

A Global View of Cross-Border Migration*

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Abstract

This paper evaluates the welfare impact of observed levels of migration and remittances in both origins and destinations, using a quantitative multi-sector model of the global economy calibrated to aggregate and firm-level data on 60 developed and developing countries. Our framework accounts jointly for origin and destination characteristics, as well as the inherently multi-country nature of both migration and other forms of integration, such as international trade and remittance flows. In the presence of firm heterogeneity and imperfect competition larger countries enjoy a greater number of varieties and thus higher welfare, all else equal. Because of this effect, natives in countries that received a lot of migration – such as Canada or Australia – are better off. The remaining natives in countries with large emigration flows – such as Jamaica or El Salvador – are also better off due to migration, but for a different reason: remittances. The quantitative results show that the welfare impact of observed levels of migration is substantial, at about 5 to 10% for the main receiving countries and about 10% for the main sending countries.

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1 Introduction

International migration has risen steadily over the last three decades. By the 2000s, substantial fractions of the total population in many receiving countries were foreign-born. For instance, immigrants account for 8–12% of the population in several G7 countries, such as United States, United Kingdom, and France, and some 20% of the population in small, wealthy countries such as Australia, Canada, and New Zealand. By the same token, some developing countries have lost a substantial fraction of their population to emigration. Emigrants account for some 10% of the population of Mexico, and as much as 20-30% in smaller countries such as El Salvador or Jamaica (Table 1).

The sheer scale of the cross-border movements of people has led to a growing interest in understanding their welfare effects. However, compared to the attention paid to the welfare analysis of international trade, very few estimates of the the welfare effects of international migration are available. This paper provides a quantitative assessment of the global welfare impact of the observed levels of migration on both the origin and destination countries, taking explicitly into account the consequences for international trade and remittances. Our multi-country general equilibrium model is calibrated to match the world income distribution and world trade patterns. It incorporates several first-order features of the world economy that are important for obtaining reliable estimates of the welfare impact of migration. First, we calibrate labor productivity differences between countries, and match the levels of remittances observed in the data. Differences in labor productivity between origin and destination countries have a direct effect on the welfare of migrants themselves. In addition, remittances transfer some of the gains from increased productivity of migrants back to the natives that remained in the home country.

Second, our model incorporates the insights of the recent literature on firm heterogeneity under monopolistic competition (e.g., Melitz, 2003). In recent years, a great deal of evidence has shown that these models are very successful at replicating both the key macro features (total trade flows, the gravity relationship) and key micro features (firm size distributions, systematically larger exporters) of the economy, making them especially suitable for quantitative analysis. Economically, the key mechanism linking migration and welfare in this type of model is product variety. Inflows of immigrants increase market size, and thus the range of varieties available to everyone for consumption and as intermediate inputs. Our quantitative analysis calibrates the key parameters of the model that determine equilibrium variety in both the short and the long run: relative country size and the firm

size distribution. Thus, we can be precise about the magnitude of impact of migration on market size, and thus on the welfare of the natives.

Third, we take explicit account of the role of goods trade in affecting the gains from migration. To that end, the model features both traded and non-traded sectors with intermediate input linkages between the two, and matches the overall levels of goods trade relative to GDP. The model is solved on a sample of 60 developed and developing countries comprising some 98% of world GDP, taking into account all the multilateral trade relationships between them.

Finally, we distinguish between the short-run and the long-run impact of migration. In the short run, the set of potential projects available in the economy is fixed, and thus it corresponds to the framework of [Chaney \(2008\)](#) and [Eaton et al. \(2010\)](#). In this case, migration has an impact on product variety by affecting the entry decision of only the marginal firms, which lie near the productivity cutoff for setting up a firm. Since these are the least productive firms in the economy, their economic impact is very limited. In the long run, the set of potential projects will change in response to migration to dissipate net profits (free entry) as in [Krugman \(1980\)](#) and [Melitz \(2003\)](#). Because some of those new firms will be quite productive, they can have a large impact on welfare. Thus the difference in the welfare impact of migration between the long and the short run depends crucially on the relative productivity of the marginal firms compared to the inframarginal ones. In evaluating this distinction quantitatively, the calibration to the observed distribution of firm size is central. To use a different language, in the short run economies will adjust to migration-induced changes in labor force mostly through changes along the intensive margin, because the additional projects that can be opened are much less productive than existing ones. In contrast, in the long run absorption of migrant workers through the extensive margin will play a much more prominent role.

The main use of our calibrated model is to compute welfare in the baseline calibration under the observed levels of bilateral migration and in the counterfactual scenario in which global migration is undone. Our findings can be summarized as follows. First, natives in the countries with largest stocks of immigrants (relative to population), such as Australia, New Zealand, or Canada, have 5–10% higher welfare in under the current levels of migration compared to the no-migration counterfactual. What generates this welfare effect is the general equilibrium response by which a larger labor force translates into a greater range of productive varieties, and thus higher per-capita welfare. At the same time, the welfare impact on the staying natives of the migration source countries depends on a trade-off.

Symmetrically to the main migration receiving countries, these source countries are worse off due to migration because a smaller labor force implies less variety in their production and exports. On the other hand, migrants send home remittances, which would stop if emigration were undone. For countries such as El Salvador or the Philippines, where remittances account for more than ten percent of GDP, the latter effect dominates and the average native stayer is about 10% worse off in the no-migration scenario. Underlying these results is the fact that the typical migrant moves from a low to a high TFP region, leading to an overall increase in efficiency units of labor worldwide (as observed by [Klein and Ventura, 2009](#)). As a result, migration allows the world as a whole to gain access to a larger set of varieties, partially compensating the migration source countries for their *brain drain*, as in [Iranzo and Peri \(2009\)](#). However, the remittance effect is not always larger than the general equilibrium variety effect. Some important emigration countries, such as Mexico and Turkey, would actually be 1–4% better off in the no-migration counterfactual.

In the short run, the welfare impact on the main in-migration countries is much smaller, at less than 1%. By contrast, the welfare impact of reversing migration on the main out-migration countries tends to be similar to the long-run impact: negative and large. This asymmetry between the long- and the short-run results is intuitive. For the main receiving countries, the long-run welfare impact is due primarily to the general equilibrium channel of increased variety, and because in the short run that channel is only of limited importance, there is a big difference in the welfare changes in the short and the long run. By contrast, for the main migration sending countries the welfare impact is driven mainly by the partial equilibrium channel of lost remittances, which works immediately in both the short and the long run.

To summarize, the natives' welfare change in both receiving and sending countries in the no-migration counterfactual ranges from about -10% to about $+4\%$ in the long run. These changes are dwarfed by the welfare impact on the migrants themselves since migration from a low- to a high-income country often involves increasing one's labor productivity dramatically. For instance, according to our model the welfare of someone moving from Mexico to the United States increases by a factor of 6, and of someone moving from Turkey to Germany, by a factor of 8. Averaging across all migrants in the world, migration is associated with a doubling of welfare in the short run, and tripling of welfare in the long run.

Existing treatments of the impact of migration adopt either the neoclassical or the Heckscher-Ohlin paradigm. The neoclassical paradigm – exemplified by the one-sector

closed-economy growth model – emphasizes scarcity of other factors of production, such as capital. As such, the typical finding is that the short-run impact of migration on wages in the receiving country is negative due to capital dilution. In the long run the capital stock adjusts to accommodate an increased labor force. The Heckscher-Ohlin paradigm emphasizes Factor Price Insensitivity with the key result that the sectoral structure will bear the brunt of adjustment, leaving wages and welfare unchanged to a first-order approximation (also known as the Rybczynski effect). While still an open question, there is growing evidence that both the neoclassical and H-O paradigms have proven unsatisfactory when taken to data. Identification of the effects of migration on factor prices at the national level requires large amounts of data and strong identifying assumptions (see [Borjas, 2003](#); [Ottaviano and Peri, 2011](#), in closed-economy settings).¹ Regarding the effects of immigration on the sectoral structure, studies based on cross-city variation find little or no impact of migration inflows ([Lewis, 2003](#); [Gonzalez and Ortega, 2011](#); [Dustmann and Glitz, 2009](#)).²

We propose a different lens through which the impact of migration can be evaluated: new trade theory. It emphasizes the role of firm heterogeneity and endogenous varieties, as well as agglomeration economies. Unlike the neoclassical and Heckscher-Ohlin paradigms, new trade theory actually predicts that wages and welfare of the natives will be strictly higher in the country receiving migration, because a greater labor force stimulates entry of new firms and thus has welfare benefits through increased varieties available for consumption and as intermediate inputs.³ Our analysis incorporates an important feature that was missing in the basic models of new trade theory, namely, data on bilateral international remittances. When remittances are taken into account the welfare effects of emigration can be positive even in the long run. Intuitively, when a country suffers a loss of labor due to migration it is compensated by the remittances sent back by those migrants. Since migrants typically move from a low to a high labor productivity country the gains from remittances may very well overcome the losses in terms of units of labor.⁴

¹See [Ortega and Peri \(2011\)](#) for a recent attempt at estimating the causal effects of immigration on aggregate income using a pseudo-gravity instrumental-variables approach that accounts for trade openness.

²At the national level, some studies do find some evidence in favor of adjustments through the industry mix ([Ciccone and Papaioannou, 2009](#))

³Though there is a large amount of empirical evidence that the monopolistic competition model with heterogeneous firms performs well on a number of dimensions (see, among many others, [Bernard et al., 2007](#); [Eaton et al., 2010](#); [Helpman et al., 2008](#)), at present there is much less evidence on the impact of migration on entry and product variety. [Mazzolari and Neumark \(2009\)](#) do find that product diversity increases with immigration using detailed data from California.

⁴For the sake of simplicity most of our analysis is conducted under the assumption of homogeneous labor. We think this is a reasonable starting point but, of course, further work should evaluate the implications of this assumption for our results.

Most closely related to our work is [Iranzo and Peri \(2009\)](#), which develops a two-country model with a differentiated sector and endogenous variety, as well as skill differences between workers, and applies it to migration between Eastern and Western Europe. Our paper shares with [Iranzo and Peri \(2009\)](#) the emphasis on market size and endogenous variety, but differs from it in several important respects. First and foremost, our model features 60 countries and multilateral trade, allowing for both greater realism, as well as a range of results on how migration affects a wide variety of countries depending on their characteristics. Second, our work incorporates many important features of the world economy, such as unbalanced trade with remittances; the observed extent of firm heterogeneity – which affects the size and importance of the entry margin; and a non-traded sector with two-way input-output linkages, and among others. Substantively, while both [Iranzo and Peri \(2009\)](#) and this paper find that welfare in the sending countries is higher with emigration, the mechanism is different: in [Iranzo and Peri \(2009\)](#) this is due to increased imported variety; in our analysis it is often the case that poor countries benefit from migration because of remittances.

Our paper also contributes to the literature on the welfare impact of migration. [Benhabib and Jovanovic \(2010\)](#) and [Klein and Ventura \(2007, 2009\)](#) examine the welfare consequences of migration in two-country one-good models closed to trade, focusing on skill complementarities and cross-country TFP differences, respectively. However, today’s world economy features substantial international trade in goods, and openness to goods trade may imply very different qualitative or quantitative outcomes than those obtained in closed-economy, one-sector models. As a matter of fact, some recent large-scale immigration episodes affect very open economies, such as Israel, Ireland, Spain, and the UK. There are reasons to believe that the results obtained in closed-economy frameworks may not be good approximations for these very open countries. [Davis and Weinstein \(2002\)](#) examine the welfare impact of migration in the two-country Ricardian model of [Dornbusch et al. \(1977\)](#). In all three of these papers, the neoclassical nature of the economy implies that the natives of rich countries lose, and workers remaining in poor countries win from migration.

The rest of the paper is organized as follows. [Section 2](#) presents the theoretical framework. [Section 3](#) describes the data. [Section 4](#) simulates the model economy and presents the main calibration results. [Section 5](#) presents counterfactual experiments and the resulting welfare implications. [Section 6](#) compares our main findings to previous results in the literature. [Section 7](#) concludes.

2 Theoretical Framework

2.1 Migration, Productivity, and Labor Force Composition

The world is comprised of \mathcal{C} countries, indexed by $i, j = 1, \dots, \mathcal{C}$. Each country is endowed with L_i efficiency units of labor. This value is a combination of the the number of people that live in the country and the amount of efficiency units of labor that each worker has. These efficiency units of labor are determined by worker-specific productivity as well as, albeit in reduced-form here, can also partly reflect each country’s endowment of capital.

Each country’s labor force is composed of natives and immigrants. Immigrants will generically differ from native workers in how many efficiency units of labor they possess. In particular, suppose that there are N_{ji} workers born in country i that migrated to country j (throughout the paper, we adopt the convention that the first subscript denotes destination country, the second subscript, source). Suppose further that workers born in country i and working in country j have A_{ji} efficiency units of labor. Generally, this value will vary by both source and destination country. Then, the total effective labor endowment in country j is just the summation over all the efficiency units of labor of workers coming from all the countries:

$$L_j = \sum_{i=1}^{\mathcal{C}} A_{ji} N_{ji}, \quad (1)$$

where, of course, the summation includes the native workers and their efficiency, $A_{jj}N_{jj}$.

It is well documented that when migrants cross the border, their wages change dramatically, often by an order of magnitude. To a large extent this is due to the large observed differences in factor prices across borders (Hendricks, 2002; Klein and Ventura, 2007). Another well established fact is that upon arrival immigrants tend to earn lower wages than comparable natives, and that this wage gap diminishes over time as immigrants acquire local skills (see Schultz (1998) and Borjas (1999) for reviews).⁵ Thus at any given snapshot, we will observe a wage gap between natives and immigrants in the typical country. Hendricks (2002) reports that the gap between the earnings of immigrants and U.S. natives with the same observable skills is less than 25 percent for most source countries (1990 US Census data). In addition his findings confirm those of Borjas (1988) that the native-immigrant wage gap does not vary much by country of origin. We interpret this as evidence that productivity differences across countries can be better explained by models allowing for

⁵Since our model assumes homogeneous labor (conditional on being native or foreign-born), the wage gap between the average native and the average immigrant may not vanish if immigrants and natives have different average skill levels.

country-specific differences in TFP than by models in which productivity is fully embodied in workers.

On account of these findings we make the following assumptions about the labor productivity of natives and immigrants. Denote by $\phi_i \leq 1$ the proportional productivity gap of a migrant relative to a native worker. Then, the efficiency units of an individual migrant from country i to country j are given by:

$$A_{ji} = \phi_i A_{jj}. \quad (2)$$

As discussed earlier, there are multiple reasons for why ϕ_i may be lower than one: imperfect skill transferability across countries, cultural and linguistic differences, labor-market discrimination, and so on. For ease of exposition we will interpret ϕ_i as measuring the degree of skill transferability.

2.2 The Environment

Consider a production structure in the spirit of [Melitz \(2003\)](#) and [Eaton et al. \(2010\)](#). In each country there are two broad sectors, the tradeable T and the non-tradeable N . In country i , consumers maximize

$$\begin{aligned} \max_{\{y_i^N(k), y_i^T(k)\}} & \left(\int_{J_i^N} y_i^N(k)^{\frac{\varepsilon_N-1}{\varepsilon_N}} dk \right)^{\frac{\alpha \varepsilon_N}{\varepsilon_N-1}} \left(\int_{J_i^T} y_i^T(k)^{\frac{\varepsilon_T-1}{\varepsilon_T}} dk \right)^{\frac{(1-\alpha)\varepsilon_T}{\varepsilon_T-1}} \\ & s.t. \\ & \int_{J_i^N} p_i^N(k) y_i^N(k) dk + \int_{J_i^T} p_i^T(k) y_i^T(k) dk = Y_i, \end{aligned}$$

where $y_i^s(k)$ is consumption of good k belonging to sector $s = N, T$ in country i , $p_i^s(k)$ is the price of this good, and Y_i is total income, which is the sum of labor income $w_i L_i$, net profits (if any) in the two sectors $\Pi_i^N + \Pi_i^T$, and net remittances received from abroad R_i . That is, $Y_i = w_i L_i + \Pi_i^N + \Pi_i^T + R_i$. Finally, J_i^s is the mass of varieties available in sector s in country i , coming from all countries. Since consumer preferences are Cobb-Douglas in CES aggregates of N and T , it is well known that consumption expenditure on sector N is equal to αY_i , and on the T sector, $(1 - \alpha) Y_i$.

The CES composites of both N and T are used both as final consumption and as intermediate inputs in production. Let X_i^s denote the total spending – final plus intermediate – on sector $s = N, T$ in country i . Given this total expenditure, it is well known that demand for an individual variety k in country i is equal to

$$x_i^s(k) = \frac{X_i^s}{(P_i^s)^{1-\varepsilon_s}} p_i^s(k)^{-\varepsilon_s}, \quad (3)$$

where P_i^s is the ideal price index of sector s in this economy,

$$P_i^s = \left[\int_{J_i^s} p_i^s(k)^{1-\varepsilon_s} dk \right]^{\frac{1}{1-\varepsilon_s}}. \quad (4)$$

Production in both sectors uses both labor and CES composites of N and T as intermediate inputs. In particular, a firm with marginal cost a must use a input bundles to produce one unit of output. An input bundle in country j and sector s has a cost

$$c_j^s = w_j^{\beta_s} \left[(P_j^N)^{\eta_s} (P_j^T)^{1-\eta_s} \right]^{1-\beta_s}, \quad (5)$$

where w_j is the wage (i.e., the price of one unit of L) in country j . That is, production in sector $s = N, T$ requires labor, inputs of N , and inputs of T . The share of value added in total sales, β_s , and the share of non-tradeable inputs in total input usage, η_s , both vary by sector.

Each country j is populated by a mass n_j^s of entrepreneurs in sector s . Each entrepreneur $k \in [1, n_j^s]$ in each $s = N, T$ and $j = 1 \dots, \mathcal{C}$ has an ability to produce a unique variety in sector s valued by consumers and other firms. Thus, each potential firm has some market power: it faces the downward-sloping demand for its variety given by (3). Entrepreneurs also differ in their marginal cost $a(k)$ of producing their goods.

There are both fixed and variable costs of production and trade. Given $a(k)$, each entrepreneur in country j decides whether or not to pay the fixed cost of production f_{jj}^s , and which, if any, export markets to serve. In the N sector, we assume that trade costs are infinite, and thus a firm in country j may only serve its own market. In sector T , to start exporting from country j to country i , a firm must pay a fixed cost f_{ij} , and an iceberg per-unit cost of $\tau_{ij} > 1$.⁶ We normalize the iceberg cost of domestic sales to one: $\tau_{jj} = 1$. Having paid the fixed costs of entering these markets, each firm produces with a marginal cost $a(k)$, markets clear, and consumption takes place.

Firm k from country j selling to country i thus faces a demand curve given by (3), and has a marginal cost $\tau_{ij} c_j^s a(k)$ of serving this market in sector s . As is well known, the profit maximizing price is a constant markup over marginal cost, $p_i^s(k) = \frac{\varepsilon_s}{\varepsilon_s - 1} \tau_{ij} c_j^s a(k)$, the quantity supplied is equal to $\frac{X_i^s}{(P_i^s)^{1-\varepsilon_s}} \left(\frac{\varepsilon_s}{\varepsilon_s - 1} \tau_{ij} c_j^s a(k) \right)^{-\varepsilon_s}$, and the total ex-post variable profits are:

$$\pi_{ij}^{V,s}(a(k)) = \frac{X_i^s}{\varepsilon_s (P_i^s)^{1-\varepsilon_s}} \left(\frac{\varepsilon_s}{\varepsilon_s - 1} \tau_{ij} c_j^s a(k) \right)^{1-\varepsilon_s}, \quad (6)$$

⁶That is, the firm in country j must ship $\tau_{ij} > 1$ units to country i in order for one unit of the good to arrive there.

where once again we assume throughout that the only firms that can sell in sector N in country i are those based in that country. Note that these are variable profits of a firm in country j from selling its good to country i only, and are valid for destination-source pair i, j , including domestic sales: $i = j$.

Not all firms will decide to serve all markets. In particular, there is a cutoff marginal cost a_{ij}^s , above which firms in country j do not serve market i . This cutoff a_{ij}^s is given by the following condition:

$$a_{ij}^s = \frac{\varepsilon_s - 1}{\varepsilon_s} \frac{P_i^s}{\tau_{ij} c_j^s} \left(\frac{X_i^s}{\varepsilon_s c_j^s f_{ij}^s} \right)^{\frac{1}{\varepsilon_s - 1}}. \quad (7)$$

We adopt the standard assumption that firm productivity in sector s , $1/a$, follows a Pareto(b_s, θ_s) distribution: $\Pr(1/a < y) = 1 - \left(\frac{b_s}{y}\right)^{\theta_s}$, where b_s is the minimum value labor productivity can take, and θ_s regulates dispersion. Standard steps of combining the definition of the price level (4) with the cutoffs (7) leads to the following expressions for prices:

$$P_i^N = \frac{1}{b_N} \left[\frac{\theta_N}{\theta_N - (\varepsilon_N - 1)} \right]^{-\frac{1}{\theta_N}} \frac{\varepsilon_N}{\varepsilon_N - 1} \left(\frac{X_i^N}{\varepsilon_N} \right)^{-\frac{\theta_N - (\varepsilon_N - 1)}{\theta_N(\varepsilon_N - 1)}} \left(n_i^N \left(\frac{1}{c_i^N} \right)^{\theta_N} \left(\frac{1}{c_i^N f_{ii}^N} \right)^{\frac{\theta_N - (\varepsilon_N - 1)}{\varepsilon_N - 1}} \right)^{-\frac{1}{\theta_N}} \quad (8)$$

and

$$P_i^T = \frac{1}{b_T} \left[\frac{\theta_T}{\theta_T - (\varepsilon_T - 1)} \right]^{-\frac{1}{\theta_T}} \frac{\varepsilon_T}{\varepsilon_T - 1} \left(\frac{X_i^T}{\varepsilon_T} \right)^{-\frac{\theta_T - (\varepsilon_T - 1)}{\theta_T(\varepsilon_T - 1)}} \left(\sum_{j=1}^C n_j^T \left(\frac{1}{\tau_{ij} c_j^T} \right)^{\theta_T} \left(\frac{1}{c_j^T f_{ij}^T} \right)^{\frac{\theta_T - (\varepsilon_T - 1)}{\varepsilon_T - 1}} \right)^{-\frac{1}{\theta_T}}. \quad (9)$$

Trade is not balanced due to remittances. Let country i receive a net transfer of resources R_i , which can be positive (for countries receiving remittances), or negative (for countries sending them). For the world as a whole, remittances sum to zero: $\sum_i R_i = 0$. The data on remittances used below to implement the model satisfy this requirement. Let Y_i^N and Y_i^T denote the value of output by firms located in country i in sectors N and T , respectively. The country's resource constraint states that total spending must equal the value of domestic production plus net transfers: $X_i^N + X_i^T = Y_i^N + Y_i^T + R_i$. Because N cannot be traded, it has to be the case that $X_i^N = Y_i^N$, and thus the aggregate resource constraint becomes:

$$X_i^T = Y_i^T + R_i. \quad (10)$$

Using the expression for total sales of a firm with marginal cost $a(k)$ and adding up all the sales of all firms serving that market, the total sales from country i to country j can be

written as:

$$X_{ji}^T = \frac{X_j^T}{(P_j^T)^{1-\varepsilon_T}} \left(\frac{\varepsilon_T}{\varepsilon_T - 1} \tau_{ji} c_i^T \right)^{1-\varepsilon_T} n_i^T \frac{b_T^{\theta_T} \theta_T}{\theta_T - (\varepsilon_T - 1)} (a_{ji}^T)^{\theta_T - (\varepsilon_T - 1)}.$$

Using expressions for a_{ji}^T in (7), and P_j^T in (9), the total exports from i to j become:

$$X_{ji}^T = \frac{n_i^T \left(\frac{1}{\tau_{ji} c_i^T} \right)^{\theta_T} \left(\frac{1}{c_i^T f_{ji}^T} \right)^{\frac{\theta_T - (\varepsilon_T - 1)}{\varepsilon_T - 1}}}{\sum_{l=1}^C n_l^T \left(\frac{1}{\tau_{jl} c_l^T} \right)^{\theta_T} \left(\frac{1}{c_l^T f_{jl}^T} \right)^{\frac{\theta_T - (\varepsilon_T - 1)}{\varepsilon_T - 1}}} X_j^T.$$

Adding up these across all destinations j and using (10), we obtain the market clearing condition for country i 's total T -sector output:

$$Y_i^T = X_i^T - R_i = \sum_{j=1}^C \frac{n_i^T \left(\frac{1}{\tau_{ji} c_i^T} \right)^{\theta_T} \left(\frac{1}{c_i^T f_{ji}^T} \right)^{\frac{\theta_T - (\varepsilon_T - 1)}{\varepsilon_T - 1}}}{\sum_{l=1}^C n_l^T \left(\frac{1}{\tau_{jl} c_l^T} \right)^{\theta_T} \left(\frac{1}{c_l^T f_{jl}^T} \right)^{\frac{\theta_T - (\varepsilon_T - 1)}{\varepsilon_T - 1}}} X_j^T. \quad (11)$$

In assessing the welfare impact of migration, we consider two types of equilibria. The short-run equilibrium assumes that the set of available projects n_j^s is fixed in each country and sector, as in Chaney (2008) and Eaton et al. (2010). Thus, in the short-run equilibrium the stock of productive project ideas cannot adjust instantaneously to changes in the labor force. In the long-run equilibrium, the stock of projects n_j^s adjusts to satisfy the free entry condition, as in Krugman (1980) and Melitz (2003). Thus, in the long run this variable will respond to changing economic conditions, in our case migration.

Though capital is not explicitly in the model, one can follow the interpretation suggested by Ghironi and Melitz (2005) and Bergin and Corsetti (2008) that the set of projects available to entrepreneurs is a form of the capital endowment. Similarly, the creation of new firms is a form of capital investment. This interpretation is natural in the sense that these projects are in effect a factor of production without which workers cannot generate output. Thus, the short-run equilibrium corresponds to a case in which the other factors of production – n_j^s here – have not had a chance to adjust to the new endowment of labor, whereas the long-run equilibrium is the one that obtains after the adjustment of other factors.

The two equilibria thus differ in their assumptions on the mass of potential entrepreneurs n_i^s in each country and sector. We now describe the equations defining the two equilibria.

2.3 Short-Run Equilibrium

In the short-run equilibrium, n_i^s is fixed exogenously. This means that entrepreneurs with access to productive projects earn net profits in this economy. Straightforward steps (see, for instance, Proposition 1 in [di Giovanni and Levchenko, 2010](#)) establish that total profits in each sector and country are a constant multiple of the total sales by firms in that sector: $\Pi_i^s = \frac{\varepsilon_s - 1}{\varepsilon_s \theta_s} Y_i^s$. This implies that the total spending on intermediate inputs in each sector is $(1 - \beta_s) \left(1 - \frac{\varepsilon_s - 1}{\varepsilon_s \theta_s}\right) Y_i^s$. Final spending is the the sum of all net income, which includes labor income, profits, and remittances: $Y_i = w_i L_i + \Pi_i^N + \Pi_i^T + R_i$. Market clearing in each sector implies that total spending equals final consumption spending plus purchases of intermediate inputs:

$$X_i^N = \alpha Y_i + (1 - \beta_N) \eta_N \left(1 - \frac{\varepsilon_s - 1}{\varepsilon_s \theta_s}\right) Y_i^N + (1 - \beta_T) \eta_T \left(1 - \frac{\varepsilon_s - 1}{\varepsilon_s \theta_s}\right) Y_i^T \quad (12)$$

$$\begin{aligned} X_i^T &= (1 - \alpha) Y_i + (1 - \beta_N) (1 - \eta_N) \left(1 - \frac{\varepsilon_s - 1}{\varepsilon_s \theta_s}\right) Y_i^N + \\ &\quad (1 - \beta_T) (1 - \eta_T) \left(1 - \frac{\varepsilon_s - 1}{\varepsilon_s \theta_s}\right) Y_i^T. \end{aligned} \quad (13)$$

A *short-run monopolistically competitive equilibrium* is a set of prices $\{w_i, P_i^N, P_i^T\}_{i=1}^{\mathcal{C}}$, and factor allocations such that (i) consumers maximize utility; (ii) firms maximize profits, and (iii) all goods and factor markets clear, given country endowments L_i and n_i^s . The equilibrium is obtained as a solution to $(\mathcal{C} - 1) + 2 \times \mathcal{C}$ equations in w_i , P_i^N , and P_i^T , that satisfies equations (8), (9), (11), (12), and (13) for each $i = 1, \dots, \mathcal{C}$. Equations (12) and (13) imply that X_i^T is linear in $w_i L_i$ and R_i , which allows us to express (11) as a system of equations in relative wages given the vector of R_i and sectoral price levels. These equations do not admit an analytical solution for a realistic number of countries and reasonable parameter values, but are straightforward to solve numerically.

2.4 Long-Run Equilibrium

In the long-run equilibrium, n_i^s will adjust to satisfy the free entry condition. As in [Krugman \(1980\)](#) and [Melitz \(2003\)](#), each country has a potentially infinite number of entrepreneurs with zero outside option. In order to become an entrepreneur, an agent must pay an “exploration” cost f_e . Upon paying this cost, the entrepreneur k discovers her productivity, indexed by a marginal cost $a(k)$, and develops an ability to produce a unique variety of N or T valued by consumers and other firms.

The equilibrium number of potential entrepreneurs n_j^s is then pinned down by the familiar free entry condition in each sector and each country. Entrepreneurs in sector s will enter until the expected profit equals the cost of finding out one's type:

$$E \left[\sum_{i=1}^{\mathcal{C}} \left(\pi_{ij}^{V,s}(a(k)) - c_j^s f_{ij}^s \right) \right] = c_j^s f_e, \quad (14)$$

for each country j and sector s , where once again in sector N , profits can only be positive for $i = j$.

With free entry, the total profits in the economy are zero. Thus the total final spending equals labor income plus remittances, $Y_i = w_i L_i + R_i$, and total spending on intermediate inputs equals a fraction $(1 - \beta_s)$ of total sales by all firms in each sector s . Market clearing in each sector implies that total spending equals final consumption spending plus purchases of intermediate inputs:

$$X_i^N = \alpha Y_i + (1 - \beta_N) \eta_N Y_i^N + (1 - \beta_T) \eta_T Y_i^T \quad (15)$$

$$X_i^T = (1 - \alpha) Y_i + (1 - \beta_N) (1 - \eta_N) Y_i^N + (1 - \beta_T) (1 - \eta_T) Y_i^T. \quad (16)$$

A *long-run monopolistically competitive equilibrium* is a set of prices $\{w_i, P_i^N, P_i^T\}_{i=1}^{\mathcal{C}}$, equilibrium measures of potential projects $\{n_i^N, n_i^T\}_{i=1}^{\mathcal{C}}$ and factor allocations such that (i) consumers maximize utility; (ii) firms maximize profits, (iii) all goods and factor markets clear, and (iv) the net profits in the economy equal zero. The equilibrium is obtained as a solution to $(\mathcal{C} - 1) + 2 \times \mathcal{C} + 2 \times \mathcal{C}$ equations in w_i, P_i^N, P_i^T, n_i^N and n_i^T that satisfies equations (8), (9), (11), (14), (15), and (16) for each $i = 1, \dots, \mathcal{C}$. As in the short-run case, (15) and (16) allow us to express X_i^T as a linear function of $w_i L_i$ and R_i , implying that (11) can be solved numerically for wages given R_i and price levels.

3 Data and Summary Statistics

The migration data come from the OECD International Migration Database. This dataset contains information on the stocks of immigrants by both destination and origin country (thus, it contains separate information on the number of natives of Mexico, and the number of natives of El Salvador, residing in the United States). We use data for 2006, the most recent year these data are available with comprehensive coverage. An important feature of these data is that it only contains information on 27 destination countries, namely members of the OECD. Thus, while we have data on hundreds of origin countries, we only have information on rich country destinations. As a result, our counterfactual exercise should

be interpreted as the consequences of undoing South-to-North migration. Any South-to-South migration flows will be left unchanged.⁷ To calculate the foreign-born shares in each country, we employ population data from [The World Bank \(2007b\)](#). Remittances data are sourced from [Ratha and Shaw \(2007\)](#). The sources and details for the other data we use are described as we present the calibration details and results.

We carry out the analysis on the sample of the largest 49 countries in the world by total GDP, plus a selection of 11 smaller countries that have experienced migration outflows of 10% or more of the native labor force. There is a 61st rest of the world country. These 60 countries together cover 98% of world GDP. We exclude the entrepôt economies of Hong Kong and Singapore, both of which have total trade well in excess of their GDP due to significant re-exporting activity. Thus, our model is not intended to fit these countries. (We do place them into the rest-of-the-world category.)

[Table 1](#) lists the countries in the sample and reports the share of immigrants (foreign born), the share of emigrants, the counterfactual population change, and the size of net remittances relative to GDP for each of these countries. The left panel displays the countries for which data on immigrant stocks are available (the OECD) while the panel on the right contains the remaining countries in our sample (the South).⁸

Several points are worth noting. First, the data reveal a great deal of dispersion in immigration and emigration shares. At one extreme there are countries like Australia and New Zealand, where 25% of the population is foreign born. At the other, El Salvador, Trinidad and Tobago, and Jamaica display emigration shares in the 20-30% range.⁹ Second, some of the OECD countries have large gross stocks of both immigrants and emigrants. Because of that, if migration had never taken place their population would be broadly the same (the third column). Ireland is the clearest example: its share of immigrants is 13%, but the share of emigrants is 16%. If migration had never taken place, its population would only be 3% higher.

The table also reports the net remittances in each country as a share of GDP. Negative values mean that a country is a net sender or remittances. Clearly, most OECD countries send more remittances than they receive, and the total net remittances are only a small

⁷For year 2000 there exist data on bilateral migration stocks covering virtually every country. Unfortunately, these data miss the large intra-Europe migration following the eastern enlargement of the European Union.

⁸Since we lack data on immigration for the South (right panel), the counterfactual population change for these countries is equal to their emigration share. That is to say, in the counterfactual these countries only experience a return of their emigrants, but not the exit of the immigrant residing in these countries.

⁹Once again, for these countries we are reporting data on emigration to OECD countries only. Thus their total emigration shares are likely to be a bit higher.

share of GDP, ranging from -1% (Australia) to $+1\%$ (Portugal).

In contrast, remittances are large, relative to GDP, for several non-OECD countries. For instance, Colombia, India, Mexico, and Nigeria report remittances of 3% of GDP. However, these are small compared to Jamaica (20%), Serbia and Montenegro (19.1%), El Salvador (17.8%), Philippines (15.5%) and the Dominican Republic (14.3%). Hence, for these countries it will be important to take remittances into account when evaluating the welfare impact of migration.

4 Calibration and Fit

We numerically implement the general multi-country model laid out in [Section 2](#). We use information on country sizes, fixed and variable trade costs, and bilateral migration flows and remittances to solve the model. Then we simulate the effects of un-doing the migration flows that we see in the data. That is, we repatriate all individuals back to their countries of origin.¹⁰

4.1 Parameter values

We implement the economy under the following parameter values (see [Table 2](#) for a summary). The elasticity of substitution is $\varepsilon_s = 6$. [Anderson and van Wincoop \(2004\)](#) report available estimates of this elasticity to be in the range of 3 to 10, and we pick a value close to the middle of the range. The key parameter is θ_s , as it governs the firm size distribution. As described in much more detail elsewhere (see, e.g., [di Giovanni and Levchenko, 2010](#)), in this model firm sales follow a power law with the exponent equal to $\frac{\theta_s}{\varepsilon_s - 1}$. In the data, firm sales follow a power law with the exponent close to 1. [Axtell \(2001\)](#) reports the value of 1.06, which we use to find θ_s given our preferred value of ε_s : $\theta_s = 1.06 \times (\varepsilon_s - 1) = 5.3$. We set both the elasticity of substitution and the Pareto exponent to be the same in the N and the T sectors. [Di Giovanni et al. \(2010\)](#) show that the reduced form exponent in the empirical distribution of firm size, which corresponds to $\theta_s/(\varepsilon_s - 1)$ in sector s is similar between the traded and non-traded sectors. It still could be the case that while $\theta_T/(\varepsilon_T - 1) \approx \theta_N/(\varepsilon_N - 1)$, the actual values of θ_s and ε_s differ. Since we do not have reliable information about how these two individual parameters differ across sectors, we adopt the most agnostic and neutral assumption that both θ_s and ε_s are the same in the two sectors.

¹⁰Recall that, due to data limitations, we can not undo the migration flows received by non-OECD countries.

We set the value of α – the share of non-tradeables in consumption – to be 0.65. This is the mean value of services value added in total value added in the database compiled by the Groningen Growth and Development Center and extended to additional countries by [Yi and Zhang \(2010\)](#). It is the value also adopted by [Alvarez and Lucas \(2007\)](#). The values of β_N and β_T – share of labor/value added in total output – are calibrated using the 1997 U.S. Benchmark Input-Output Table. We take the Detailed Make and Use tables, featuring more than 400 distinct sectors, and aggregate them into a 2-sector Direct Requirements Table. This table gives the amount of each input required to produce a unit of final output. Thus, β_s is equal to the share of total output that is not used pay for intermediate inputs, i.e., the payments to factors of production. According to the U.S. Input-Output Matrix, $\beta_N = 0.65$ and $\beta_T = 0.35$. Thus, the traded sector is considerably more input-intensive than the non-traded sector. The shares of non-traded and traded inputs in both sectors are also calibrated based on the U.S. I-O Table. According to the data, $\eta_N = 0.77$, while $\eta_T = 0.35$. Thus, more than 75% of the inputs used in the N sector come from the N sector itself, while 65% of T -sector inputs come from the T sector. Nonetheless, these values still leave substantial room for cross-sectoral input-output linkages.

Next, we must calibrate the values of τ_{ij} for each pair of countries. To do that, we use the gravity estimates from the empirical model of [Helpman et al. \(2008\)](#). Combining geographical characteristics such as bilateral distance, common border, common language, whether the two countries are in a currency union and others, with the coefficient estimates reported by [Helpman et al. \(2008\)](#) yields, up to a multiplicative constant, the values of τ_{ij} for each country pair. We vary the multiplicative constant so as to match the mean and median imports/GDP ratios observed in the data in our sample of countries. The advantage of the [Helpman et al. \(2008\)](#) estimates is that they are obtained in an empirical model that accounts explicitly for both fixed and variable costs of exporting, and thus correspond most closely to the theoretical structure in our paper. Note that in this formulation, $\tau_{ij} = \tau_{ji}$ for all i and j .

Next, we must take a stand on the values of f_{ii}^s and f_{ij}^s . To do this, we follow [di Giovanni and Levchenko \(2010\)](#) and use the information on entry costs from the Doing Business Indicators database ([The World Bank, 2007a](#)). This database collects information on the administrative costs of setting up a firm – the time it takes, the number of procedures, and the monetary cost – in a large sample of countries in the world. In this application, the particular variable we use is the amount of time required to set up a business. We favor this indicator compared to others that measure entry costs either in dollars or in units of per

capita income, because in our model f_{ii}^s is a quantity of inputs rather than value. We must normalize the f_{ii}^s for one country. Thus, we proceed by setting $f_{US,US}^s$ to a level just high enough to ensure an interior solution for production cutoffs.¹¹ This value of $f_{US,US}^s$ is a rather low one, implying that in the U.S. 95% of potential entrepreneurs produce. Then, for every other country f_{ii}^s is set relative to the U.S.. To be precise, if according to the Doing Business Indicators database, in country i it takes 10 times longer to register a business than in the U.S., then $f_{ii}^s = 10 \times f_{US,US}^s$. Since we do not have data on fixed costs of operating a business that vary by sector, we set f_{ii}^s to be equal in the N and T sectors.

To measure the fixed costs of international trade, we use the Trading Across Borders module of the Doing Business Indicators. This module provides the costs of exporting a 20-foot dry-cargo container out of each country, as well as the costs of importing the same kind of container into each country. Parallel to our approach to setting the domestic cost f_{ii}^s , the indicators we choose are the amount of time required to carry out these transactions. This ensures that f_{ii}^T and f_{ij}^T are measured in the same units. We take the bilateral fixed cost f_{ij}^T to be the sum of the cost of exporting from country j and the cost of importing into country i . The foreign trade costs f_{ij}^T are on average about 40% of the domestic entry costs f_{ii}^T . This is sensible, as it presumably is more difficult to set up production than to set up a capacity to export.¹²

Finally, we set the value of the “exploration cost” f_e such that the equilibrium number of operating firms in the U.S. is equal to 7 million. According to the 2002 U.S. Economic Census, there were 6,773,632 establishments with a payroll in the United States. There are an additional 17,646,062 business entities that are not employers, but they account for less than 3.5% of total shipments. Thus, while the U.S. may have many more legal entities than what we assume here, 7 million is a sufficiently high target number. Since we do not have information on the total number of firms in other countries, we choose to set f_e to be the same in all countries. In the absence of data, this is the most agnostic approach we could take. In addition, since f_e represents the cost of finding out one’s abilities, we do not expect it to be affected by policies and thus differ across countries. The resulting value of f_e is 15 times higher than $f_{US,US}^s$, and 2.4 times higher than the average f_{ii}^s in the rest of the sample. The finding that the ex-ante fixed cost of finding out one’s type is much higher

¹¹That is, we set $f_{US,US}^s$ to a level just high enough that $a_{ji}^s < 1/b_s$ for all $i, j = 1, \dots, \mathcal{C}$ in all the baseline and counterfactual exercises, with $1/b_s$ being the upper limit of the distribution of a .

¹²The results are very similar if we instead set the bilateral fixed cost to be the sum of domestic costs of starting a business in the source and destination countries: $f_{ij}^T = f_{ii}^T + f_{jj}^T$. This approach may be preferred if fixed costs of exporting involved more than just shipping, and required, for instance, the exporting firm to create a subsidiary for the distribution in the destination country.

than the ex-post fixed cost of production is a common one in the quantitative models of this type (see, e.g., Ghironi and Melitz, 2005).

4.2 Solution algorithm

Using these parameter values, summarized in Table 2, we can solve the full model for a given vector of L_i . To find the values of L_i , we follow the approach of Alvarez and Lucas (2007). First, as described in Section 2.1 L_i is not population *per se*, but a combination of the number of workers and the efficiency units – or labor productivity – that workers possess in country i . To obtain the values of L_i that are internally consistent in the model, we start with an initial guess for L_i for all $i = 1, \dots, \mathcal{C}$, and use it to solve the full model. Given the solution for wages, we update our guess for L_i for each country in order to match the GDP ratio between each country i and the U.S.. Using the resulting values of L_i , we solve the model again to obtain the new set of wages, and iterate to convergence (for more on this approach, see Alvarez and Lucas, 2007). Thus, our procedure generates vectors w_i and L_i in such a way as to match exactly the relative total GDPs of the countries in the sample. In practice, the results are not far from simply equating the relative total labor to the relative GDPs. In this procedure, we must normalize the population of one of the countries. We thus set L_{US} to its actual value of 300 million as of 2006, and compute L_i of every other country relative to this U.S. value. An important consequence of this approach is that countries with higher labor productivity A_{ii} will tend to have a greater number of potential productivity draws n_i^s , all else equal, since our procedure will give them a higher L_i . This is akin to the assumption adopted by Alvarez and Lucas (2007) and Chaney (2008), that the number of productivity draws is a constant multiple of equipped labor L_i . The difference in our approach is that we take labor-cum-productivity to be a measure of market size, we solve for n_i^N and n_i^T endogenously within the model.

4.3 Labor productivity parameters

Having obtained the estimates of the total efficiency-adjusted labor endowment L_i and the data on bilateral immigrant stocks N_{ji} for each destination and origin country, we obtain country-specific productivity A_{jj} for every country j by combining (1) and (2):

$$A_{jj} = \frac{L_j}{\sum_{i=1}^{\mathcal{C}} \phi_i N_{ji}}. \quad (17)$$

Clearly, this calculation requires assigning values to ϕ_i , the migration penalty in terms of labor productivity and wages. In our model this parameter is identified by the wage ratio

of immigrants to natives in each country. More specifically, in country i the ratio of native wages to the wages of immigrants from country j currently working in country i is given by ϕ_i , which is allowed to vary by country of origin. As discussed earlier, [Hendricks \(2002\)](#) reports that the gap between the earnings of immigrants and U.S. natives with the same observable skills is less than 25 percent for most source countries (1990 US Census data). In addition his findings confirm those in [Borjas \(1988\)](#) that the native-immigrant wage gap does not vary much by country of origin.

On this basis we consider two alternative parameterizations of our model: $\phi_i = 1$ and $\phi_i = 0.75$, common for all countries of origin. In the former the average wages of natives and immigrants will be equal in each country although they will differ across countries. In the latter immigrants' wages will be 25 percent lower than natives' wages in all countries. For ease of exposition our baseline calibration will have $\phi_i = 1$.¹³

Having estimated “native” labor productivity A_{jj} , our counterfactual experiments will evaluate the welfare in all countries of the world should all migrants return to their countries of origin. In this scenario the counterfactual effective labor forces of each country j would be:

$$\widetilde{L}_j = A_{jj} \sum_{i=1}^c N_{ij}, \quad (18)$$

where the tilde denotes the value in the no-migration counterfactual. That is, all the workers native to j that ever migrated to any destination country i are assumed to have stayed home and supplied labor with native productivity. We compute the welfare of both natives and migrants in the counterfactual world characterized by labor endowments (18). We will distinguish between the short- and the long-run effects of such an experiment.

4.4 Model Fit

Before describing the counterfactual results, we assess the model fit on overall and bilateral trade; as well as on how the total labor productivities implied by the model compare to GDP per capita at country level. The baseline is solved as the long-run equilibrium given the total populations (including migrants), total GDPs, and remittances in all countries as they are in the data in 2006.

[Figure 1\(a\)](#) reports the scatterplot of bilateral trade ratios, $\pi_{ij} = X_{ij}/w_i L_i$.¹⁴ Note that since in the data we only have bilateral trade as a share of GDP, not of total sales, we

¹³[Klein and Ventura \(2009\)](#) assume that international migration entails a 15% permanent loss in skills. Their choice is consistent with the estimates in [Borjas \(1996\)](#) and delivers realistic migration rates.

¹⁴Since the baseline is solved as the long-run equilibrium, total profits are zero and GDP is simply labor income.

compute the same object in the model. This captures both the distinction between trade, which is recorded as total value, and GDP, which is recorded as value added; as well as the fact that there is a large non-traded sector in both the model and in the data. On the horizontal axis is the natural logarithm of π_{ij} that comes from the model, while on the vertical axis is the corresponding value of that bilateral trade flow in the data.¹⁵ Hollow dots represent exports from one country to another, π_{ij} , $i \neq j$. Solid dots, at the top of the scatterplot, represent sales of domestic firms as a share of domestic absorption, π_{ii} . For convenience, we add a 45-degree line. It is clear that the trade volumes implied by the model match the actual data well. Most observations are quite close to the 45-degree line. It is especially important that we get the variation in the overall trade openness ($1 - \pi_{ii}$) right, since that will drive the contribution of trade to the welfare impact of migration in each country. **Figure 1(b)** plots the actual values of $(1 - \pi_{ii})$ against those implied by the model, along with a 45-degree line. We can see that though the relationship is not perfect, it is quite close.

Table 3 compares the means and medians of π_{ii} and π_{ij} 's for the model and the data, and reports the correlations between the two. The correlation between domestic shares π_{ii} calculated from the model and those in the data for this sample of countries is around 0.57. The correlation between export shares, π_{ij} , is actually higher at 0.78. Since we use estimated gravity coefficients together with the actual data on bilateral country characteristics to compute trade costs, it is not surprising that our model fits bilateral trade data quite well given the success of the empirical gravity relationship. Nonetheless, since the gravity estimates we use come from outside of our calibration procedure, it is important to check that our model delivers outcomes similar to observed trade volumes.

The model delivers a vector of implied labor productivities A_{jj} for each country, and we would like to compare these estimates to the data. Unfortunately, as a model object, A_{jj} reflects the physical productivity of a unit of labor, which we cannot measure in the data. In addition, in the model one native worker will receive a wage equal to $w_j A_{jj}$, and because of global market clearing wages of a single efficiency unit of labor will differ across countries as well. To match the model precisely with the data, we calculate in the model the real, PPP-adjusted per capita income (for a native worker), which is given by $w_j A_{jj} / P_j$, with $P_j = (P_j^N)^\alpha (P_j^T)^{1-\alpha}$ the consumption price level. This object is then directly comparable to income data from the Penn World Tables. **Figure 2** presents the scatterplot of the real PPP-adjusted per capita income for 2006 from the Penn World Tables on the x-axis against

¹⁵Note that the scatterplot is in log-log scale, so that the axes report the trade shares in levels.

the corresponding object in the model, along with a 45-degree line. The model matches the broad variation in per capita income in our sample of countries quite well. The countries line up along the 45-degree line, though it appears that the model tends to underpredict the relative income levels of poorer countries, and slightly over-predict the relative income levels of the richest countries. Overall, however, both the simple correlation and the Spearman rank correlation between the model and the data are 0.94.¹⁶

5 Counterfactuals

As discussed in [Section 2](#), we define the short run as the case in which the mass of potential firms (n_i^T and n_i^N) is fixed in each country i . Thus, to evaluate the short-run impact of migration on welfare, we compare the welfare in the counterfactual of no migration relative to the benchmark, *given the benchmark values of n_i^S* . In other words, all migrants return to their home countries but the set of potential firms remains unchanged. In the long-run counterfactual, we let n_i^S adjust to the new, no-migration population level.

It is worth noting that the welfare comparison between the baseline equilibrium and the no-migration counterfactual is far from obvious. Qualitatively, the increasing returns due to the fixed start-up costs suggest that population gains will be welfare enhancing. However, it is important to keep in mind that the countries that will receive large inflows of return migrants will simultaneously lose the remittances that those individuals used to send. Given that most migrants moved from low to high income countries, the loss in remittances can potentially be large relative to the country’s GDP. From the quantitative perspective, we note that the welfare effects from return migration will be mediated by the calibration of the firm-size distribution. As argued by [di Giovanni and Levchenko \(2010\)](#) this matters crucially for welfare analysis.

5.1 Welfare

In the baseline scenario a generic country i ’s population can be divided in three groups: individuals born in country i that stayed in the country (stayers), individuals born in country i that migrated to another country (emigrants) and individuals born in other countries that migrated to country i (immigrants). Individual welfare corresponds to the indirect

¹⁶The plots and the correlations are reported dropping United Arab Emirates, for which the model under-predicts real per capita income by about a factor of 2. U.A.E. is a very small, special economy for which we do not have immigration data, and thus the poor performance of the model regarding the U.A.E. is highly unlikely to affect any of the substantive results in the paper. Including U.A.E., the simple correlation between the model and the data is 0.91, and Spearman correlation is 0.94.

utility function. Since the direct utility function is CES and homothetic, indirect utility is simply an individual's income divided by the consumption price level. In the presence of remittances, we have to consider natives and migrants separately. We assume that outgoing remittances are sent by the migrants only, that is, natives living in their home country are not transferring any of their income abroad. We also assume that incoming remittances are received by natives only, that is, remittances from abroad coming into the country go to natives, and not to immigrants living in that country.¹⁷ Note also that we are implicitly assuming that immigrants' human capital remains unaffected by the migration experience. That is, upon return to their home country migrants bring no new skills and display the same skill level as the natives from their home country that never left the country. While a bit simplistic we think this is a reasonable starting point.¹⁸

Specifically, in the baseline equilibrium the utility levels enjoyed by the native stayers (born in j and working in j) and immigrants from country i working in country j are, respectively:

$$W_{jj} = \frac{w_j A_j + (\Pi_j^N + \Pi_j^T) / \sum_{k=1}^{\mathcal{C}} N_{jk} + R_j^{in} / N_{jj}}{P_j},$$

and

$$W_{ji} = \frac{\phi_i w_j A_j + (\Pi_j^N + \Pi_j^T) / \sum_{k=1}^{\mathcal{C}} N_{jk} - R_{ji}^{out} / N_{ji}}{P_j},$$

where $\sum_{k=1}^{\mathcal{C}} N_{jk}$ is the total population of country j , including both immigrants and natives, R_j^{in} is the total gross amount of remittances received by the native stayers in country j from the rest of the world, R_{ji}^{out} are the total gross remittances that individuals born in country i and working in country j send to their country of origin, and $P_j = (P_j^N)^\alpha (P_j^T)^{1-\alpha}$ is the consumption price level for all residents of country j .¹⁹ We make the assumption that all residents of a country have an equal number of shares to domestic profits. That is, non-natives receive the same per capita profits as native stayers. As discussed earlier, there are positive profits in the short run. In the long run, due to free entry, profits are zero.

In the counterfactual scenario each country's population is composed by the individuals that were born in that country, including both those that never left and returnees.²⁰ Our

¹⁷For example, remittances from Mexicans working in the United States are received by native Mexicans living in Mexico, and not by Guatemalan immigrants living in Mexico or by Mexicans living in Spain. We lack data to evaluate the plausibility of this assumption but we think it is reasonable and it is not likely to bias our results in any economically important manner.

¹⁸See [Rauch and Trindade \(2002a\)](#) and [Rauch and Trindade \(2003\)](#) for estimates of the effects of migration on enhancing trade flows via the information conveyed through ethnic networks.

¹⁹Recall that R_j was used to denote the total net remittances received by country j from the rest of the world, which can take both positive and negative values.

²⁰Recall the caveat that we lack data on the distribution of immigrants by origin country for non-OECD

measures of individual welfare in the counterfactual equilibrium where all migrants return to their countries of origin are analogous to the previous expressions, with the proviso that all remittances disappear from the equations. Now all residents of country j are natives of that country: some had never left and others are return migrants. Hence, counterfactual individual utility in country j is given by

$$\widetilde{W}_{jj} = \frac{\widetilde{w}_j A_j + (\widetilde{\Pi}_j^N + \widetilde{\Pi}_j^T) / \sum_{k=1}^C N_{kj}}{\widetilde{P}_j},$$

where the tilde denotes the value in the no-migration counterfactual.

5.2 The Long Run

Table 4 reports our main results. Here we use the utility of a native stayer as our measure of welfare. Specifically, for each country, we report the proportional difference in the real income of a native stayer in the counterfactual where all migrants have returned to their countries of origin relative to her real income in the benchmark scenario. Thus positive (negative) values will be interpreted as evidence that a country would have better (worse) off in a world without international migration. The first column presents the long-run change in welfare. We break up the sample into OECD countries, which are both destinations and origins, and the non-OECD countries, for which we only have data on on out-migration. Roughly, we can think of the first group (left panel) as the migrant-receiving countries (the North) and the second group (right panel) as the migrant-sending countries. But keep in mind that there is substantial North-North migration as well.

The bottom rows present some summary statistics. In the long run equilibrium, the average country in the North would experience a utility loss of 2.43% should all migrants return to their home countries. However, among this group there is substantial dispersion. The standard deviation is larger than the mean change in welfare (2.99%). Turning to the right panel, we find that the average country in the South also experiences a loss from return migration of a similar magnitude (2.24%), with an even larger standard deviation (3.62%). The intuition for why there is a loss for both groups is that the allocation of labor is more efficient in the baseline equilibrium since migrants tend to go to high-TFP destinations. As a result there is an increase in the world's total efficiency units of labor. This is reminiscent

countries. Hence, the counterfactual population in these countries includes native stayers, immigrants and returnees from OECD countries. Thus the change in population experienced by these countries is equal to their baseline share of emigrants. To the extent that most remittances received by non-OECD countries originate in OECD countries this will not have a significant impact on our results.

of the forces highlighted in [Klein and Ventura \(2007\)](#) in their analysis of the welfare costs of barriers to international labor mobility.²¹ The main recipients of immigrants (the North) expand the number of varieties they produce. The countries of origin benefit, both because they are able to import the new varieties and because of remittances. Their emigrants are now typically experiencing large increases in earnings and a fraction of those is being shared with the native stayers through remittances.²²

Let us now turn to the outcomes for individual countries. At one extreme, the natives of the OECD countries (the North) with the largest baseline shares of foreign-born in the population, such as Australia, New Zealand, and Canada would experience a substantial welfare loss should all migrants return to their home countries. Respectively, the changes in welfare for these countries are -11.04% , -6.72% , and -6.96% , compared to the baseline utility level. It is worth noting that some OECD countries, such as Greece and Portugal, are slightly better off (about 1%) in the no-migration counterfactual. As [Table 1](#) shows, these are the OECD countries with noticeable net out-migration, and thus their population would actually increase if *all* migration were reversed. Nevertheless, as noted earlier, the mean effect of reversing migration on the OECD would be a sizeable welfare loss (-2.43%).

The non-OECD countries display a similar range of outcomes. At the top end of the distribution, Trinidad and Tobago (3.83%), Mexico (1.22%), and Turkey (1.05%) would be better off if all migrants returned to their home countries. However, the typical country in the South would lose out. For instance, welfare in El Salvador, the Dominican Republic, Jamaica, and the Philippines would fall by approximately 10%.

To better understand these results, it is helpful to decompose them into three components: the role of country size, international trade, and remittances. We shall present these results using scatter plots. Given the central role of population changes in driving the results, the horizontal axis in all the following figures is the percentage change in the total population between the baseline and the counterfactual scenarios (column 3 of [Table 1](#)). A positive value is a population gain due to return migration.

[Figure 3](#) summarizes the main results. Solid dots depict the welfare change in the long-run counterfactual (the first column of [Table 4](#)). Two points are worth noting. First, among countries suffering population loss in the counterfactual (mainly the North), there is a fairly linear relationship between population change and changes in welfare. Namely, the larger

²¹Their model features two regions and a single good. Both international trade and remittances is absent from their analysis.

²²[Iranzo and Peri \(2009\)](#) first formalized the argument that migration source countries benefit from migration through increased access to new varieties through imports. Their analysis does not take remittances into account and is conducted in a two-region setup.

the population loss, the larger the welfare loss. For instance, Australia would lose 22.6% of its population, leading to a -11.04% change in the welfare of its native stayers. In contrast, among countries experiencing population gains we find instances of welfare gains as well as welfare losses. El Salvador and Trinidad and Tobago are a case in point. Respectively, these countries would gain 19% and 17.9% in terms of population. But while the former would suffer a welfare loss of 9.1%, the latter would experience a welfare gain of 3.83%. As we show below, the diverging effects of return migration on these two countries have to do with the role of remittances.

Figure 3 plots the results from two additional counterfactual scenarios. The hollow dots report the welfare changes of undoing all migration in a world with international trade, but assuming there are no remittances. The hollow triangles show the welfare changes assuming away both remittances and international trade. The results are striking. In the absence of remittances the relationship between population change and welfare changes is roughly monotonic (hollow dots). The larger the population gain is in the counterfactual, the larger the welfare gain for native stayers. In particular, we note that El Salvador and Trinidad and Tobago would now experience practically the same welfare gain (about 5%). The key is that remittances are a very large share of income in El Salvador, while this is not the case in Trinidad and Tobago. If remittances are ignored then the evaluation of the changes in welfare for the natives of these two countries delivers very similar results. Note also that for the countries experiencing large population losses in the counterfactual (the North) the welfare change is very similar in the scenarios with and without remittances. This is because the remittances originated in these countries are very small relative to the country's GDP. Finally, it is also worth noting that the relationship between population welfare changes in the absence of remittances is not linear but roughly concave, indicating a lower elasticity for countries with very large counterfactual population gains. We will provide an intuition for this result shortly.

In turn let us now examine the changes in welfare when the thought experiment of return migration is conducted in a world without international trade (autarky) and no remittances. The resulting welfare changes are plotted using hollow triangles. Relative to the scenario with trade but no remittances the distribution of welfare changes is left practically unchanged. But note though that the relationship between population and welfare changes now becomes almost perfectly linear. What is responsible for the difference in the slope of the relationship between population and welfare changes relative to the scenario with trade (and no remittances)? Our theory implies that in autarky a population

gain will translate into a (long-run) increase in domestic varieties, which turns out to be fairly linear. However, in the presence of trade the resulting welfare gain is moderated by the reduction in the number of varieties that are available through international imports, giving rise to a decreasing marginal welfare gain.

It is worth stressing that the role of international trade in determining the size of the welfare changes from return migration is fairly large, particularly for those countries receiving large numbers of return migrants, relative to their labor force. For example, if we ignored the role of international trade (hollow triangles) we would conclude that the real income of natives from El Salvador would have been almost ten percent higher in the absence of migration. However, when the consequences of trade are considered (hollow dots) the gain is approximately five percent only.

All in all, two conclusions emerge from this Figure. First, there is a strong positive relationship between welfare and population change in the long run. Countries that experience gains in population due to return migration tend to enjoy large increases in welfare. However, these results need to be qualified in the case of countries that are large receivers of remittances, relative to their GDP. For some of these countries return migration has catastrophic welfare consequences. The gains from larger domestically produced varieties are dwarfed by the loss of remittances accompanying the return of migrants.

5.3 The Short Run

Let us now analyze the effects of undoing migration in the short run, that is, we reallocate all individuals to their countries of origin but we keep unchanged the baseline mass of potential entrepreneurs in each country n_i^N and n_i^T . Recall that changes in a country's labor force will thus affect the number of operating firms *only* through changes in the operating cutoff.

The changes in the welfare of native stayers for each country can be found in the second column of [Table 4](#). As shown in the bottom rows of the Table, the short-run mean welfare loss for the countries in the North (left panel) is much smaller than in the long run, at -0.49% compared to the previous -2.43% . By and large, in the short run the welfare of natives in the OECD countries would be unaffected if migration were reversed. Turning now to the South (right panel), we find a welfare loss also for these countries. As was the case in the long run, both the average natives in the North and in the South lose out. However, the average loss is now larger, at -3.44% instead of the previous -2.24% , for the average native stayer in the South.

Let us now examine the whole cross-country distribution. Again we find it helpful to

present the results using a scatter plot in order to isolate the roles of country size, trade openness and remittances (Figure 4). As was the case in the long run, we observe a different relationship between population and welfare changes in the subsamples of countries experiencing population losses and gains. For the former group of countries, there is practically no effect on welfare regardless of the size of the population loss in the counterfactual scenario. For instance, even though Australia and Canada would lose 22.6% and 15.4% of their respective populations, they would experience negligible changes in their welfare. In stark contrast, among countries experiencing net population gains (essentially, the South), there appears to be a systematic *negative* association between population and welfare change: the larger the population gain, the larger the welfare loss for native stayers. Furthermore we again find large differences in the welfare change among some countries with very similar population gains. As before, El Salvador would lose a lot in the no-migration scenario (almost 15%), compared to Trinidad and Tobago (-1.99%) despite both experiencing a similar population gain in the counterfactual. As we discuss below, this is once again due to the large difference in the size of remittances for these two countries.

To explain these results it is helpful to proceed in two steps. We first comment on the role of remittances and later turn to international trade. It turns out that once country heterogeneity in remittances is removed, the relationship between population and welfare changes becomes roughly monotonic. As illustrated by the hollow dots in Figure 4, under trade but no remittances, larger population *gains* in the counterfactual lead to larger welfare *losses*.²³

Let us now turn to the role of international trade. Comparing the hollow triangles and dots in the Figure we find that the relationship between population gain and welfare changes disappears. Welfare will be practically unaffected by undoing migration, regardless of whether any particular country experiences a net loss or a net gain in terms of population.

What accounts for the sharply different relationship between population and welfare gains in the short run and in the long run? Setting aside remittances, a change in population brings about two substantial changes to the economy: larger labor force bids down the wage, *ceteris paribus*; and additional firms enter, raising variety available for consumption and for use as intermediates, thereby raising both labor productivity and welfare. What is crucial for the latter effect is the characteristics of these additional entering firms. In the short run, the set of potential projects available in the economy is fixed. Thus, any new entry that occurs in response to migration is by the least productive firms, that before the inflow of

²³Recall that this relationship is positive in the long run.

new workers were not sufficiently productive to find it worthwhile to operate.

Quantitatively, it matters crucially *how much* less productive these new entrants are relative to the firms that are already in the market. For this, the calibration to the observed firm size distribution (Zipf’s Law) plays an important role. Essentially, the observed firm size distribution contains information on the relative productivity of the marginal firms compared to the inframarginal ones. The extremely skewed firm size distribution observed in the economy implies that the inframarginal, existing firms are vastly more productive, and thus matter much more for welfare, than the marginal ones (for a detailed exploration of this result, see [di Giovanni and Levchenko, 2010](#)).

Thus, in the countries gaining population in the counterfactual, the short-run entry by the least productive firms leads to only limited gains from variety that are not enough to compensate for the lower equilibrium wages, leading ultimately to welfare losses (even not taking into account the loss of remittances). By the same token, in the countries losing population in the counterfactual (Australia, Canada), the marginal, least productive firms drop out, but they were much less productive than the large firms that remain. Thus, any short run welfare loss from decreased variety is fairly modest.

The principal benefit from having a larger population lies in the additional net entry that occurs in response – a larger n_i^s . When an increase in population leads more entrepreneurs to draw their productivity, some of those new draws will turn out to be very productive, stimulating entry everywhere in the productivity distribution. Because the long-run entry will feature some very productive firms, it will have a much larger impact on welfare. Once again, here the calibration to the observed firm size is quantitatively important, because it tells us just how productive the firms at the top of the distribution are, and thus how much they will matter for welfare.

5.4 Imperfect skill transferability

In our baseline scenario the overall long-run welfare gains from migration stemmed from the global increase in units of efficiency of labor from the point of view of the world. This is because most migrants move from low to high TFP countries, as analyzed by [Klein and Ventura \(2007\)](#) and [Klein and Ventura \(2009\)](#). However, our estimates of these welfare gains are likely to be too high. The reason is that typically migrants earn less than comparable natives, possibly reflecting the loss in human capital associated to imperfect transferability of skills across countries.

In order to gauge the role of imperfect skill transferability on our previous results we now

compute the long-run welfare changes by assuming that immigrants have a 25% productivity disadvantage compared to natives (or, in the notation of [Section 2.1](#), $\phi = 0.75$). [Figure 5](#) compares the welfare changes in the long run under the assumption of no human capital loss (solid dots) to the welfare changes under $\phi = 0.75$ (hollow dots). The former data points correspond exactly to the long-run welfare changes (under trade and remittances) in [Figure 3](#).

Essentially, accounting for the imperfect transferability of skills uniformly increases the welfare gains from return migration. We note though that the largest changes accrue to the countries in the North. Specifically, these countries suffer a smaller welfare loss as a result of the net population loss due to return migration. This is intuitive: given $\phi = 0.75$, the loss of one migrant labor is 25% lower in terms of efficiency units of labor than in the baseline scenario with $\phi = 1$. The difference is quantitatively important for the countries with large immigrant shares in the baseline equilibrium. For Australia the welfare loss accounting for imperfect skill transferability is 8.6%, as opposed to 11% in the setup with $\phi = 1$.

Note though that the effect is not symmetric since the countries in the South receive the same efficiency units of labor regardless of the value of ϕ . The only differences between the two scenarios are due to the global general equilibrium effects through trade, which are evidently minor.

5.5 The Welfare of Migrants

The discussion above describes the welfare impact of migration on the native stayers, and thus highlighted primarily the general equilibrium effects of migration through population changes and the role of remittances. The model can also be used to understand the impact of migration on the welfare of the migrants themselves. The dominant mechanism here is the labor productivity differential between the source and destination countries, which in the case of developing-developed comparisons is quite large. Thus, an individual from country j produces with A_{jj} in her home country, and with $\phi_j A_{ii}$ in foreign country i . Since the differences between A_{jj} and $\phi_j A_{ii}$ are often several-fold, the welfare impact of migration on migrants' earnings is large, as has been commonly observed in micro data (see [Hanson, 2009](#); [Clemens et al., 2008](#))).

[Table 5](#) reports, for selected country pairs, the percentage change in a migrant's welfare (real income) in the long-run counterfactual (in which she is living in the home country)

compared to the baseline, (in which she is living in the host country).²⁴ Thus, a negative number means that the migrant would be worse off if she returned to the home country. Columns 1 and 2 report, respectively, the long-run and short-run changes in the migrant’s welfare associated to returning to the home country. Throughout we assume that skills are perfectly transferable ($\phi = 1$). Let us first discuss the long-run results (column 1). Clearly, the welfare losses for the migrants themselves associated to returning all migrants to their home countries would be large. In the long run, a Canadian immigrant to the U.S. would lose 33.5% of her initial real income in returning to Canada, while a Spanish immigrant to the U.S. would suffer a 24.7% loss. A Salvadorean (Mexican) in the United States that were returned to El Salvador (Mexico) would suffer a 94.2% (83.4%) loss in real income and the earnings of an Indian in Australia returned to her home country would fall by 97.9%. Likewise a Turkish worker in Germany that were returned to Turkey would see her earnings reduced by 87.8%. The average migrant would lose 69.4% of her earnings. Turning now to the short-run estimates (column 2), we observe that the coefficients are uniformly lower but still very sizeable. For the average migrant the short-run loss in real earnings is -48.8% . This is sensible: one of the benefits of migration in the long run is stimulating net entry and raising welfare through increased variety. That channel is largely turned off in the short run.

Thus the loss from return migration for the migrants themselves is very large. This is largely due to the fact that most individuals migrated from low to high TFP countries. It is also interesting to aggregate native stayers and migrants and compute the change in welfare for the average individual in each country, including both groups. The resulting figures for the short run and long run, respectively, are -2.2% and -2.6% .²⁵ These figures are very close to what we obtained earlier for native stayers, reflecting the fact that migrants are a small share of the world population.

6 Discussion

Klein and Ventura (2009) analyze the welfare costs of barriers to international labor mobility. They consider a dynamic, two-region model with a single good, produced using capital, labor

²⁴Note that these welfare changes are somewhat different from the evaluations of the similar question in the empirical literature. Those studies compare the earnings of comparable individuals across locations for given factor prices. In our experiment, we compute the earnings before and after *all* the migrants in the world are returned to their home countries, allowing for general-equilibrium effects on all prices.

²⁵Technically, we take the simple average of the percentage welfare change across all the individuals in the world, migrants and the non-migrants.

and land. In their model capital moves costlessly across regions. Workers can move but at a cost. Land is not mobile. In their setup migration decisions are endogenous and there is capital accumulation. Their calibration takes into account international differences in labor quality and total factor productivity.

Even though their setup is very different from ours, their results offer an interesting complementary view of the main questions addressed in our paper. They find that removing barriers to labor mobility would induce very large population movements, from the low to the high TFP region. This migration would be accompanied by large capital flows, resulting in large effects on output and welfare. They also show that assuming that capital is fixed in its original location would reduce the estimated effects roughly by half. Despite the large differences in the economic setup employed, our results are highly consistent with theirs. We also find large elasticities of migration-induced population change to output and real income. Underlying these large estimates is the fact that the typical migrant moved from a low to a high TFP location. Also consistent with their findings, allowing for capital adjustments (in the form of changes in the mass of potential entrepreneurs) greatly magnifies the estimated welfare effects of migration.

From a modeling perspective, our approach is much more similar to [Iranzo and Peri \(2009\)](#), in the sense of estimating the effects of immigration explicitly taking into account the implications for international trade. These authors consider a two-region, two-sector model. One sector produces a homogeneous good while the other produces a continuum of varieties under monopolistic competition. One region is characterized by high TFP and relatively better technology at producing the differentiated good. Trade is subject to iceberg costs and migration entails a cost in terms of skill loss. Production requires only labor and workers are heterogeneous in their units of efficiency of labor. In comparison, our model has a large number of countries, features heterogeneity in firm productivity, realistic trade costs and, most importantly, we explicitly take into account the role of international remittances.

The main mechanism in [Iranzo and Peri \(2009\)](#) is also present in our model. Namely, in migrating to a higher TFP country, migrants fuel an expansion in variety that allows the world as a whole, and the source region in particular, to benefit from greater variety of goods and lower prices through international trade.²⁶ By explicitly accounting for country-level heterogeneity in several dimensions, our analysis produces a more credible quantitative assessment of the relevance of this mechanism. On top of that, our results highlight the

²⁶[Iranzo and Peri \(2009\)](#) also report differences in the welfare of the native and migrant populations by skill levels. In their analysis more skilled workers display higher migration rates and, as a result, skilled workers in the receiving region lose out from a reduction in barriers to migration.

large role played by remittances, both qualitatively and quantitatively, in determining the welfare effects of migration for each country.

Admittedly, our analysis has abstracted from several important elements. Chiefly, we have ignored any direct links between migration and trade. In particular, we have ruled out trade-enhancing effects of immigration via information dissemination. [Rauch and Trindade \(2002b\)](#) show that ethnic Chinese networks increased bilateral trade, with a larger effect on differentiated products. They argue the effect operates through an improved match between buyers and sellers as well as better enforcement mechanisms. Incorporating this mechanism into the pattern of trading costs in the model seems feasible, but has been left out from the present analysis to maintain comparability with the benchmark models used in the recent trade literature.

7 Conclusions

Our main contribution in this paper is to evaluate quantitatively the welfare effects of international migration using a model with a large number of countries. Most importantly, our model explicitly incorporates international remittances. Our model is calibrated to match the firm size distribution as well as a large set of relevant moments. The calibrated model accounts quite well for the main features of international trade in the data. We use the model to evaluate the short and long-run effects of undoing the existing bilateral migration flows.

Our analysis delivers several interesting findings. First, we find that international migration has large effects, both on economic outcomes and on welfare. The largest effects are on the migrants themselves. The average migrant's real income and welfare would have been 69.4% lower in the absence of all migration in the long run. However, the effects on natives are also sizeable. The real income of the average native stayers in the North and in the South would have been, respectively, 2.43% and 2.24% lower in a no-migration world. To cite a few examples, welfare in large immigration countries, such as Australia and Canada, would have been roughly 10% lower in the absence of international migration. Likewise, native stayers in high emigration countries would also have experienced similarly sized welfare and real income losses. Underlying these results is the fact that the typical migrant moved from a low to a high TFP region, leading to an overall increase in efficiency units of labor worldwide (as in [Klein and Ventura, 2009](#)).²⁷ As a result, all countries gained

²⁷See also [Armenter and Ortega \(2010\)](#) for a multi-region analysis in the context of US internal migration where the interaction between TFP differences and migration flows plays an important role. [Armenter and](#)

access to a larger set of varieties, partially compensating the migration source countries for their *brain drain*, as in [Iranzo and Peri \(2009\)](#).

Second, examination of the cross-country relationship between population gains due to return migration and welfare gains reveals a systematic *positive* relationship. Countries with a counterfactual population gain tend to benefit. The reason is that the increase in the scale of the economy, in terms of the labor input, allows the country to increase the set of varieties it produces and exports.

Third, our estimates of the welfare effects of migration differ substantially in the short and in the long run. The main difference between the two time horizons is that in the short run we assume that the mass of potential entrepreneurs remains unaffected when migrants return to their home countries. Our analysis reveals that the typical native stayer in the North would have suffered only a 0.49% loss in real income and welfare in the absence of migration. This is because the labor outflow would trigger downsizing in the least productive operating firms, with little general equilibrium effects. In contrast, the typical native stayer in the South would lose about 50% more than in the long-run scenario (3.44% versus 2.24%). The reason for this asymmetry is that to absorb the incoming labor flows the receiving country would have to start up marginal low-productivity projects that were deemed unprofitable in the benchmark equilibrium. Put differently, in the short-run equilibrium increases in the size of the labor force have to be absorbed solely through increases in output along the intensive margin, which lowers wages and worsens the terms of trade. As a result, in the short-run equilibrium population and welfare gains are *negatively* related.

Finally, these results mask a great deal of heterogeneity across countries. In several instances we find country pairs that while featuring very similar changes in population in the counterfactual scenario, experience very different changes in welfare.²⁸ The crucial element accounting for this diverging experiences is the size of remittances relative to income for these countries. For countries that receive large remittances, such as El Salvador or the Philippines, the welfare and real income of their native stayers would fall substantially in the no-migration counterfactual scenario. The reason is that even though they would experience large increases in their respective labor forces (19% and 3%, respectively), they would also lose the remittances that they are currently receiving (17.8% and 15.5% of their respective GDP). Hence, failing to account for the role of remittances severely bias the estimates of

Ortega (2011) provide a theoretical analysis of the two-skill, two-region case.

²⁸See, for instance, El Salvador and Trinidad and Tobago.

the welfare effects of migration for an important subset of countries.

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Table 1. Country Sample and Migrant Stocks

Country	Share		Population Change		Remittances		Country	Share		Population Change		Remittances	
	Immigrants	Emigrants	in Counterfactuals	in Counterfactuals	/GDP	/GDP		Immigrants	Emigrants	in Counterfactuals	in Counterfactuals	/GDP	/GDP
			<i>Destination and Source Countries</i>					<i>Source Only Countries</i>					
Australia	0.242	0.015	-0.226	-0.009			Algeria	0.025	0.025	0.025	0.023		
Austria	0.108	0.046	-0.062	0.001			Argentina	0.012	0.012	0.012	-0.004		
Belgium	0.108	0.030	-0.078	0.014			Belarus	0.005	0.005	0.005	0.001		
Canada	0.185	0.032	-0.154	-0.016			Brazil	0.005	0.005	0.005	0.005		
Czech Republic	0.023	0.026	0.003	0.005			Bulgaria	0.037	0.037	0.037	0.082		
Denmark	0.058	0.038	-0.019	0.001			Chile	0.016	0.016	0.016	-0.002		
Finland	0.034	0.053	0.019	0.002			China	0.003	0.003	0.003	0.012		
France	0.076	0.017	-0.060	-0.001			Colombia	0.023	0.023	0.023	0.034		
Germany	0.064	0.033	-0.031	-0.004			Croatia	0.103	0.103	0.103	0.020		
Greece	0.014	0.066	0.052	-0.002			Dominican Republic	0.097	0.097	0.097	0.143		
Hungary	0.034	0.030	-0.005	-0.003			Ecuador	0.068	0.068	0.068	0.050		
Ireland	0.129	0.156	0.026	-0.007			Egypt, Arab Rep.	0.004	0.004	0.004	0.042		
Italy	0.025	0.042	0.018	-0.002			El Salvador	0.190	0.190	0.190	0.178		
Japan	0.015	0.005	-0.010	-0.001			India	0.003	0.003	0.003	0.030		
Korea, Rep.	0.011	0.038	0.028	-0.001			Indonesia	0.002	0.002	0.002	0.007		
Netherlands	0.101	0.047	-0.055	-0.002			Iran, Islamic Rep.	0.011	0.011	0.011	0.006		
New Zealand	0.251	0.128	-0.122	0.003			Israel	0.021	0.021	0.021	-0.023		
Norway	0.086	0.030	-0.056	-0.002			Jamaica	0.317	0.317	0.317	0.200		
Poland	0.001	0.046	0.045	0.012			Malaysia	0.010	0.010	0.010	-0.006		
Portugal	0.023	0.134	0.111	0.010			Mexico	0.107	0.107	0.107	0.031		
Slovak Republic	0.005	0.041	0.036	0.006			Nigeria	0.003	0.003	0.003	0.031		
Spain	0.116	0.016	-0.100	-0.003			Pakistan	0.005	0.005	0.005	0.044		
Sweden	0.106	0.022	-0.083	-0.005			Philippines	0.030	0.030	0.030	0.155		
Switzerland	0.137	0.035	-0.103	-0.007			Romania	0.070	0.070	0.070	0.058		
United Kingdom	0.084	0.060	-0.024	-0.003			Russian Federation	0.008	0.008	0.008	0.001		
United States	0.119	0.003	-0.116	-0.008			Saudi Arabia	0.004	0.004	0.004	-0.049		
							Serbia and Montenegro	0.106	0.106	0.106	0.191		
							South Africa	0.011	0.011	0.011	0.001		
							Thailand	0.006	0.006	0.006	0.002		
							Trinidad and Tobago	0.179	0.179	0.179	0.006		
							Turkey	0.038	0.038	0.038	-0.001		
							Ukraine	0.019	0.019	0.019	-0.010		
							United Arab Emirates	0.003	0.003	0.003	-		
							Venezuela, RB	0.011	0.011	0.011	-0.004		
							Rest of World	0.011	0.011	0.011	0.021		

Notes: This table presents the countries in the sample, broken down into those for which inward migration data are available for 2006 (the OECD), and those for which only outward migration to the OECD data are available. The first column presents the percentage of foreign born in total population. The second column presents the share of emigrants from each country to the receiving countries in the sample, as a share of the remaining population. The last column presents the percentage change in the population if all the emigrants never left, and all the immigrants never arrived. This is the percentage change in the population evaluated in the counterfactual. Source: [The World Bank \(2007b\)](#); [OECD \(2011\)](#).

Table 2. Parameter Values for Symmetric and Non-Symmetric Country Simulations

Parameter	Baseline	Source
ε ^a	6	Anderson and van Wincoop (2004)
θ ^b	5.3	Axtell (2001): $\frac{\theta}{\varepsilon-1} = 1.06$
α	0.65	Yi and Zhang (2010)
$\{\beta_N, \beta_T\}$ $\{\eta_N, \eta_T\}$	$\{0.65, 0.35\}$ $\{0.77, 0.35\}$	1997 U.S. Benchmark Input-Output Table
τ_{ij} ^{c,d}	2.30	Helpman et al. (2008)
f_{ii} ^c	14.24	The World Bank (2007a); normalizing $f_{US,US}$
f_{ij} ^c	7.20	so that nearly all firms the U.S. produce
f_e	34.0	To match 7,000,0000 firms in the U.S. (U.S. Economic Census)

Notes:

^a Robustness checks include $\varepsilon = 4$ and $\varepsilon = 8$.^b Robustness checks include $\frac{\theta}{\varepsilon-1} = 1.5$ and $\varepsilon = 6$, so that $\theta = 6.5$.^c Average in our sample of 60 countries.^d $\tau_{ij} = \tau_{ji}$. Trade costs are adjusted by a constant ratio to match the median-level of openness across the 60-country sample.**Table 3.** Bilateral Trade Shares: Data and Model Predictions for the 60-Country Sample

	Model	Data
Domestic sales as a share of domestic absorption (π_{ii})		
mean	0.7559	0.7286
median	0.7468	0.7697
corr(model,data)	0.5662	
Export sales as a share of domestic absorption (π_{ij})		
mean	0.0041	0.0042
median	0.0018	0.0042
corr(model,data)	0.7822	

Notes: This table reports the means and medians of domestic output (top panel), and bilateral trade (bottom panel), both as a share of domestic absorption, in the model and in the data. Source: International Monetary Fund (2007).

Table 4. Proportional Change in Native Welfare in the Counterfactual Relative to Benchmark

Country	Destination and Source Countries		Country	Source Only Countries	
	Long Run	Short Run		Long Run	Short Run
Australia	-0.1104	-0.0025	Algeria	-0.0160	-0.0217
Austria	-0.0339	-0.0061	Argentina	0.0002	-0.0022
Belgium	-0.0479	-0.0146	Belarus	-0.0129	-0.0106
Canada	-0.0696	0.0033	Brazil	-0.0030	-0.0044
Czech Republic	-0.0109	-0.0089	Bulgaria	-0.0574	-0.0663
Denmark	-0.0144	-0.0041	Chile	0.0025	-0.0016
Finland	-0.0016	-0.0057	China	-0.0082	-0.0092
France	-0.0323	-0.0046	Colombia	-0.0213	-0.0282
Germany	-0.0171	-0.0019	Croatia	-0.0049	-0.0338
Greece	0.0109	-0.0064	Dominican Republic	-0.0924	-0.1169
Hungary	-0.0061	-0.0022	Ecuador	-0.0234	-0.0447
Ireland	0.0010	-0.0042	Egypt, Arab Rep.	-0.0352	-0.0343
Italy	0.0042	-0.0015	El Salvador	-0.0910	-0.1431
Japan	-0.0051	-0.0003	India	-0.0260	-0.0258
Korea, Rep.	0.0091	-0.0014	Indonesia	-0.0068	-0.0065
Netherlands	-0.0272	-0.0020	Iran, Islamic Rep.	-0.0026	-0.0060
New Zealand	-0.0672	-0.0109	Israel	-0.0005	-0.0014
Norway	-0.0253	-0.0004	Jamaica	-0.0828	-0.1660
Poland	-0.0002	-0.0143	Malaysia	-0.0062	-0.0057
Portugal	0.0149	-0.0196	Mexico	0.0122	-0.0264
Slovak Republic	-0.0020	-0.0117	Nigeria	-0.0278	-0.0262
Spain	-0.0490	-0.0041	Pakistan	-0.0355	-0.0351
Sweden	-0.0350	0.0013	Philippines	-0.1062	-0.1161
Switzerland	-0.0467	-0.0010	Romania	-0.0286	-0.0497
United Kingdom	-0.0152	-0.0027	Russian Federation	-0.0022	-0.0040
United States	-0.0559	0.0000	Saudi Arabia	-0.0036	0.0059
			Serbia and Montenegro	-0.1184	-0.1465
			South Africa	-0.0015	-0.0037
			Thailand	-0.0060	-0.0062
			Trinidad and Tobago	0.0383	-0.0199
			Turkey	0.0105	-0.0032
			Ukraine	-0.0041	-0.0061
			United Arab Emirates	-0.0017	-0.0014
			Venezuela, RB	0.0002	-0.0019
Mean	-0.0243	-0.0049	Mean	-0.0224	-0.0344
Std. Dev.	0.0299	0.0055	Std. Dev.	0.0362	0.0471

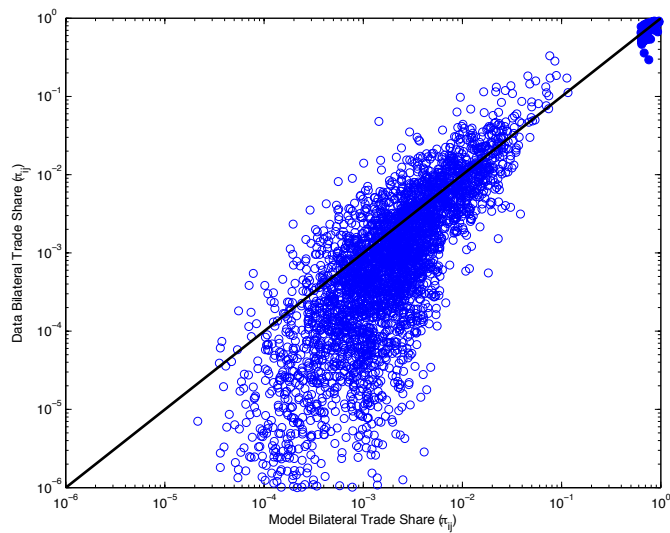
Notes: This table presents the proportional change in welfare in the no-migration counterfactual relative to the baseline. The measure of welfare employed here is the real income of the average native stayer. The first column in each panel compares welfare in the long run, the second column in the short run.

Table 5. Change in Migrants' Welfare

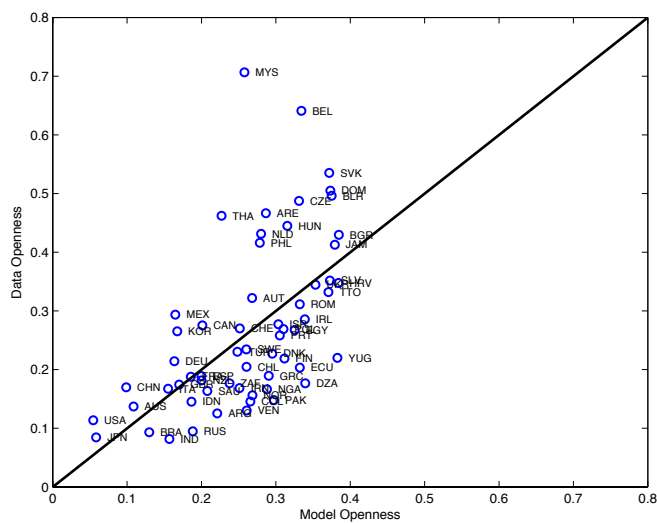
	Long Run	Short Run
Canada → United States	-0.335	-0.227
Spain → United States	-0.247	-0.161
Mexico → United States	-0.834	-0.616
El Salvador → United States	-0.942	-0.729
Poland → United Kingdom	-0.822	-0.629
Turkey → Germany	-0.878	-0.656
New Zealand → Australia	-0.289	-0.191
India → Australia	-0.979	-0.706
Migrant Mean	-0.694	-0.488
Change in Global Welfare	-0.026	-0.022

Notes: This table presents the welfare (real income) changes of migrants in the no-migration counterfactual relative to the benchmark.

Figure 1. Benchmark Model vs. Data



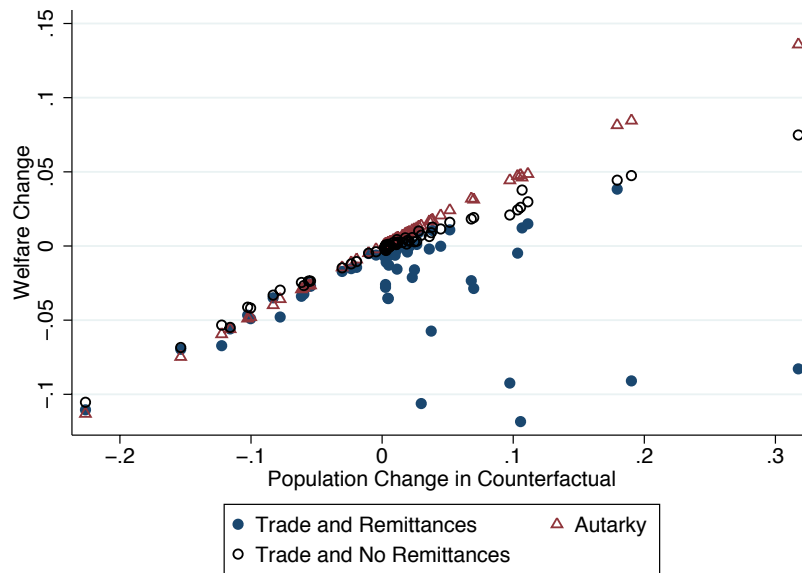
(a) Bilateral Trade Shares



(b) Overall Openness

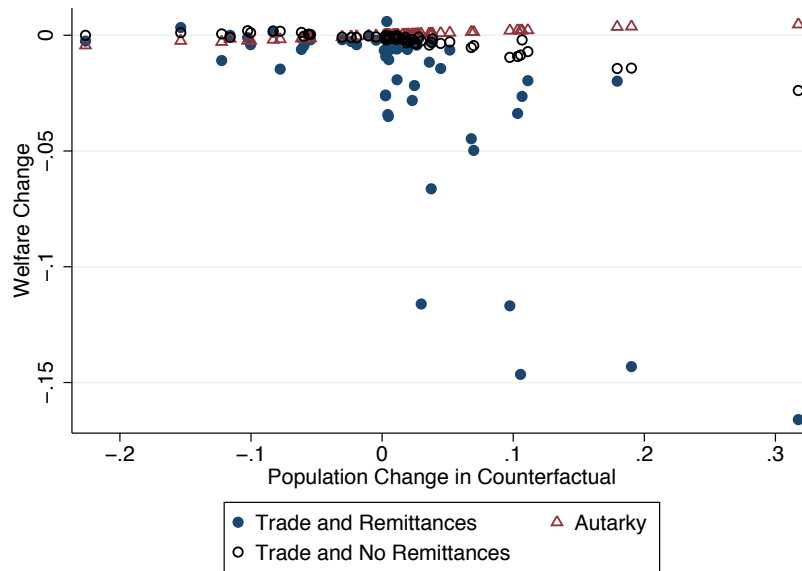
Notes: This figure presents the scatterplots of bilateral trade shares and overall imports/GDP, model (x-axis) against the data (y-axis). The straight line in each plot is the 45-degree line.

Figure 3. Proportional Change in Native Welfare in the Long Run: Autarky, Trade, and Remittances



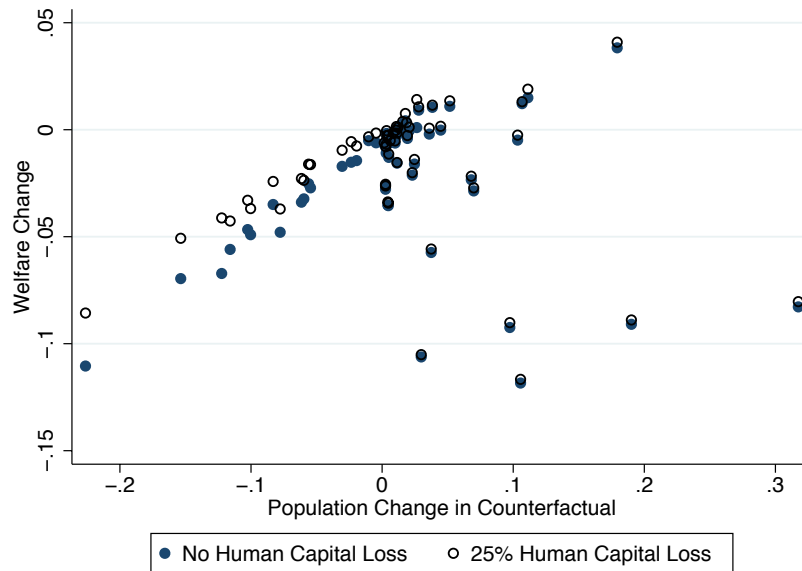
Notes: This figure reports the proportional change in welfare in the long-run counterfactual relative to the benchmark, under the assumption of trade and remittances (solid dots), autarky (hollow triangles), and trade without remittances (hollow dots), against the proportional change in the population that the counterfactual entails. The measure of welfare employed here is the real income of the average native stayer.

Figure 4. Proportional Change in Native Welfare in the Short Run: Autarky, Trade, and Remittances



Notes: This figure reports the proportional change in welfare in the short-run counterfactual relative to the benchmark, under the assumption of trade and remittances (solid dots), autarky (hollow triangles), and trade without remittances (hollow dots), against the proportional change in the population that the counterfactual entails. The measure of welfare employed here is the real income of the average native stayer.

Figure 5. Proportional Change in Native Welfare in the Long Run: imperfect skill transferability



Notes: This figure reports the proportional change in welfare in the long-run counterfactual relative to the benchmark, under the assumption that migrants do not lose any human capital ($\phi = 1$, solid dots) and under the assumption that they lose 25% of their human capital ($\phi = 0.75$, hollow dots), against the proportional change in the population that the counterfactual entails. The measure of welfare employed here is the real income of the average native stayer.