one reported in Gorton and Ianchovichina (2021), because of substantial dynamic gains. The results from this counterfactual also indicate that the optimal reductions in trade costs tend to stimulate the economic development of the relatively more populous and productive locations in the Latin American economies in the long run. By contrast, a reduction in migration entry costs in such top locations has no effect on the present discounted value of the region's real per capita income, reflecting the relatively low migration entry costs in these locations. In both counterfactuals, the welfare increases are significantly larger than the increases in real per capita output because the reductions in both types of mobility frictions allow people to relocate to locations with better amenities and therefore derive higher utility. These results suggest that trade costs, not migration frictions, represent a major constraint to the efficient distribution of economic activity and growth in Latin America.

The paper is structured as follows. Section 2 provides an overview of the main features of the dynamic spatial general equilibrium framework of Desmet *et al.* (2018), the data, and parameter calibration. Section 3 discusses the additional data on subjective well-being, the procedure used to relax the assumption of spatially uniform initial utility, and the adjusted migration frictions in the Latin American countries. We also compare the adjusted and non-adjusted entry costs to gauge the value added of the modification. Section 4 presents international comparisons of the migration and trade frictions in Latin America with those in select advanced and emerging economies, which we consider appropriate comparators for Latin America. In Section 5 we discuss the results from two counterfactual simulations. The first counterfactual explores the effect of reduced trade costs due to optimal expansions of domestic road infrastructure networks in the Latin American countries. The second counterfactual examines the effect of reduced migration entry costs in the more productive and populous locations in the countries in Latin America. Section 6 summarizes the results and discusses a few caveats.

2. Theoretical Framework

This section briefly describes the main elements of the dynamic spatial development framework developed by Desmet et al. (2018) and the calibration procedure for the mobility frictions.

2.1 The dynamic global spatial model

The model represents the world as a two-dimensional space consisting of a continuum of locations, which can be differentiated based on geography, amenities, and productivity. In each location, firms decide how much to produce and invest in innovation, which increases productivity locally and of nearby locations through spatial diffusion. Consumers decide how much to consume and where to live. Trade and migration frictions generate agglomeration and congestion forces, whose interactions determine the equilibrium spatial distribution of the economic activity in each time period.

Assuming the economy occupies a surface *S*, each location *r* has land density *H(r)* > 0 and initial population of workers, $\overline{L_0}(r)$. In each period *t*, consumers derive utility from local amenities, $a_t(r)$, and the consumption, y_t, of a set of differentiated varieties of a representative good, modeled as a CES aggregate.[3] Consumers cannot borrow or save so in each period they have to consume all of their income, derived from wages and rents from local ownership of land.[4] Thus, the utility of a consumer *i* who chooses to live in location *r* in period *t* is given by:

$$u_t^i(\bar{r}, r) = a_t(r) \times y_t(r) \times \varepsilon_t^i(r) \times \bar{m}(\bar{r}, r)^{-1},$$

where $\bar{r} = (r_0, \ldots, r_{t-1})$ stands for the history of locations where the agent lived prior to period *t*, and $\bar{m}(\bar{r}, r) = \prod_{s=1}^{t} m(r_{s-1}, r_s)$ are the migration costs cumulatively incurred based on all past choices $\bar{r}$ and the current location *r*. The local amenities of location *r*, $a_t(r) = \bar{a}(r)\bar{L}_t(r)^{-\lambda}$, depend on the fundamental and exogenous level of amenities in *r*, $\bar{a}(r)$, and the parameter driving the negative

[3] Agents have homogeneous preferences for consumption. Thus, their equilibrium choices are such that local consumption equals local real income. See Section 2.1 of Desmet et al. (2018) for details.
[4] Rents are distributed uniformly across a location's residents.

externalities to population density, $\lambda > 0$. When choosing where to live, agents draw the stochastic taste shock $\varepsilon_t^i(r)$, distributed according to a Fréchet distribution such that:

$$P\left(\varepsilon_t^i(r) < z\right) = e^{-z^{-1/\Omega}}.$$

The parameter Ω determines the heterogeneity of agents' preference on where to live and the intensity of congestion forces in the economy. The higher Ω is, the higher are the frictions to mobility of agents across *S*. Finally, the bilateral moving cost between two locations *s* and *r*, $m(s, r)$, can be decomposed into an origin ($m_1(s)$) and a destination-specific component ($m_2(r)$):

$$m(s, r) = m_1(s)m_2(r).$$

where $m(r, r) = 1$ for all $r \in S$ since the model assumes no migration frictions within a location. These assumptions enable the decomposition of the utility penalties of leaving or entering a location in such a way that only the entry barriers $m_2(r)$ matter for the optimal location choice.[5] In this setup, an individual's location choice depends only on current variables.

Given the distributional assumptions on the taste shock, the total population in location *r* at time *t* has the following closed-form solution:

$$H(r)\bar{L}_t(r) = \frac{u_t(r)^{1/\Omega} m_2(r)^{-1/\Omega}}{\int_S u_t(v)^{1/\Omega} m_2(v)^{-1/\Omega} dv} \bar{L} \qquad (1)$$

where $u_t(r) = a_t(r)y_t(r)$. Equation (1) shows that locations with higher real income and/or amenities are preferred by consumers, while locations with higher entry barriers $m_2(r)$ are less appealing to agents. The parameter Ω drives the extent to which population choices react to changes in these two factors.

In each location, *r*, firms produce a good $\omega \in [0,1]$ using land and labor so that for a unit of land production of good ω in location *r* at period *t* takes the format:

$$q_t^\omega(r) = \phi_t^\omega(r)^{\gamma_1} z_t^\omega(r) L_t^\omega(r)^\mu.$$

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[5] The intuition behind it is that the $m_1(r)$ costs are somehow "refunded" upon the decision on where to live. It implies that Desmet et al. (2018) focus on net, rather than gross, migration flows and utility changes. See Assumption 1 of the mentioned reference for details.

The firm's productivity depends on a local, variety-specific productivity shifter, $z_t^\omega(r)$,[6] as well as an innovation parameter, $\phi_t^\omega(r)$. The latter requires firms to employ $\nu\phi_t^\omega(r)^\xi$ additional units of labor, where ξ is a parameter. Thus, the production decisions of firms will implicitly contain innovation decisions, which will drive the dynamics of local and aggregate growth. Moreover, the productivity shifter takes the format of an i.i.d. (across goods and time) draw from a Fréchet distribution with cumulative distribution:

$$F(z, r) = e^{-T_t(r)z^{-\theta}},$$

where $T_t(r) = \tau_t(r)\bar{L}_t(r)^\alpha$, $\alpha \geq 0$, $\theta > 0$, and $\tau_0(.)$ are exoneously given. Therefore, local productivity at any point in time is partially driven by agglomeration economies (determined by the parameter α) and by $\tau_t(r)$. The latter is an endogenous dynamic process that depends on local innovation and the diffusion of innovation to nearby locations.[7] In each unit of land a continuum of firms compete in prices. Since the firms are similar over small units of land, locally firms face perfect competition.

The solution for the static profit maximization of the firm[8] will be such that the shipping price of variety ω produced in *r* and consumed in *s* is proportional to the marginal cost of production at *r* and the trade costs between the two locations:

$$p_t^\omega(s, r) = \frac{mc_t(r)\zeta(s, r)}{z_t^\omega(r)},$$

where $mc_t(r)$ is the marginal cost of producing ω at *r* and $\zeta(s, r)$ is the trade costs between *r* and *s*. The bilateral structure of production (existence of trade) allows us to obtain the export probabilities between two locations *r* and *s*, $\pi_t(s, r)$, in the fashion of Eaton and Kortum (2002):

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[6] The model assumes that across locations r the variety-specific productivity shifters, $z_t^\omega(r)$, are spatially correlated, with the correlation increasing and becoming perfect as the distance between locations goes down to zero, while for sufficiently distant pairs the draws become independent.

[7] In particular, $\tau_t(r) = \phi_{t-1}^\omega(r)^{\theta\gamma_1}\left(\int_S \eta\tau_{t-1}(s)ds\right)^{1-\gamma_2}\tau_{t-1}(r)^{\gamma_2}$. Parameters γ_1 and γ_2 belong to the interval [0,1]. If $\gamma_1 < 1$, the distribution of productivity draws is shifted up by past innovations with decreasing returns. If $\gamma_2 < 1$, the dynamic evolution of a location's technology also depends on the aggregate level of technology. Convergence is ensured when both parameters are less than one since then there are local decreasing returns to scale but economywide linear technological progress.

[8] Desmet et al. (2018) show that when firms face local perfect competition, they bid the land price up to the point at which they make zero profits after paying for their investment in innovation. This implies that current innovation decisions do not affect future profits -- as they will also be zero. Therefore, the solution to the dynamic innovation problem becomes a sequence of static innovation decisions that maximizes static profits.

$$\pi_t(s,r) = \frac{T_t(r)[mc_t(r)\zeta(s,r)]^{-\theta}}{\int_S T_t(u)[mc_t(u)\zeta(s,u)]^{-\theta} du}.$$

Finally, in the absence of credit markets, trade is balanced location by location, so that local nominal income equals total expenditure from all locations *s* on goods produced in a location *r*. Formally, that implies:

$$w_t(r)H_t(r)\bar{L_t}(r) = \int_S \pi_t(s,r)w_t(s)H_t(s)\bar{L_t}(s)ds \qquad (2)$$

where $w_t(r)$ and $w_t(r)H_t(r)\bar{L_t}(r)$ stand for the nominal wages and income in location *r*, respectively. Desmet et al. (2018) show that a dynamic equilibrium of the economy exists and is a sequence of static equilibria where, in each time period *t*, markets for goods and labor clear. That requires equations (1) and (2) to simultaneously hold in each period *t*.

2.2 *Data and parameter calibration: Quantifying spatial frictions*

A path-breaking contribution of the presented framework is its ability to quantify spatial frictions in the world economy using real world data. In this application, the Earth's surface is divided into about 17,000 $1° \times 1°$ grid cells. By using global data at this unit of disaggregation for several characteristics, one can use the model's structure to back out several parameters of the model, including the two mobility parameters of key importance to our investigation – the trade frictions, $\zeta(s,r)$, and the migration entry costs, $m_2(r)$. In what follows, we explain the conceptual idea behind the estimation of the mobility frictions in Desmet et al. (2018).

Trade costs, $\zeta(s,r)$, are estimated using a rich transportation infrastructure data covering the entire Earth's surface and capturing different modal types of transportation as well as geographical characteristics. Combined with the Fast-Marching algorithm in Allen and Arkolakis (2014), these data allow us to estimate a bilateral matrix, $\zeta(s,r)$, containing about 300 million entries for *s*-*r* location pairs (17,000x17,000). We estimate trade frictions only for 2000, because the sources of transportation and geographic data are only available for that year.

Migration entry costs, $m_2(r)$, are quantified for each location *r* using a calibration strategy. It starts with the estimation of the fundamental amenities ($\bar{a}(r)$) to initial level of utility ($u_0(r)$) ratio ($\bar{a}(r)/u_0(r)$) for each location *r* of the model in a way that allows the model-implied economic activity and population to exactly match the spatial distribution of the economic activity and population worldwide for the year 2000.

Table 1. Parameter values and trade costs

Parameter	Value	Source / Comment
Internally calibrated		
Discount factor	0.965	
Relation between amenities and population (λ)	0.32	
Relation between population distribution and growth (γ_1)	0.319	
Relation between population distribution and growth (γ_2)	0.993	
Parameter calibrated to match the elasticity of trade flows with respect to distance of -0.93 ($\boldsymbol{\Upsilon}$)	0.393	The elasticity of -0.93 calibrated by Head and Mayer (2014)
Trade costs ($\zeta(s,r)$)		Estimated matrix for 17,000 x 17,000 location pairs
Externally calibrated		
CES elasticity of substitution among differentiated varieties of a represented consumption good ($\boldsymbol{\rho}$)	4	Bernard et al. (2003)
Elasticity of migration flows with respect to income (Ω)	0.5	Monte et al. (2018)
Relation between subjective well-being and utility in the model (ψ)	1.8	Deaton and Stone (2013)
Static elasticity of productivity to density (α)	0.06	Carlino et al. (2007)
Trade elasticity (θ)	6.5	Eaton & Kortum (2002); Simonovska & Waugh (2014)
Nonland share of production	0.8	Greenwood et al. (1997); Desmet & Rappaport (2017)
Parameter (ξ)	0.125	Desmet & Rossi-Hansberg (2015)
Modes of travel parameters: Rail	0.1434	Allen and Arkolakis (2014)
Modes of travel parameters: No Rail	0.4302	Allen and Arkolakis (2014)
Modes of travel parameters: Major Road	0.5636	Allen and Arkolakis (2014)
Modes of travel parameters: Other Road	1.1272	Allen and Arkolakis (2014)
Modes of travel parameters: No Road	1.9726	Allen and Arkolakis (2014)
Modes of travel parameters: Water/No Water	0.0779	Allen and Arkolakis (2014)

The main source for these data is the G-Econ data set (Nordhaus et al., 2006), which provides gridded GDP and population data covering the entire globe. Desmet et al. (2018) use the Gallup World Poll

(GWP) average subjective well-being (SWB) Cantril's Ladder scores circa 2000,[9] at the country level, to obtain the initial level of well-being $u_0(r)$ and separately identify the fundamental amenities $\bar{a}(r)$. Subsequently, the model is simulated one period forward; the estimated migration frictions $m_2(r)$ are the values such that the model-implied population distribution for the subsequent year matches the one observed in the data. To convert the ordinal SWB scores into cardinal values, Desmet et al. (2018) show that for a given time period t, the following relationship holds: $u_t^i(r) = e^{\psi SWB_t^i(r)}$, where ψ is the inverse of the estimated coefficient on the log of real income in a cross-country regression of SWB of an individual *i* residing in location *r* on the log of their real income (Deaton and Stone, 2013; Kahneman and Deaton, 2010).[10] Table 1 presents the values of all internally and externally calibrated parameters along with their sources.

3. Migration frictions: Adjusting for spatial variation in initial utility in Latin America

When calibrating the migration frictions, Desmet et al. (2018) assume that the initial level of well-being $u_0(r)$ is the same in all geolocations within a country. This assumption might be appropriate in the case of advanced economies, but not necessarily in the case of developing countries (Burger et al., 2021; Bryan and Morten, 2019; Chauvin, Glaeser, Ma, and Tobio, 2017). Hence, we relax the assumption of uniform initial level of utility in Latin America. Using geo-coded data on subjective well-being from several survey rounds of the Gallup World Poll (GWP) and Latinobarómetro, we first compute the average subjective well-being scores for different subnational (level-1) administrative regions in each LAC country.[11] We then estimate a set of adjusted fundamental amenities and migration frictions in locations across Latin America. In the next section, we provide details on the quantification methodology for the baseline period of 2000.

[9] The Cantril's Ladder is an ordinal scale indicating how an individual rates their own life. The scores vary from 0 for their worst possible life to 10 for their best possible life. Although the benchmarks for worst and/or best possible life might vary across individuals, regions, and countries, Desmet et al. (2018) abstract from such potential differences in the benchmarks based on the finding by Deaton and Stone (2013) and Stevenson and Wolfers (2013) of a relationship between subjective well-being (SWB) and the log of real income that is similar within the U.S. as well as across countries.

[10] The inclusion of a location fixed effect in the estimation of the linear relationship between SWB and log of real income addresses endogeneity concerns that a location with a higher utility attracts more people and affects the amenity levels in the location.

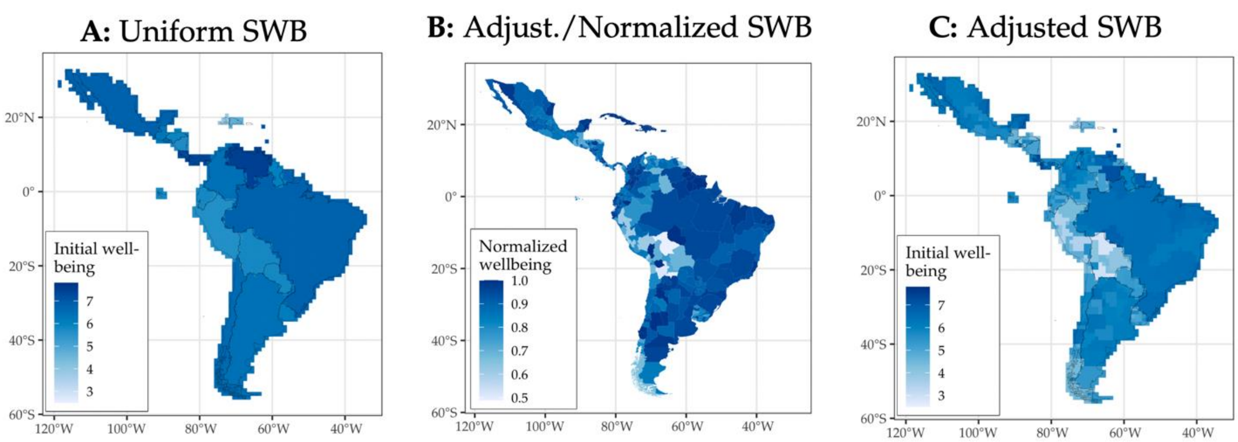
[11] The details of this procedure, as well as its geographical coverage, are provided in the Data Appendix.

3.1 *Geo-coded subnational subjective well-being data for Latin America*

First, we geo-code hundreds of locations using information from several waves of the Gallup World Poll and Latinobarómetro and match them to administrative 1 (adm1) geographical units.[12] We then calculate the average well-being within adm1 units and normalize it within countries. That provides a scale from zero to one that we use to compute the initial level of utility for adm1 geographical units based on the country-level well-being data originally used in Desmet et al. (2018).

The results from these adjustments are shown in Figure 1. In Panel A we plot the country-level well-being data originally used by Desmet et al. (2018), while in Panel B we show the within-country subjective well-being calculated by matching the data from Latinobarómetro and the Gallup World Pall to adm1 geographical units (normalized within countries). Panel C shows the adjusted well-being across Latin America resulting from the interaction of the information in Panel A with the one in Panel B. Compared to Panel A, Panel C shows that our procedure captures better the heterogeneity of subjective well-being within the Latin American countries. Indeed, we see much lower adjusted initial levels of utility than in Desmet et al. (2018) in many areas in Bolivia, Peru, Colombia, the República Bolivariana de Venezuela, and some areas in Chile and Argentina.

Figure 1. Subjective well-being (SWB) by country adjusted with LB and GWP data



Notes: Panel A shows the raw observed subjective well-being data circa 2000 from Desmet et al. (2018); Panel B shows the scale for adjustment obtained with additional data on subjective well-being reflecting its subnational heterogeneity within countries; and Panel C shows the resulting adjusted well-being which is used in the quantification of migration frictions.

[12] Further details on the data collection and assembling are provided in the appendix.

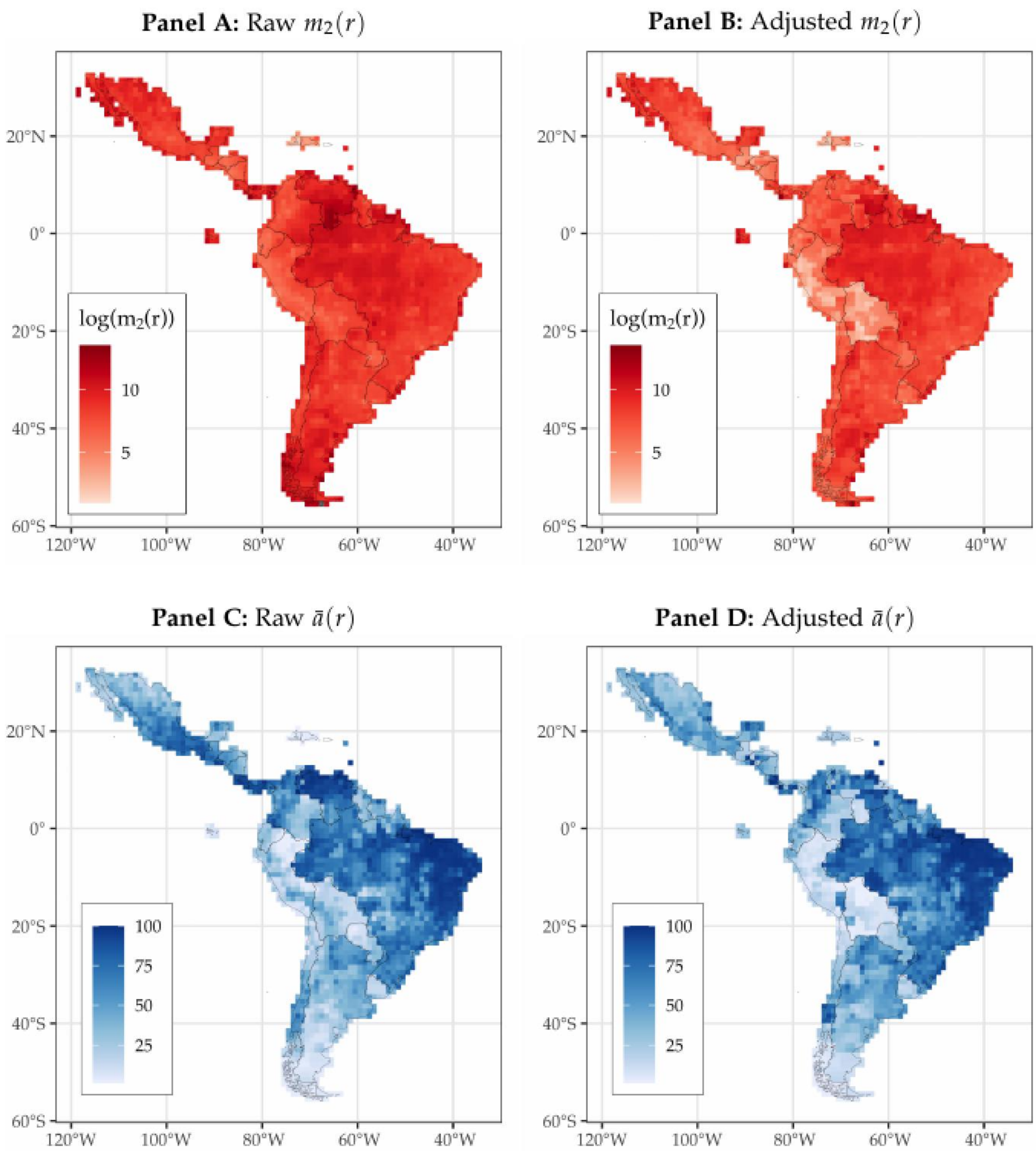
By using this information in the subsequent step of the model calibration, we can improve the precision with which we quantify the migration frictions $m_2(r)$. With uniform initial subjective well-being levels, domestic migration costs between any two locations in different subnational regions can be due only to differences in initial technology or fundamental amenities. With heterogenous initial subjective well-being levels, differences in domestic migration costs can also reflect differences in initial utility. Then, a small change in the population in a location with low subjective well-being relative to other parts of the country can be attributed to domestic frictions restricting the movement of people out of a location with low fundamental amenities. With uniform initial utility, this situation would be explained with good amenities in the location, which imply relatively high entry costs for the location.

3.2 Calibration of adjusted migration costs and comparison with non-adjusted ones

Armed with a more precise measure of initial utility, $u_0(r)$, we proceed by solving for $m_2(r)$ as explained in the previous section. We use $u_0(r)$ to separately identify the fundamental amenities $\bar{a}(r)$ and then find the values of migration frictions that allow the model-predicted population numbers to match the spatial distribution of population in the next period, 2001. In Panel A of Figure 2, we show the "raw" entry costs for locations obtained based on uniform within-country initial utility levels in Desmet et al. (2018). In Panel B, we display our results for the adjusted entry costs, obtained after accounting for the heterogeneity in initial utility.

As expected, the differences between the results displayed in Panel A and Panel B are greatest for the less developed Latin American countries. Poor locations in Peru and Bolivia, but also in Central America, have much lower estimated entry costs $m_2(r)$ than suggested by the "raw" entry costs in Desmet et al. (2018). The intuition for these differences is the following. Many of the poorest locations within these countries were previously assumed to provide an observed well-being as large as in the richer locations of these same countries. Consequently, the model did not find a very high amenity difference between the poor and rich locations, and therefore few incentives for people to move out of the former. When we account for the heterogeneity of well-being within countries, the model "understands" that these locations are less pleasant to live in, and therefore assigns lower fundamental amenities (Panel D) and migration frictions (Panel B) in these locations.

Figure 2. Migration frictions and fundamental amenities



Notes: Panel A shows the migration frictions estimated without accounting for the within-country heterogeneity of well-being. Panel B shows the adjusted values obtained after accounting for within-country heterogeneity of well-being. Panel C shows the raw fundamental amenities, while Panel D plots the adjusted fundamental amenities.

Stated differently, in Panel B we see that the model assigns much higher migration frictions, in relative terms, to the richer locations compared to the poorest, within each country. It understands, therefore, that people do not out-migrate from poorer areas because of higher frictions in richer areas of the country. Indeed, by comparing Panel C to D, we see that by not accurately accounting for the initial value of well-being, quite a few locations in several countries, including the República Bolivariana de Venezuela, Mexico, Panama, Nicaragua, and Bolivia, appear to have very high fundamental amenities (Panel C); yet, after accounting for the within-country variation in well-being, this turns out not to be the case (Panel D).

In line with these results, the adjustment substantially lowers the average level of migration frictions in most countries in the region (see Table 2). The declines are largest in the less developed Bolivia and Guatemala, and in Chile, where there are considerable differences between the adjusted fundamental amenities in the core area of the country – centered on the capital city of Santiago – and the southern and northern ends of the country. Furthermore, the within-country variation in the adjusted migration frictions is highest in Panama, the República Bolivariana de Venezuela, and Chile, indicating the potential for improved economic efficiency through reductions in the dispersion of migration frictions in these countries.

Table 2. Raw and adjusted migration frictions in Latin America

	Raw $m_2(r)$			Adjusted $m_2(r)$			% Change $m_2(r)$	
	Mean	Median	St. Dev.	Mean	Median	St. Dev.	Mean	Median
Argentina	0.084	0.043	0.199	0.037	0.018	0.083	-55.67	-57.51
Bolivia	0.016	0.018	0.009	0.002	0.0003	0.004	-90.86	-98.46
Brazil	0.095	0.067	0.082	0.052	0.036	0.047	-44.93	-46.94
Chile	0.228	0.092	0.710	0.021	0.006	0.102	-90.69	-93.90
Colombia	0.047	0.028	0.048	0.011	0.007	0.011	-75.53	-75.57
Costa Rica	0.071	0.058	0.043	0.020	0.011	0.016	-71.78	-80.58
Dominican Republic	0.001	0.0003	0.003	0.001	0.0003	0.003	–	–
Ecuador	0.041	0.007	0.088	0.038	0.003	0.089	-5.48	-61.30
Guatemala	0.012	0.011	0.010	0.001	0.001	0.001	-91.52	-94.24
Guyana	0.035	0.032	0.017	0.031	0.029	0.017	-10.02	-9.88
Honduras	0.010	0.004	0.011	0.002	0.001	0.002	-83.94	-79.24
Haiti	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	–	–
Mexico	0.078	0.040	0.136	0.033	0.019	0.057	-57.83	-52.43
Nicaragua	0.006	0.004	0.004	0.002	0.001	0.001	-69.04	-66.38
Panama	0.394	0.156	0.757	0.219	0.024	0.775	-44.58	-84.84
Peru	0.012	0.006	0.030	0.004	0.001	0.021	-70.55	-85.74
Paraguay	0.031	0.015	0.039	0.011	0.006	0.013	-64.13	-58.87
El Salvador	0.008	0.008	0.002	0.003	0.003	0.004	-58.10	-58.10
Suriname	0.356	0.279	0.444	0.356	0.279	0.444	–	–
Uruguay	0.015	0.015	0.008	0.004	0.002	0.002	-77.05	-83.84
Venezuela	0.513	0.213	0.744	0.078	0.023	0.124	-84.72	-89.40

Notes: Statistics of migration frictions normalized with respect to average US migration frictions.

4. Mobility frictions: International comparisons

How do migration and trade frictions in Latin America compare to those in other parts of the world? To answer this question, we start by displaying in Table 3 the average migration entry costs by region and country. In 2000, average migration frictions in Latin America were approximately a fifth of the entry costs in the European Union and less than 4% of those in the US in 2000. Yet, entry barriers in Latin America were much higher than in Southeast Asia and China. Furthermore, entry barriers were much higher in Brazil, Suriname, and Panama than the average for the region, and lowest in the least developed Latin American countries such as Bolivia, Guatemala, and Haiti.

Table 3. Average migration frictions by country and region in 2000, relative to the US

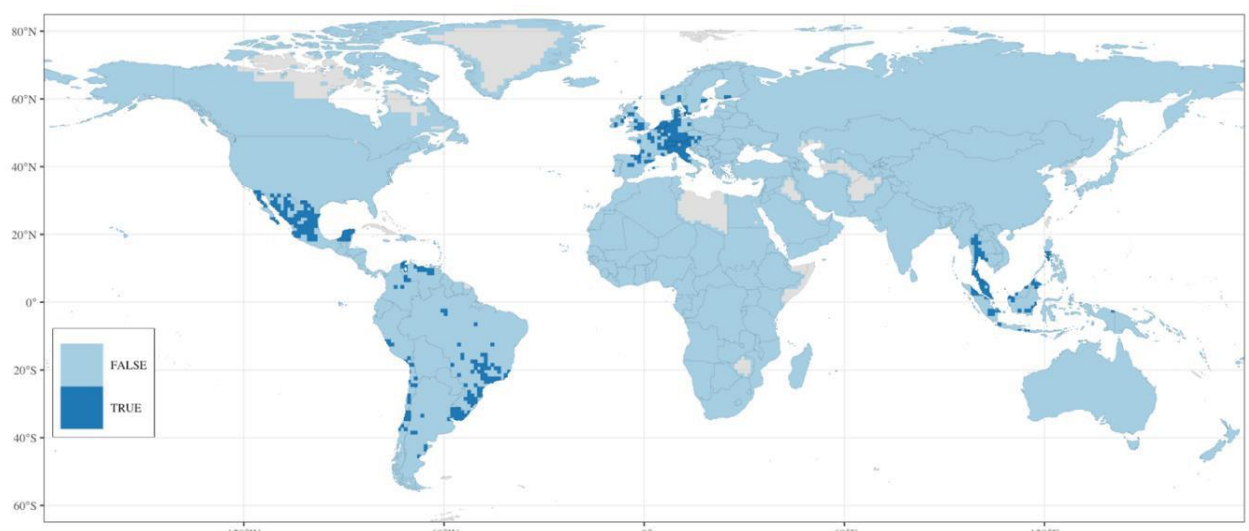
Region/country	Average $m_2(r)$
Panel A: Comparison Region	
European Union	0.222
Southeast Asia	0.007
Latin America	0.039
Panel B: Comparison Countries	
US	1
China	0.003
Panel C: Countries in Latin America and the Caribbean	
Argentina	0.037
Bolivia	0.002
Brazil	0.052
Chile	0.021
Colombia	0.011
Costa Rica	0.02
Dominican Republic	0.001
Ecuador	0.038
Guatemala	0.001
Guyana	0.031
Honduras	0.002
Haiti	0.0001
Mexico	0.033
Nicaragua	0.002
Panama	0.219
Peru	0.004
Paraguay	0.011
El Salvador	0.003
Suriname	0.356
Uruguay	0.004
Venezuela, RB	0.078

Notes: Average migration frictions within countries/regions estimated internally in the model for 2000.

Making international comparisons of bilateral domestic trade costs is not straightforward because countries differ in terms of area size, topography, transportation infrastructure (here we consider all modes of ground transportation), the cost of different modes of transportation, and the spatial distribution of economic activity and population. For example, we expect lower bilateral transportation costs in the European Union than in Latin America, because the former has a smaller area size and more developed transportation infrastructure.

We organize our investigation by focusing on locations that belong to the top quartile of the within-country per capita GDP distribution and whose population is above the country median in Latin America, the European Union, and Southeast Asia (Figure 3). A focus on these more productive and populous locations – which we refer to as top locations – is warranted given the high urbanization rates in most Latin American countries and the importance of good connectivity between such locations for economic growth. As shown in Figure 4, the distribution of bilateral trade costs for shipping goods across top locations in Latin America is skewed to the right and has a much wider range than the corresponding distributions for Southeast Asia and the EU, which are symmetric and overlapping. This suggests that it is much more costly to ship goods between top locations in Latin America than in Southeast Asia and the EU and indicates that the top locations in the EU and Southeast Asia are better connected than the top locations in Latin America (Figure 4, Panel A).

Figure 3. Top locations in LAC, the European Union, and Southeast Asia

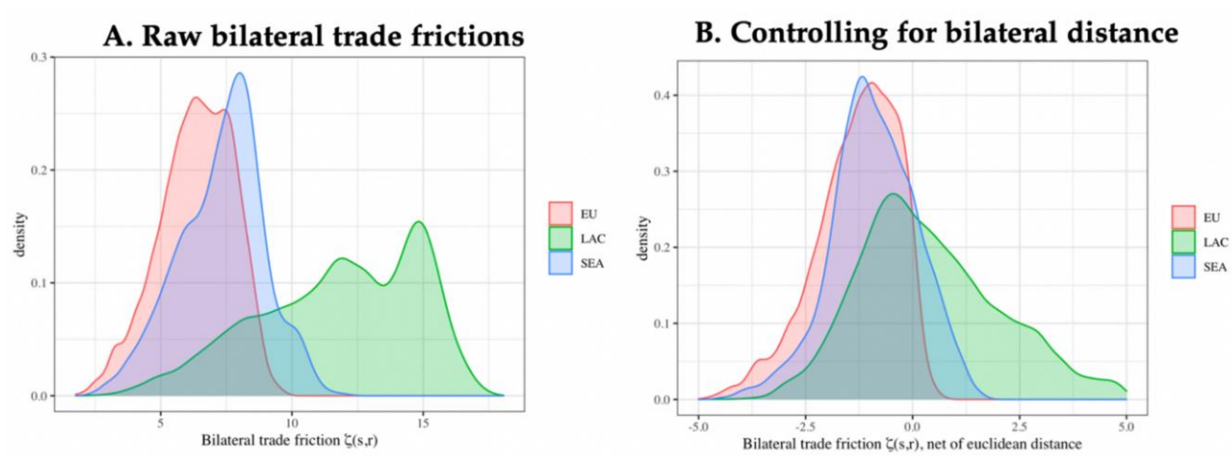


Notes: The map above illustrates in dark blue the top locations (grid cells); these locations belong to the top quartile of the within-region per capita GDP distribution and have population above the region's median population. Data are missing for territories/countries shown in grey. The GDP per capita at the grid cell level is obtained from the G-Econ database.

Since distances between top locations are larger in a larger region like Latin America, in Panel B of Figure 4 we display the distribution of bilateral trade frictions after absorbing the bilateral Euclidean distance between locations. By doing so, we stress the role of transportation infrastructure between equally distant pairs in the regions of interest. In fact, we see that controlling for distance reduces but does not eliminate the cross-regional differences in bilateral trade frictions. Latin America still has many more top locations with higher adjusted bilateral trade costs than either the EU or Southeast Asia, consistent with evidence of poor transportation infrastructure in the region (Pellegrina, 2022; Sotelo, 2020).

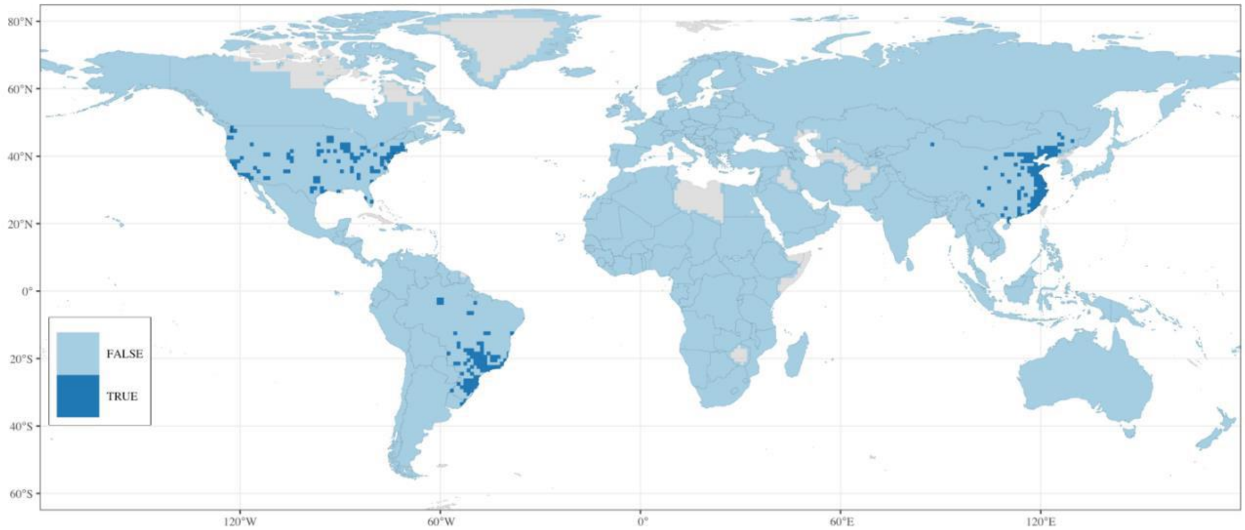
We then narrow our focus to specific countries with large territories, comparing bilateral trade frictions across relatively populous locations in the top quartile of the within-country GDP distributions of Brazil with those across comparable top locations in the US and China (Figure 5). This way we focus on the more productive and populous locations in each of these countries. In Brazil, these are locations along the coast and the South of the country; in the US, these are locations mostly in the Eastern half of the country and on the West Coast; and in China, the top locations are mostly found in the Eastern section of the country.

Figure 4. Distribution of bilateral trade frictions between top locations in Latin America, the European Union, and Southeast Asia



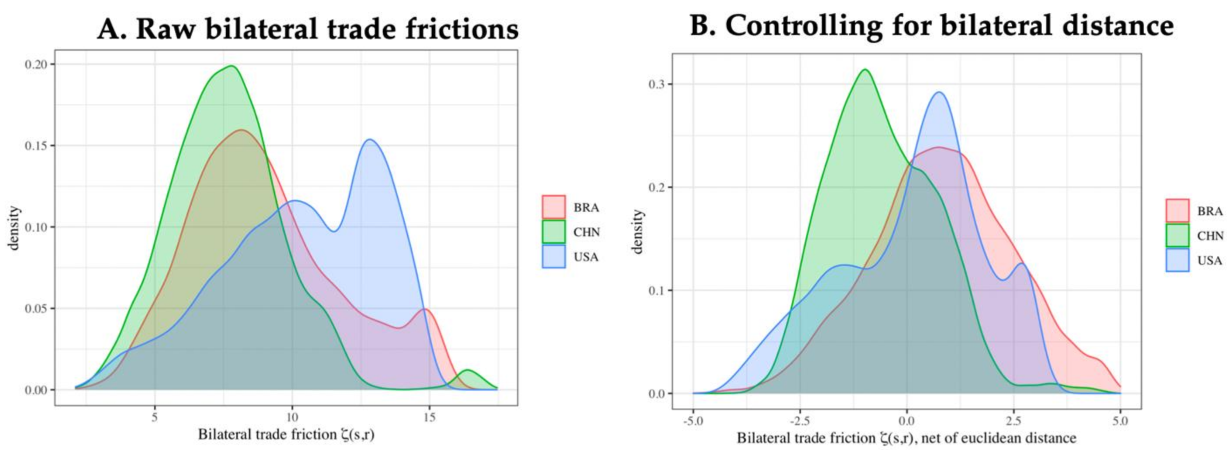
Notes: The two density graphs illustrate the distribution of the bilateral trade frictions between the locations at the top quartile of the within-region per capita GDP distribution and whose population exceeds the median population in the following regions: LAC, EU, and Southeast Asia (the locations are shown in Figure 3). Panel A documents the raw trade frictions; Panel B documents these trade frictions after absorbing the bilateral Euclidean distance between locations.

Figure 5. Top productivity and relatively populous locations in Brazil, USA, and China



Notes: The map above illustrates in dark blue the top locations (grid cells); these locations belong to the top quartile of the within-country per capita GDP distribution and have population above the median population in the respective country. Data are missing for territories/countries marked in grey. The GDP at the grid cell level is obtained from the G-Econ database.

Figure 6. Distribution of bilateral trade frictions between top locations in Brazil, USA, and China.



Notes: The two density graphs illustrate the distribution of the bilateral trade frictions between the top-quartile and more populous locations in Brazil, USA, and China. Panel A documents the raw trade frictions; Panel B documents these trade frictions after absorbing the bilateral Euclidean distance between locations.

Given the need to ship products between top locations on the East and West coasts of the US, it is not surprising that there are many more pairs of top locations with relatively high trade costs in the

US than in Brazil or China where activity in top locations is concentrated in just one-half of the country (Figure 6). However, after adjusting for distance, it appears that there are many more pairs of locations with relatively high trade costs in Brazil compared to the US and China.

5. Effects of reduced mobility frictions on spatial development in Latin America

This section investigates how changes in mobility frictions could affect the evolution of Latin America's spatial development over the next century. We rely again on the spatial dynamic growth model of Desmet et al. (2018) who evaluated the model by running a simulation backwards in time from 2000 to 1870 and comparing the model's predictions on the distribution of population levels in the data. The correlations between the simulated population levels and the actual country-level population data were high: 0.96 until 1950 and around 0.70 before 1900. They also found highly significant correlations between the calculated amenities and commonly used measures of amenities such as temperature, proximity to water, and precipitation. Finally, one of the main predictions of their model – namely that the correlation between density and productivity is higher in areas with higher per capita incomes – was confirmed in the data.

We first establish a baseline in which the model predicts the spatial evolution of Latin America over the next century, assuming no change in mobility frictions. Starting from the calibrated model with data for 2000 and adjusted migration frictions, the equilibrium of the model is obtained by simultaneously solving equations (1) and (2) for a period t as in lemma 3 of Desmet et al. (2018). Within this procedure, given the trade and adjusted migration frictions in 2000, the distribution of local amenities, net of congestion disutility, and productivities reflecting innovation choices and spatial diffusion are updated and used to solve for the equilibrium of the subsequent period, $t+1$. This procedure for solving the dynamic problem as a sequence of static problems is repeated as many periods as needed (in our case 100 times). The baseline captures the evolution of the world economy towards its balanced growth path from 2000 to 2100. The baseline results suggest that LAC's share in global output is projected to mostly stagnate during the next century while its share in global welfare is expected to rise only modestly (Figure 7).

5.1 Reducing trade costs by making optimal investments in domestic road networks

Section 4 provides evidence of relatively high bilateral trade costs in LAC. For this reason, our first counterfactual explores the implications of cuts in these bilateral costs. A reduction in transportation costs could be due to several reasons including improvements in transportation technologies, reduction in fuel costs, and/or improvements in road infrastructure. When focusing on infrastructure improvements, it is unrealistic to design a counterfactual in which transportation costs are reduced in a uniform way across all locations. Most governments have limited fiscal space and implementation capacity for country-wide infrastructure programs. Therefore, we design a counterfactual that quantifies the dynamic gains from reductions in trade frictions due to *optimal* investments in road infrastructure in the LAC countries and projects the economic adjustments to these changes over the subsequent 100 years.

We obtain the geolocations where bilateral trade costs are reduced in an optimal way and the size of these reductions from the work of Gorton and Ianchovichina (2021). They use data from multiple sources and the general equilibrium spatial framework of Fajgelbaum and Schaal (2020) to identify the endogenous change in trade costs due to optimal expansions of the domestic road networks in most Latin American countries. Gorton and Ianchovichina (2021) demonstrate that optimal investments are more likely along road segments linking more productive and populous locations, which in LAC tend to have relatively high bilateral costs, as shown in Section 4. Since these costs $\zeta^n(\mathrm{s,r})$ vary across goods n, we calculate the change in average trade costs from optimal investments along each link (*s*,*r*) as follows:

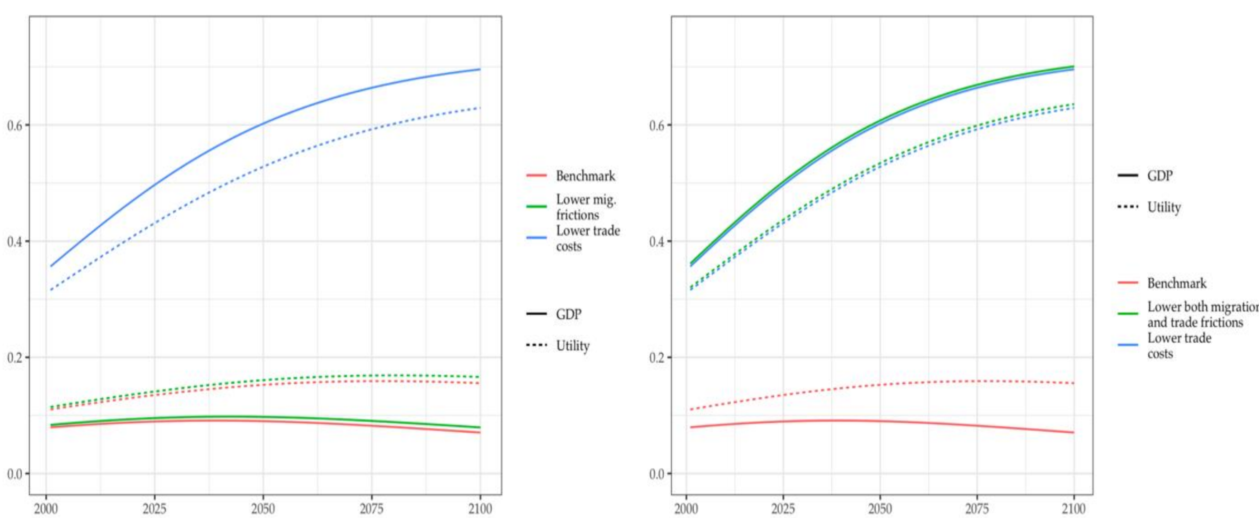
$$\hat{\zeta}(\mathrm{s,r}) = \sum_{n}^{N} \pi^n(s,r)\hat{\zeta}^n(\mathrm{s,r})$$

where N is the number of goods transported in the economy and $\pi^n(s,r)$ is good *n*'s share of all goods N traded along route (*s*,*r*).

In Figure 7, we compare the performance of LAC relative to the global economy in terms of utility and GDP and the evolution of these metrics over the next century in the baseline (shown in red) and the counterfactual of optimally reduced trade costs (shown in blue). The results suggest that optimal reductions in domestic trade costs are likely to increase LAC's share in the world's utility and GDP in a sustained and re-enforcing way. The regional effect is expected to be substantial, largely because we assume that such investments are not made in the rest of the world. Latin America's share in GDP rises relative to the baseline in the first period and is 62 percentage points higher relative to the baseline in 2100. Lower transportation costs have a direct and immediate positive effect because fewer resources are allocated for transportation services and market access expands for economic agents. Lower transportation costs also stimulate specialization, which changes the spatial distribution of economic activity in a way that stimulates productivity and innovation in the long run. Since investments in transportation infrastructure are made in an optimal way, the gains of locations that become denser and more productive outweigh the losses of locations that experience outmigration. Over time this leads to a virtuous cycle of growth and productivity gains.

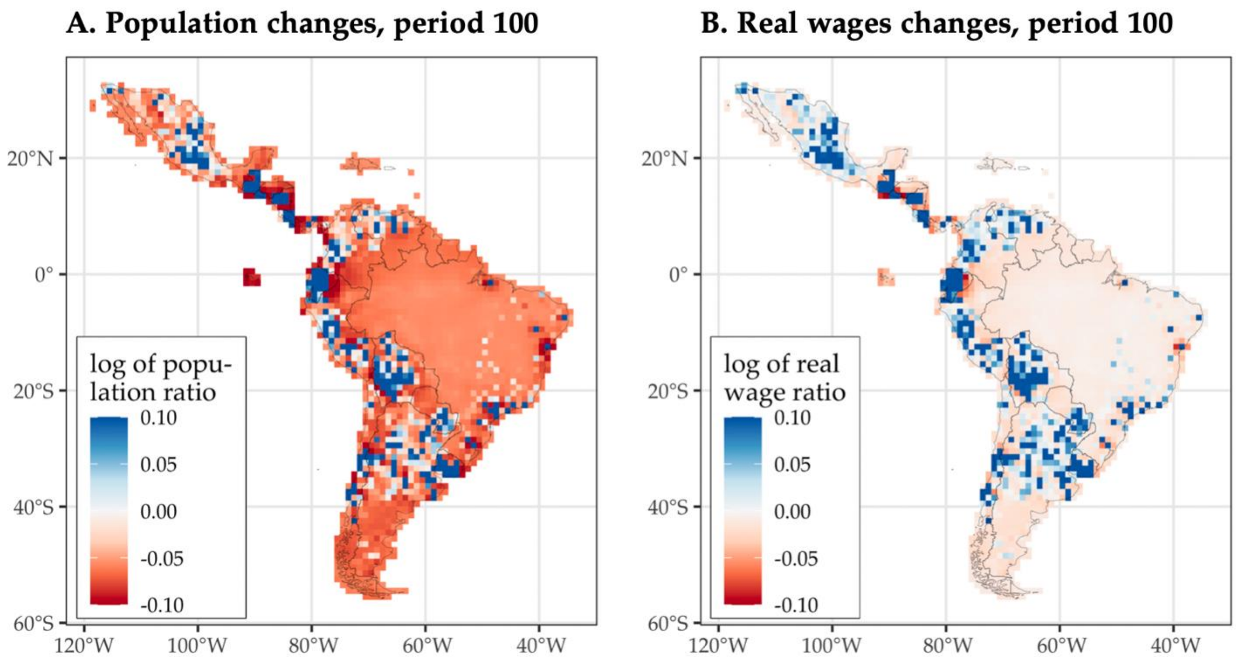
The optimal reductions in transportation costs stimulate the reallocation of economic activity and population to relatively more populous and productive locations in Latin America, for example, along the Southern part of Brazil's coast and the areas around the capital cities of Argentina, Uruguay, Chile, and Mexico (Figure 8). Many locations in Peru, Bolivia, Ecuador, and Central America experience increases in population and wages (Figure 8). It is important to note that these locations see growth in population not only due to domestic migration but also due to inflows of migrants from the rest of the world. The increased density in these areas of Latin America boosts long-term growth and the wage gains, while technological diffusion stimulates growth in neighboring areas (those identified in paler shades of blue).

Figure 7. Utility and GDP changes from optimal cuts in trade costs and reductions in migration frictions in LAC countries' top locations



Notes: The graph above documents the gains (in terms of GDP and utility) from reducing, optimally, the trade frictions within LAC. The solid lines stand for the results in terms of LAC's share of the world's GDP. The dashed ones stand for the results in terms of utility.

Figure 8. Spatial effects of optimal cuts in trade costs



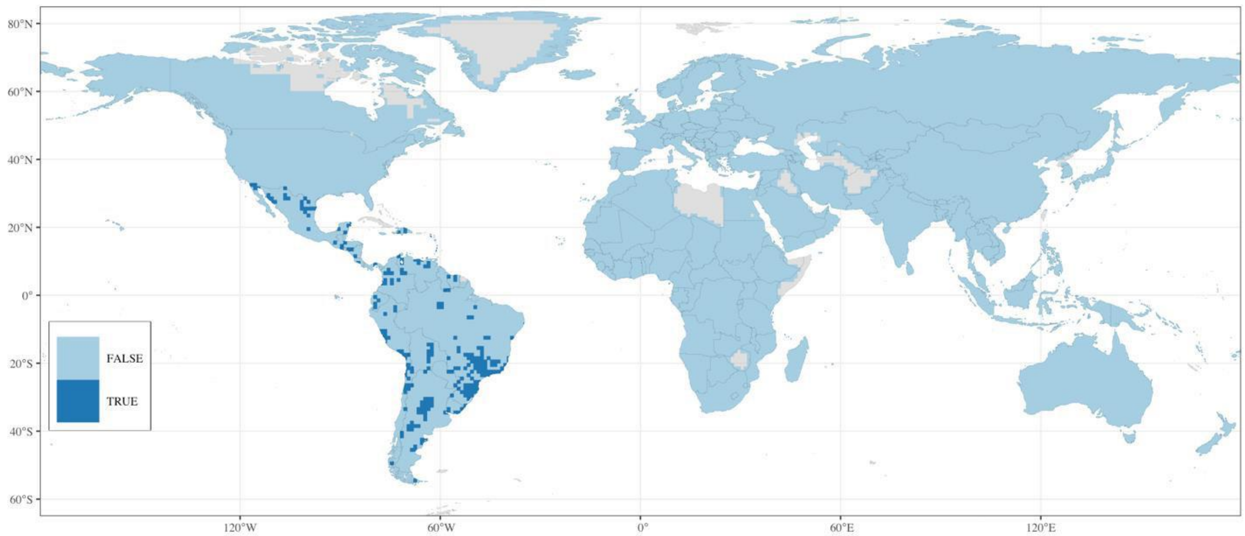
Notes: The maps above illustrate the log ratio between the grid cell level population/real wages in the simulations with lower trade frictions and the population/real wages in the benchmark simulations. The ratios are displayed in logs, thus values larger (smaller) than zero stand for higher (lower) outcomes in the simulation with lower trade frictions.

The strong regional gains, which in present discounted value are 15% for output per capita and 53% for welfare, are driven mostly by large increases in mostly small, relatively low-income countries, including Bolivia, Costa Rica, Ecuador, El Salvador, Guatemala, Nicaragua, Panama, and Uruguay (Table 4). In the baseline, these countries lose both population and per capita income. In the counterfactual, the reduction in trade costs not only boosts the economies of these countries (the direct effect). The economic revival also allows people to stay in their home countries rather than relocate to other parts of the world (the indirect effect). In these countries, per capita income increases in the counterfactual combined with the declines in the baseline yield large positive changes in per capita income relative to the baseline.

5.2 Reducing migration frictions in Latin America's top productivity locations

We next explore the effects of reducing the migration entry costs in locations that belong to the top quartile of the within-country GDP per capita distribution and whose population is above the country median to those in the bottom quartile of the migration frictions in each Latin American country. In other words, we cut the entry barriers in the more productive and populous locations in the countries in Latin America, namely the top locations shown in Figure 9, whenever these barriers are higher than the bottom quartile entry cost.

Figure 9. Top productivity locations, in terms of GDP per capita, in the LAC countries



Notes: The map shows the locations (grid cells) at the top quartile of the within-country per capita GDP distribution and whose population exceeds the median population in the respective LAC countries. The GDP at the grid cell level is obtained from the G-Econ database. Data are missing for territories/countries marked in grey.

The results, shown in green in the left panel of Figure 7, suggest that making it easier to migrate to the top locations in the Latin American countries increases welfare and output per capita, but the increase is much smaller than the one in response to the optimal cuts in trade costs. Unlike the optimal reductions in trade costs, which stimulated specialization of production and led to a virtuous cycle of growth and productivity gains, mostly in top locations, the cuts in entry costs in top locations have a more muted effect, reflecting the relatively low dispersion in entry barriers within these countries (Table 1) and the fact that, in most countries, entry costs in quite a few top locations are lower than those in the bottom quartile of the entry cost distribution. This implies either no cuts to entry costs in many top locations or relatively small cuts in those top locations where entry costs are greater than those in the bottom quartile. The muted effect is further eroded over time due to congestion costs. The effect on welfare, however, is self-sustaining as lower entry costs in top locations enhance not only consumption but also enable people to relocate to cities with better amenities, which has a lasting effect on welfare.

The country-specific results, presented in Table 4, suggest that in quite a few countries reductions in migration frictions enhance welfare, but not per capita incomes. This result reflects the fact that in these countries reductions in migration frictions occur only in the least productive top locations. As these locations become relatively more attractive compared to the most productive top locations, welfare is enhanced as people become better off by relocating to these least productive top locations. However, their decision is not productivity enhancing, resulting in negative changes in terms of the PDV of real GDP per capita. There are countries where both welfare and productivity increase (Table 4). In these countries, reductions in migration friction occur in the most productive top locations, encouraging people to move to these most productive top locations and eventually lifting both welfare and GDP per capita.

Table 4. Percentual changes in real per capita GDP and welfare in different counterfactuals compared to the baseline simulation (quartile version).

	Panel A: Optimal cut in trade costs		*Panel B: Reduction in migration frictions*	
	Change (%) in PDV of real GDP pc (2000-2100)	Change (%) in PDV of of welfare (2000-2100)	Change (%) in PDV of real GDP pc (2000-2100)	Change (%) in PDV of of welfare (2000-2100)
World	1.32	7.83	0.08	2.48
LAC	15.05	53.64	-0.53	19.1
Argentina	3.11	6.63	0	6
Bolivia	27.55	125.87	-1.21	935.97
Brazil	2.65	4.14	-0.17	1.13
Chile	4.7	21.59	-1.19	38.56
Colombia	5.2	7.43	-1.36	8.56
Costa Rica	55.19	73.86	0.16	97.88
Dominican Republic	0.03	-0.9	0.2	-0.44
Ecuador	87.63	208.93	0.27	7.64
El Salvador	893.31	1287.65	1.14	0.78
Guyana	-0.54	-1.49	0.1	2.28
Guatemala	352.51	394.6	-1.27	1539.07
Haiti	-0.04	-1.01	0.17	-0.45
Honduras	-2.91	-4.09	1.75	0.73
Mexico	3.58	5.44	-0.82	43.19
Nicaragua	126.95	224.41	0.5	2.22
Panama	425.16	2774.5	0.52	28
Paraguay	6.98	7.71	0.02	5.96
Peru	3.66	2.86	-0.51	18.75
Suriname	-0.62	-1.45	-0.73	4.23
Uruguay	136.57	402.87	-0.37	17.29
Venezuela	3.78	4.83	-1.48	30.92

The combined effect of optimal cuts in trade costs and cuts in migration frictions in top locations is shown in the right panel of Figure 7. The effect of optimal cuts in trade costs clearly dominates the small boost from cuts in migration frictions in top locations. By 2070, the effect of cutting migration frictions in top productivity location on GDP becomes close to 0. These results give us a reason to conclude that trade costs, not migration frictions, represent a major constraint to the efficient distribution of economic activity and to high sustainable economic growth in Latin America.

6. Conclusions

Transportation costs can hinder economic development with uneven effects across space within countries and regions. Barriers to the mobility of workers in the economy could have analogous results, by not allowing labor to allocate optimally across space. In this paper, we assess the magnitude of migration frictions in Latin America c. 2000 and quantify the effects of cuts in trade and migration frictions on spatial development in the region. We show that reductions in trade costs in an optimal way can be key for the long-term spatial economic development in the region and the potential to speed up its convergence to advanced countries' standards of living.

Using the dynamic spatial general equilibrium model in Desmet et al. (2018) and fine-grained spatial data, we first calibrated migration entry costs using information on differences in initial utility across regions within the Latin American countries. We find that in most Latin American countries, migration entry costs calibrated based on spatially differential initial utility are on average substantially lower than those obtained assuming uniform within-country initial utility. Their within-country dispersion is also mostly lower. International comparisons suggest that the adjusted migration frictions are also smaller on average in Latin America than those in advanced economies, but trade frictions are considerably higher, even after adjusting for distance.

We then use two counterfactual simulations to assess the relative importance of the two types of mobility frictions. The first counterfactual explores the effects of reductions in transportation costs due to optimal expansion of the domestic road networks in most Latin American countries. We show that such a reduction increases the present discounted value of real per capita income in the region on average by 15.1% – a much larger magnitude than the one obtained with static quantitative trade models because of dynamics gains. The optimal improvements in connectivity also tend to stimulate the economic development of the relatively more populous and productive locations in the Latin American countries. By contrast, making it easier to migrate to such top locations has no effect on the present discounted value of the region's real per capita incomes, reflecting the relatively low dispersion in migration entry costs in most Latin American countries and the relatively low entry barriers in these locations. In both counterfactuals, the welfare increases are significantly larger than the increases in real per capita income because the reductions in both types of mobility frictions allow people to relocate to areas with better amenities and therefore derive higher utility. These results imply that trade costs, not migration frictions, represent a major constraint to the efficient distribution of economic activity and high, sustainable economic growth in Latin America.

The results presented in the paper are subject to the following caveats. We do not consider the cost of implementing the optimal expansions in domestic road networks in Latin America. Therefore, the gains from optimal reductions in transportation costs can be seen as gross rather than net gains. In addition, we assume that nearly all Latin American countries undertake such optimal investments at the same time. This is easier said than done as it entails substantial coordination, political, and institutional costs, which are also not taken into consideration. Our results are nonetheless very informative of the multiplicative gains of such policies over time and across space. Economic gains diffuse across space, and improvements in the integration of markets intensify these forces. By using a dynamic spatial framework where growth (through innovation and spatial diffusion) takes place, we provide evidence that making markets within LAC better connected can lead to long-run gains that far exceed any short-run (static) gains.

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Data Appendix

This appendix describes the sources for the data on subjective well-being used in the calibration of amenities and migration frictions in Section 3. We obtained these data from the Latinobarómetro surveys and complement them with data from the Gallop World Poll (GWP). The Latinobarómetro provides a much finer geographical coverage of LAC than the GWP; it is representative at the subnational level, while the GWP is representative at the national level.

Latinobarómetro. First, we retrieve the oldest waves for 1997 and 2000 that contain questions for overall satisfaction with life. The answer to the life satisfaction question is provided in four categories: "Very Satisfied", "Fairly Satisfied", "Not very satisfied", and "Not at all satisfied". To be compatible with the zero to ten scale of the Cantril Ladder metric used in the GWP, these are set at 10, 7.5, 5, and 2.5, respectively. The countries covered in this adjustment are Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Uruguay, and the República Bolivariana de Venezuela.

Next, we geocode all the 536 coordinates of the locations of interviews in the Latinobarómetro surveys. We then overlay the coordinates at the administrative 1 level (i.e. states) and calculate the average well-being in each of the administrative units. We normalize the values obtained within countries so that in each country the maximum equals one.[13] Finally, we overlay the Desmet et al. (2018) grid over the administrative shape of LAC to retrieve the zero to one scale of within-country well-being. We then multiply the subjective well-being values used by Desmet et al. (2018) by our scale to obtain adjusted heterogeneous values for subjective well-being within the Latin American countries.

Gallop World Poll. To increase the spatial coverage of subjective well-being within countries for which the information from Latinobarómetro was insufficient, we obtain data from the Gallop World Poll (GWP). We retrieve the answers to the same question on life satisfaction from the GWP surveys for Brazil, Argentina, Mexico, Colombia, Ecuador, and Paraguay for the period from 2000 to 2015. This way we obtain Cantril ladder scores for about 100 additional coordinates that are analogously matched to the Desmet et al. (2018) grid.

[13] If an administrative unit does not have any data point of well-being from the Latinobarómetro, we assign the minimum of the country to it.