Exchange Rates and Wages in an Integrated World

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Abstract

We analyze how the pass-through from exchange rate to domestic wages depends on the degree of integration between domestic and foreign labor markets. Using data from 66 countries over the period 1981–2005, we find that the elasticity of domestic wages to real exchange rate is 0.15 after a year for countries with high barriers to external labor mobility, but about 0.40 in countries with low barriers to mobility. The results are robust to the inclusion of various controls, different measures of exchange rates, and definitions of labor market integration. These findings call for including labor mobility in macro models of external adjustment.

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1. **Introduction**

"Weak pound has Poles eyeing homeland. A survey by Britain's largest Polish-speaking radio station at the end of last year reported that almost 40 per cent of migrant Polish workers would seriously consider returning home if the exchange rate fell to four zlotys to the pound" (Financial Times, May 25, 2008).

"Exchange rate keeps Filipinos from working abroad. The monthly pay of most of the Middle East jobs is measly – US dollars 250 for hotel workers or dollars 300 for laborers. But, because of the weak US dollar, the peso value of their salaries has been eroded by 20–25 percent since 2000 and that has had a big impact on one of the world's biggest exporters of labor" (Financial Times, November 16, 2007).

These two quotes illustrate how modern migrants are sensitive to exchange rate movements. By increasing the value of wages in domestic currency that a migrant can get by working abroad and therefore raising the reservation wage of domestic workers, currency depreciation can have a direct impact on domestic labor supply. Labor supply, which is usually considered fixed in the short-run within a country, may in reality change in response to exchange rate fluctuations. The supply channel, however, operates only if workers can migrate (or credibly threaten to migrate). This paper analyzes how and under which conditions labor supply—and in particular, wages—respond to exchange rate fluctuations.

Exchange rate movements may have an impact on wages through different channels apart from the labor supply channel, which is the focus of this paper. First, as in standard macro models, depreciation of the exchange rate makes imported goods more expensive, increases the consumer price index and reduces real wages (at unchanged nominal wages). Second, exchange rate depreciation enhances competitiveness, which can lead to an expansion in local production and, therefore, to higher labor demand and to a rise in real wages in the economy (Campa and Goldberg, 2001; Goldberg and Tracey, 2003). Third, by raising the costs of imported capital and intermediate goods, which are often complements to domestic labor, exchange rate depreciation may reduce the demand for workers (Robertson, 2003). Finally, exchange rate fluctuations may also influence inflation expectations and so enter in the wage setting mechanism; in fact, wages

are often indexed to foreign currency in countries with a history of high inflation and frequent depreciation. The main challenge of this paper is to identify the labor supply channel. Identifying the effect of exchange rates on domestic wages through the labor supply channel is challenging because many factors, including external and internal shocks and policies, are correlated with exchange rate movements and wages.

We identify the effect of exchange rates on wages by exploiting variation across countries in the degree of integration between domestic and international labor markets. The identification strategy is based on the following reasoning. The effect of a depreciation on wages is larger if:1) the cost of migrating abroad is low; 2) workers have information about outside options, and 3) it is easy to remit given that workers can consume part of their wages at home through remittances or return migration. In a country with a history of migration, the cost of moving and the information on outside options is low because the existing networks provide assistance and lower the cost of communication.[1] Moreover, the cost of remittance is lower (and so the potential benefit from migration is higher) for countries with a large community in host countries (Beck and Martínez Pería, forthcoming).

The more integrated the labor market is, the easier it is for workers to move; a given exchange rate depreciation is likely to be associated with a larger increase in wages (see Figure 1). In order to control for shifts in labor demand, we control for imports and exports, which clearly influence labor demand.[2] This identification strategy does not assume that exchange rate movements have no impact on labor demand; it only assumes that the impact of exchange rate

[1] See Carrington, Detragiache, and Vishwanath (1996) for empirical evidence on how information on the destination is key to labor mobility even within the same country without language and/or legal impediments.

[2] See Goldberg and Tracey (2003) for a recent survey.

movements on labor demand is uncorrelated with the degree of labor market integration after controlling for exports and imports. This condition is spelled out in the model below.

What are good proxies for labor market integration? Following the intuition above, labor market integration is defined in terms of the costs of moving abroad. Moving abroad can be less costly if there is a large network of nationals living abroad or families have a large receipt of remittances.[3] It also may be easier to move if potential migrants speak the same language as in major destination countries, if there are historical ties between countries of origin and possible destination countries, or if destination countries are geographically close. We use these concepts to construct various measures of labor market integration.

The literature has so far ignored the fact that exchange rate movements may have an impact on domestic wages through migration. Why has the previous literature ignored the response of labor supply to exchange rate fluctuations? The lack of investigation of this question in the literature is due to several reasons. First, the size of migration was less in the past than present. According to the United Nations' Population Division, only 75 million (2.3 percent of the total world population) lived and worked outside their country of birth in 1965 while this number increased to 214 million—that is 3.1 percent of the world population— in 2009. Second, the pool of potential emigrants was considered relatively small with respect to the size of domestic labor market so that migration could not be large enough to have an impact on domestic wages. However, this is no longer true considering the large size of modern day migration in some countries; even in a large country such as Mexico, migration has a noticeable impact on domestic wages (Mishra, 2007; Aydemir and Borjas, 2007). Third, it was considered that potential migrants do not respond fast enough to exchange rate fluctuations. However, Hanson and Spilimbergo

[3] There is a vast literature, both in sociology and economics, which establishes the importance of networks in explaining migration (e.g., Massey and Espinoza, 1997, Munshi, 2003).

(1999) have shown that the effect of depreciation on illegal migration is quite fast for Mexico; mobility is even easier in some Eastern European countries, which are new members of the European Union, and have scarce legal impediments.[4] Fourth, until recently communication was difficult so that potential migrants were imperfectly informed of job opportunities. However, recent research has shown that modern communication has a sizeable impact on migration decision (Braga, 2007). Fifth, there was much less scope for sending remittances home in periods of stringent capital controls. Nowadays, workers can send home remittances relatively freely.[5] In sum, the changes that occurred in the world in the past twenty years suggest that we need to update our framework on the relationship between exchange rates and labor supply.

This paper is related to four strands of literature. The first strand studies the impact of exchange rate movements on wages through their effects on labor demand using either individual or industry-level data and exploits variation across industries in the degree of exposure to international trade, with focus on the U.S. or G7 countries (Campa and Goldberg, 2001; Goldberg and Tracy, 2003). This literature finds evidence that the elasticity of wages to exchange rates is higher for industries with higher exposure to trade, confirming that the trade channel plays an important role in explaining pass-through from exchange rate to wages. This calls for controlling for the trade channel in our empirical strategy. We contribute to this literature by proposing a new channel through which exchange rate movements are related to wages.

The second strand of literature to which this paper is related provides direct evidence on exchange rates and labor mobility. For example, Hanson and Spilimbergo (1999) find that a

[4] Borjas and Fisher (2001) show that the flow of illegal immigrants from Mexico to the United States is more volatile during periods of fixed exchange rate regimes in Mexico.

[5] The cost of sending remittances to Mexico has declined from 15 percent of the amount sent to about 5 percent between 1990 and 2003 (IMF, 2005).

depreciation of the Mexican peso by 10 percent vis-à-vis the U.S. dollar, increases, ceteris paribus, border apprehensions by 6 to 8 percent. In a similar vein, Yang (2006) and Yang (2008) consider the relationship between exchange rate shocks, return migration and remittances of households in Philippines. Yang (2008) finds that a 10 percent increase in the peso to dollar exchange rate increases remittance receipts in pesos by 6 percent. Yang (2006) finds that households with larger exchange rate shocks had lower return rates.[6]

The third strand of literature directly looks at labor market integration and wages in source countries. Mishra (2007) and Aydemir and Borjas (2007) estimate that a 10 percent migration from Mexico to the United States increases Mexican wages by about 4 percent. Similarly, Bouton, Paul and Tiongson (2009), in a recent study on Moldova find that a 10 percent increase in the emigration rate is associated with 3.2 percent increase in wages. Thus, the existing evidence supports the proposed hypothesis in this paper that exchange rate movements can affect wages via labor supply.

Finally, this paper is related to the literature on pass-through from exchange rate to domestic prices. The literature on pass-through aims to explain why exchange rate movements are only partly reflected in import prices in general (for instance, Goldberg and Knetter, 1997; Campa and Goldberg, 2005); our work focuses on how exchange rate movements are reflected in the price of labor. In particular, our analysis of the effect of movement of a country's exchange rate vis-à-vis the U.S. dollar on wages of immigrants from that country to the U.S. is analogous to the study of pass-through of the price of imports from a particular country to the U.S.. Interestingly, our estimates of the effect of depreciation in a country highly integrated with the

[6] This is consistent with life-cycle motive of return migrants (neoclassical maximizers choose length of stay based on comparing marginal benefit to marginal utility cost of extra stay); favorable exchange rate shock implies that the migrant reduce their return rate to accumulate savings to increase future consumption.

U.S. on the wages of its workers in the U.S. is 0.6, which is similar to the long-term pass through of 0.5 estimated for manufacturing wages in OECD countries (Campa and Goldberg, 2001).[7] The main result of the paper is that the elasticity of domestic wages with respect to real exchange rate depends upon the degree of integration between domestic and international labor markets. Based on a sample of 66 countries over the period 1981–2005, and considering immigration to the OECD, the estimates suggest that the elasticity is 0.15 after one year in countries with *high* barriers to external labor mobility while it is four times higher (about 0.4 percent) in countries with *low* barriers to mobility. Labor market integration is defined in terms of past migration rates; countries with high and low barriers to labor mobility are defined respectively by emigration rates being less than the 10th percentile and greater than the 90th percentile in the sample. Our results are robust to the inclusion of country and time fixed effects, and of country-time varying controls such as trade flows, measures of crisis in origin country of migrants, unemployment, FDI, measures of labor-market institutions and foreign wages and prices. The results are also robust to using (i) alternative definition of exchange rates —e.g., migration weighted exchange rate, (ii) alternative measures of integration—e.g., remittances to GDP and past emigration stocks, and (iii) different sample of countries—developing vs. developed.

We also test the plausibility of our identification strategy by looking at wages of immigrants in recipient countries. We analyze specifically if the sensitivity of wages of immigrants in the U.S. (the primary receiving country in our sample) to exchange rate movements vis-à-vis the dollar depends on the degree of labor market integration.[8] The hypothesis is that a given exchange rate

[7] The analogies with the pass-through literature also inform our estimation strategy as discussed below.

[8] On average over 1980–2005, about 36 percent of all the migrants to the OECD end up in the U.S.

depreciation in the origin country brings about a larger decline (or a smaller increase) in real wages of immigrants in the U.S. the more integrated a country's labor market is with the United States. A depreciation of the Mexican peso triggers labor mobility (or threat of mobility) of Mexican workers to the U.S., and as a result puts a downward pressure on wages of Mexican immigrants in the U.S. A similar depreciation of the currency in a country that is poorly integrated with the U.S. should not have any effect on the wages of workers from that country in the U.S. under the assumption that workers from different countries are imperfect substitutes in the U.S. We find strong empirical evidence for this conjecture.

Finally, we also find evidence for a direct relationship between exchange rates and emigration (and remittances). The estimates suggest that exchange rate depreciations are significantly associated with higher emigration rates and remittances to GDP, after controlling for various push and pull factors in source and destination countries.

These pieces of complementary evidence on wages in sending and receiving countries and on the impact of exchange rates on emigration point consistently to the same evidence that the degree of labor market integration is a crucial variable to explain the labor market effects of exchange rate movements.

These findings call for including labor mobility in macro models of external adjustment and for reconsidering the welfare effects of exchange rate movements. While capital mobility is usually taken into consideration in macro models of external adjustments, labor mobility is not considered in general. This is a grave limitation because labor mobility has several important implications for the analysis of adjustment. First, welfare calculations for effects of exchange rate movements can change substantially in the presence of labor mobility, and second, the optimal speed of adjustment can be different in the presence of labor mobility.

The paper is organized as follows. Section 2 outlines a simple theoretical framework to analyze the effects of labor mobility on wages. Section 3 presents the empirical implementation of the reduced form of the framework of Section 2. Section 4 presents the data with a particular focus on the measures of labor market integration. Section 5 presents the empirical evidence looking at the effect of migration in sending countries. Section 6 looks at the "mirror" evidence in the U.S., the main recipient country. Section 7 examines the evidence on how migration rates and remittances are sensitive to exchange rate movements. Section 8 concludes.

2. Exchange Rates and Labor Mobility: Theoretical Framework

The paper starts by developing a simple model of labor demand and supply to motivate the empirical analysis. Consider two countries, Home (H) and Foreign (F). Assume that domestic and foreign workers are imperfect substitutes. All variables in H and F will be denoted without and with an asterisk (*) respectively. A subscript t in all variables is dropped for simplicity as we assume that all adjustments happen during the same year. In the empirical section, we allow for lagged responses.

Labor demand in an integrated world

Our labor demand equation is as follows:

$$L^d = \left(\frac{w}{P}\right)^{-\alpha} \left[NX\left(\frac{eP*}{P}\right) \right]^{\eta} \bar{D} \qquad (1)$$

Where L^d is the domestic labor demand, w is the nominal wage, P is the domestic price index, $P*$ is the foreign price index, NX is net external demand, which depends on real exchange rate, and e is the nominal exchange rate in home currency units per unit of the foreign currency. This term captures the channels through which labor demand is exposed to goods market

integration.[9] This labor demand can be derived using a standard Cobb-Douglas assumption and the Keynesian aggregate demand (see the appendix for the derivation.) In specifying the labor demand, we assume that the exchange rate affects labor demand only through trade, which is consistent with the previous literature (e.g., see Campa and Goldberg, 2001). $\overline{D}$ represents other factors that affect labor demand. Finally, for sake of simplicity, we assume that there is only one foreign labor market; if there is more than one foreign labor market, the term $\frac{eP*}{P}$ should become the real exchange rate defined as $\frac{\prod_j \left(e_j P_j *\right)^{w_j}}{P}$ where j is the indicator for foreign country j, and w_j are weights usually calculated as a function of trade flows.

Labor supply in an integrated world

In a world where factor markets are integrated, labor supply depends on both the domestic and foreign wages.

$$L^s = \left[\frac{w}{P}\right]^{\gamma} \left[\frac{ew*}{P}\right]^{-\phi I} \overline{S} \qquad (2)$$

L^s is the domestic labor supply, and $w*$ is the foreign wage. $\overline{S}$ is a term that reflects country-specific historical determinants of labor participation, including demographic structure and female labor force participation. This labor supply has two important innovations. The first innovation is to introduce foreign wages in the domestic labor supply curve, recognizing that workers have an opportunity to work abroad.[10] The second innovation is to introduce a measure

[9] Note that equation (1) could be easily expanded adding a term for imports of capital goods. Given our focus, we prefer to keep the model parsimonious. In the empirical specification, we allow for different coefficients for imports and exports.

[10] The micro-foundation of the labor supply curve with foreign labor market is sketched in the appendix.

of the degree of labor market integration, *I*; if a country is completely closed to international labor markets, $I = 0$ and in that case, labor supply depends only on domestic wages; this is the case in the standard labor supply curves, which do not take into account the opportunity of working abroad. We assume $\phi > 0$; i.e., given a certain level of foreign wages, an increase in the real exchange rate reduces the domestic labor supply owing to emigration. Moreover, given the increase in the real exchange rate, the higher the degree of integration of the labor market, the larger the reduction in the labor supply. In equilibrium,

$$L^s = L^d \tag{3}$$

Taking logs of (3):

$$\ln \frac{w}{P} = a_1 I \ln \frac{e}{P} + a_2 \ln NX + a_3 \ln X + a_4 I \ln w^* \tag{4}$$

Where $a_1 = \frac{\phi}{\alpha + \gamma}; a_2 = \frac{\eta}{\alpha + \gamma}; a_3 = \frac{1}{\alpha + \gamma}; a_4 = \frac{\phi}{\alpha + \gamma}; X = \bar{D} - \bar{S}$

Equation (4) forms the basis of our empirical specification. $a_1 > 0$ implies that the higher the degree of labor market integration, the larger is the impact of change in the real exchange rate on real wages. Equation (4) is the reduced form for the real wage in the sending countries.

Effects on receiving countries

The previous section focused on the effects of integration and labor mobility on sending countries; this section focuses on the "mirror" issue of the effects of integration and labor mobility on recipient countries. We use the same framework as above to derive the reduced form for wages of immigrants in receiving countries. We assume that the labor market in recipient countries is segmented according to the nationality of immigrants.[11]

[11] To our knowledge the segmentation of labor markets across immigrants from different nationalities has not been directly tested for the U.S.. However, several factors suggest that immigrants from different countries are imperfect

(continued)

Because of data limitations, we also restrict our sample to the U.S. as the destination country. The resulting equation (derived in detail in the appendix) is as follows:

$$\ln \frac{w_i^{US}}{P^{US}} = -f(I_{i,US}) * \ln \frac{e_i}{P_i} + x^{US} + x^i \qquad (5)$$

The subscript *i* indicates that the variable refers to the origin country of migrants. $I_{i,US}$ is a measure of labor market integration with the U.S.. $f(I_{i,US})$ is positive and is an increasing function of $I_{i,US}$. w_i^{US} is the wage that migrants from country i earn in the U.S., and P^{US} is the price index in the U.S. x^{US} and x^i are control variables in the U.S. and origin country i respectively that affect real wages of migrants in the U.S.. Equation (5) implies that the effect of exchange rate movements in country i on wages of immigrants from *i* should be different according to the degree of integration of country i with the United States. In particular, (i) a depreciation in the origin country depresses the wage of immigrants in the U.S. from that origin country, and (ii) a higher degree of labor market integration with the U.S., leads to a larger decline in wages given the exchange rate depreciation We test this implication in Section 6.

3. Empirical Specification

Some adjustments to the model are necessary to make it econometrically estimable. First, we allow for country-specific fixed effects in order to account for all possible country-specific and time-invariant factors that affect wages. For example, country fixed effects control for time-invariant institutional factors that affect domestic labor supply. Second, we also introduce year

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substitutes. First, immigrants from different countries come with very different characteristics (e.g. level of education, knowledge of English). Second, even when the observable level of education is the same, the quality of education can be very different (Hanushek and Kimko, 2000). Third, there is strong evidence that "differences in the U.S. earnings of immigrants with the same measurable skills, but from different home countries, are attributable to variations in political and economic conditions in the countries of origin" (Borjas, 1987). Fourth, immigrants from different nationalities tend to cluster in specific locations.

fixed effects to account for worldwide factors that may have had an impact on domestic and foreign labor demands, so generating spurious correlations. Our estimation with country and year fixed effects follows the standard specification of the pricing-to-market equation estimated in the pass through literature.[12] Third, we introduce the labor market integration variable and the exchange rate as separate regressors, in addition to their interaction, to check if integration and/or exchange rates have a direct impact in addition to the mechanism analyzed in this paper. Fourth, we use a weighted average of foreign wages in various OECD countries, using the share of migrants in different destination countries as weights. This allows us to get a measure of foreign wages that varies by source countries. Fifth, labor markets take some time to react to changes in the exchange rate, especially when migration is involved; to take this into account we lag the explanatory variables by one year. Sixth, we allow for two different coefficients for exports and imports rather than imposing one coefficient for net exports. This is mostly in recognition of the fact that the exchange rate may have different impact on labor market through imports and exports.[13] After these adjustments, equation (4) becomes:

$$\ln(\frac{w}{P})_{it} = I_{it-1} + \ln\frac{e_{it-1}}{P_{it-1}} + \beta(I_{it-1} * \ln\frac{e_{it-1}}{P_{it-1}}) + \theta X_{it-1} + s_i + v_t + \varepsilon_{it} \qquad (6)$$

Where i denotes the origin country; t denotes year; X_{it-1} are the lagged controls (discussed below); and s_i and v_t are country and year fixed effects respectively.

4. Data

[12] In the pass-through literature, however, time and country fixed effects capture different effects than in our exercise. The country fixed effects proxy for time-invariant quality and markup differences across countries and the time fixed effects capture the common-across-countries changes in marginal costs and markups (see Goldberg and Knetter, 1997; Campa, and Goldberg, 2005; Goldberg and Hellerstein, 2008).

[13] This is also in line with the prior literature on exchange rates and wages. (see for example, Campa and Goldberg, 2001).

We analyze how the pass-through from exchange rate to wages depends on the degree of labor market integration using data from 66 countries over the period 1981–2005.

Wages in sending countries

The dependent variable in the empirical analysis is the average real wage earned in manufacturing per hour. The main source of data on nominal wages is the Labor Statistics database available from the International Labor Organization (http://laborsta.ilo.org/).[14] In most countries, the statistics on wages refer to "wages and salaries," which include direct wages and salaries, bonuses and gratuities, etc., whereas in some countries they refer to "earnings," which include, more broadly, all compensation such as paid leave, pension and insurance schemes. The country-specific variations in the definitions of wages call for country fixed effects that we include in every regression. We convert these total wage payments to hourly wage payments by dividing by the total number of hours worked; these data are from the ILO. We use two alternative sources of data on wages to check the robustness of the results. The first source is the International Financial Statistics (IMF, various years, line 65). The data are wage indices (with 2000=100) and represent wage rates or earnings per worker employed per specified time period, typically in the manufacturing sector. The data on earnings typically include payments in kind and family allowances and cover salaried employees as well as wage earners. The data are as reported directly to the Fund, or as drawn from the publications of statistical offices of various countries. The second source of information on wages is from the Freeman and Oostendorp database of Occupational Wages around the World. The data are based on the October inquiry of the ILO, are standardized, and are disaggregated by occupations. The

[14] The data are provided in local currency terms, and we have deflated the wage data using the consumer price index (CPI) from the International Financial Statistics (IMF, various years). For details on the wage data, see Appendix.

coverage of the alternative sources of wage data is very limited, and our analysis using these covers at most 30 countries.

Wages in the U.S. by nationality of immigrants

In addition to data on wages in origin countries, we also use data on wages of immigrants in the United States. The data are obtained from the Integrated Public Use Microdata Series - Current Population Survey (IPUMS-CPS) for the years between 1994 and 2005. The IPUMS-CPS data set is based on the March Annual Demographic File and Income Supplement to the Current Population Survey (CPS). The data are restricted to foreign-born individuals aged 18–64 who participate in the civilian labor force.[15] The individual data are averaged to construct the mean hourly wage for immigrants in the U.S. from various origin countries. The average wage is constructed using sampling weights as recommended by the IPUMS-CPS.[16] Finally, the wage is adjusted for inflation using CPI in the origin countries.

Migration

Data on migration comes from the International Migration Statistics (IMS) dataset for OECD countries (OECD, 2006), and is available through SourceOECD, an online database. Immigrants in the OECD are defined by nationality and/or country of birth. We use the information on immigrants defined by nationality given the broader coverage of the data (see appendix for details on the migration data).[17] Except for Australia, Canada, Mexico, and New

[15] Note that beginning 1994, the CPS included a question on the country of birth of individuals.

[16] Since the CPS relies a complex stratified sampling scheme, it is essential to use the weights. The weights are based on the inverse probability of selection into the sample and adjustments for the following factors: failure to obtain an interview; sampling within large sample units; the known distribution of the entire population according to age, sex, and race; over-sampling Hispanic persons; to give husbands and wives the same weight; and an additional step to provide consistency with labor force estimates from the basic survey.

[17] The data on stock of immigrants defined by nationality are available for 185 source countries for 26 years vis-à-vis 179 countries for 16 years for the data on immigrants defined by country of birth.

Zealand, all other OECD countries record data on migrants by nationality. IMS also has information on migrants in the U.S. by nationality for 1990, whereas the information on immigrants by birth is available for 1980, 1990, and from 1995–2001. The correlation between the two sets of data is very high (0.95). For OECD countries that define migrants only by country of birth, we use this measure.[18]

Table A1 provides information on the top five destination OECD countries of migrants for countries in the sample for which data is available in the IMS. It corresponds to the year in the period 1981–2005 with the maximum number of destination countries. Not surprisingly, the United States is the top destination country for about half of the origin countries of migrants in the sample. On average, about 36 percent of all the migrants to the OECD end up in the U.S., compared to 22 percent in Europe.

The bilateral stocks of migrants are aggregated for all destination countries to obtain the emigrant stock in the OECD for each origin country in the sample. Furthermore, the stock of migrants is normalized by the population in each origin country to derive the emigration rates. One-year lagged emigration rates are used as the principal measure of labor market integration.[19] Table A2 shows the emigration rates to the OECD for the countries in the sample. Not surprisingly, countries in the Latin American and Caribbean region like Jamaica, El Salvador, Trinidad and Tobago, Mexico, Dominican Republic and Ecuador have the highest emigration rates in the world. For example, about 50% of the population in Jamaica was residing in the

[18] The IMS data do not include explicit estimates of illegal immigrants. However, data for some countries on stock of migrants partially incorporate illegal migration; therefore, the phenomenon does not necessarily go completely unmeasured. For example, individuals may remain on population registers after their permits have expired, residing as illegal (or "undocumented") immigrants.

[19] Conceptually, we should use long lags. However, two factors require using shorter lags. First, using long lags would imply losing the vast majority of observations; second, the ranking of emigration rates are overall stable over time (see Table A2). In any case, the main results in the paper are unchanged if we use two- or three-year lagged emigration rates as measures of labor market integration (results available upon request).

OECD by 2005. The list of countries with highest emigration rates also includes New Zealand and some European countries like Portugal, Croatia, Macedonia, and Iceland.

Exchange rates

Data on exchange rates are taken from the International Financial Statistics (IMF, various issues). Exchange rates from the IFS are expressed in nominal currency per U.S. dollar and are deflated by CPI. For the empirical analysis, we construct a migration-weighted measure of exchange rates by weighting the bilateral exchange rates with the share of migrants in different destination countries.

$$e_{ct} = \sum_{c'} e_{cc'} \frac{M_{cc'}}{M_c} \qquad where \qquad e_{cc'} = \frac{e_{cUS}}{e_{c'US}} \tag{7}$$

Where $M_{cc'}$ is the total stock of emigrants from *c* to *c'* and M_c is the total number of emigrants from *c*. The migration-weighted exchange rate measure is deflated by CPI. We use the migrant shares at the beginning of the sample period for each country to address endogeneity concerns. We also construct alternative migration-weighted exchange rate measures using different weights based on (i) time-varying weights using the current migrant shares, (ii) average migrant shares over the sample and, (iii) migrant shares in 1995 (the earliest year with broad coverage of data on migrants from a large number of countries). The correlation between the real exchange rate vis-à-vis the U.S. dollar and different measures of migration-weighted exchange rates is high (see Table 3a). The main results reported in the paper are qualitatively similar if we use alternative exchange rate measures.

Other measures of labor market integration

We use information on worker remittances as another measure of labor market integration. Worker remittances are defined as the value of monetary transfers sent to the origin countries by workers who have been abroad for more than one year. These are recorded under "current

transfers" in the current account of the IMF's Balance of Payments Statistics Yearbook. Worker remittances are normalized by GDP from the IMF (IMF, various issues).

Composite index of integration—super-integration

Finally, we also construct a composite measure of integration that is based on three sub-indicators as follows: (i) common official language (at least 10 percent of the population has an official language with any of the top five destination countries), (ii) common border (whether the origin country shares a common border with any of the top five destinations) and (iii) colonial linkages (whether the origin country was ever a colony of any of the top five destination countries). Information on these variables is derived from a new dataset compiled by CEPII.[20] The top five destination countries are chosen based on their shares of migrants (shown in Table A1). A country is defined as integrated if all the three conditions are satisfied. In other words, this is a very demanding measure, or a measure of super-integration.

Control variables

The data on trade are taken from the United Nations Statistical Division Commodity Trade (COMTRADE) database accessible through the World Integrated Trade Solution (WITS). We extract data on value of exports and imports (in U.S. dollars), and deflate them by GDP in U.S. dollars from the IMF (IMF, various issues). Data on unemployment rate and foreign direct investment (FDI as a ratio of GDP) are taken from the International Financial Statistics (IMF, various issues). Episodes of crisis are defined by negative growth in real GDP per capita from the World Development Indicators. Data on tax wedges (defined as the difference between the firm's labor costs and worker's net income) are used as an indicator of labor market distortions and are taken from the IMF database on structural reforms (IMF, 2008). The indicator uses tax

[20] The data are available are http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

rates corresponding to the income bracket of a worker with average wage in the manufacturing sector. In particular, it measures labor income taxation, which affects incentives of employers to hire labor and those of workers to supply labor.[21] Summary statistics for all the variables used in the empirical analysis are shown in Table A4.

Time series properties of real wages and real exchange rates

In order to examine the time-series properties of the two key variables – real wages and migration-weighted real exchange rates-- we use some of the latest non-stationary macro panel techniques suggested by Pedroni (2009). The tests are very general in that they allow for country fixed effects, heterogeneous trends, and common time effects.

First we test for the presence of unit roots using (i) Im, Pesaran and Shin ADF test (adjusted for small sample size distortions using bootstrapping techniques) (Im., Pesaran, and Shin, 2003, and Pedroni and Yao, 2006), (ii) Bai and Ng (2004) test and (iii) Pesaran (2007) cross-sectionally augmented Dickey Fuller (CADF) test. (ii) and (iii) take into account common factor dependencies in a panel (a more general form of cross-sectional dependency than allowed for e.g. by the use of time-effects). The results reported in Table A5 show that all the tests fail to reject the null of unit root in both real wages and migration-weighted exchange rates.

Next, we also conduct tests of cointegration between real wages and real exchange rates suggested by Pedroni (2004) and Pedroni (1999). The tests treat all parameters as heterogeneous across members of the panel, and allows for both heterogeneous dynamics and heterogeneous cointegrating vectors, as well as complete endogeneity. The bottom panel of Table A5 shows four commonly used test statistics – (i) pooled Phillips-Perron t-statistics, (ii) pooled ADF t-

[21] There is a significant literature mainly for developed countries, establishing that taxes on labor are important determinants of labor market outcomes (Bassanini and Duval, 2006).

statistics, (iii) group-mean Phillips Perron t-statistics and (iv) group mean ADF t-statistics. Three out of the four test statistics reject the null of no cointegration.

Given the evidence for cointegration, we stick to the specification in levels as also suggested by our theoretical section.[22] Under cointegration, standard panel techniques produce superconsistent estimates of slope coefficients (the rate of convergence is faster in the panel than even the time series case); we get precise estimates even in small panels and even if regressors are endogenous.

5. Results for sending countries

Before evaluating equation 6, we establish a strong and significant correlation between real wages and real exchange rates. The first column of Table 1 reports the correlation between real wages and real exchange rates, controlling for time and country fixed effects. This correlation is robust even after including imports and exports (as share of GDP). However, this specification does not control for the degree of integration.

Table 2 presents our main specification based on equation (6); the first column is the basic model while columns [2]–[6] present regressions with additional control variables. As described in the data section, we use bilateral exchange rates weighted by share of migrants in different destination countries in the initial sample period, deflated by CPI, for the baseline estimations. The estimated pass-through is significantly larger in countries with more integrated labor markets, confirming the prediction of our model. In addition, countries with higher emigration rates (lagged) have higher wages. This confirms the evidence from individual country studies in the prior literature (e.g., Mishra, 2007; Aydemir and Borjas, 2007).

[22] Previous literature on migration and wages (Borjas, 2003; Hanson and Spilimbergo, 1999) also estimate regressions in levels.

Changes in the real exchange rate occur in connection with other changes in the economy, creating a potential problem of omitted variable in our basic specification. In particular, large changes in real exchange rates are often associated with economic crises, which are, in turn, also correlated with changes in wages. Conversely, a high level of exchange rate is often associated with economic booms and high wages. These associations could generate the correlation that we observe in the first specification. In order to control for the existence of a possible spurious correlation, we control for the occurrence of an economic crisis, defined as negative growth in real GDP per capita, in specification (2). Even in this case, our main result—namely, that the elasticity of wages to exchange rate depends on the degree of integration—goes through.

Columns [3]–[6] of Table 2 present various specifications that include several variables, which could be correlated with exchange rates and labor mobility and also potentially influence wages in source countries of emigrants. In particular, we include: unemployment rates in sending countries as a proxy for push factors; labor market institutions in source countries as proxied by tax wedge; FDI as a share of GDP in source countries to capture the fact that exchange rate movements could influence firms to move instead of workers; and average wages and prices in the OECD, which capture pull factors for migrants to the OECD. The wages and prices in OECD countries are weighted by the share of migrants in destination countries in the initial sample period. All specifications include country and year fixed effects.

The results of specifications [3]–[6] confirm the results of our previous specifications despite the fact that the number of observations shrinks considerably when we include all the controls.[23] In

[23] For robustness, we also introduce as additional controls, interactions between various determinants of labor demand in Table 2 in sending countries (exports, imports, crisis indicator and FDI) and exchange rates; the main results (available upon request) are identical to Table 2. The interaction between exports to GDP ratio (lagged) and exchange rates (lagged) is positive and statistically significant in most specifications; providing additional support for the central hypothesis in Campa and Goldberg (2001) using cross-country evidence; the larger is the exposure to trade, a given exchange rate depreciation is associated with a larger increase in wages.

order to check if the results in Table 2 are driven by changes in the sample (rather than by adding controls), we also estimate all the specifications in Table 2 on a consistent sample (Table A7); the interaction term is positive and statistically significant at conventional levels.

Next, we look at the following alternative measures of real exchange rates: (i) exchange rates vis-à-vis the U.S. dollar; (ii) migration-weighted exchange rates based on contemporaneous time-varying migrant shares; (iii) migration-weighted exchange rates based on time-invariant average migrant shares over the sample; (iv) migration-weighted exchange rates based on migrant shares in 1995 (since 1995 is the first year with migration statistics available for a large number of countries); and finally (v) trade-weighted exchange rates. The correlation between the U.S. dollar exchange rate and the different migration-weighted exchange rate measures is reasonably high (Table 3a). Table 3b presents the results using the alternative measures of exchange rates. Column [1] uses real U.S. dollar exchange rates; columns [2]-[4] use the migration-weighted exchange rates with different weighting methods. The last column uses the trade-weighted exchange rates. Our core results on the interaction between exchange rates and labor market integration hold using these alternative exchange rate measures.

Discussion of the results

The basic regressions support the finding that the elasticity of real wages with respect to real exchange rates depends on the degree of integration between domestic and international labor markets. The estimated elasticities for various deciles of (lagged) emigration rate in the sample are shown in Table 4; each column presents the elasticities based on different exchange rate measures used in Tables 2 and 3. The elasticity is strictly increasing in the degree of labor market integration – the easier it is for workers to move abroad (measured by past emigration rates), the more responsive are real wages to exchange rate movements. For example, the estimates based on Specification [6] in Table 2 suggest that the elasticity is 0.15 after one year in countries with

high barriers to external labor mobility (defined by lagged emigration rates less than the 10th percentile) while it is more than twice as high in countries with *low* barriers to mobility (defined by lagged emigration rates greater than the 90th percentile). The range of estimated elasticities based on different exchange rate measures (and Specification 6) is -0.19 to 0.09 in countries with high barriers, whereas it lies between 0.12 to 0.45 in countries with low barriers.

The average pass-through from migration-weighted real exchange rate to wages is large: 29 percent of a depreciation feeds into wages within one year (based on estimated coefficients in Column [6] of Table 2). The average pass-through ranges from 0.05 to 0.3 for different exchange rate measures. As a comparison, the pass-through of exchange rate elasticity to manufacturing wages is 0.06 in the US through the demand channel (Campa and Goldberg, 2001); the estimated pass-through from exchange rate to price of imports is approximately 0.45 at the one-quarter horizon and 0.64 in the long term (Campa and Goldberg, 2005). Note, however, that the reasons for the incomplete pass-through are very different in the case of wages and in the case of import prices. In our paper, pass-through is incomplete because migration cannot provide complete arbitrage; in the latter literature, pass-through is incomplete because the presence of nontraded and import goods.[24]

The rest of the empirical section tests several assumptions, which are used in Table 2: different measures of labor market integration; alternative sources of data on wages; homogeneity of developing and developed countries with respect to labor mobility; inclusion of the composition

[24] Most studies on pass-through concur that nontraded goods/ imported inputs contribute 50 to 78 percent in explaining incomplete pass-through even using very different methodologies (Goldberg and Hellerstein, 2008; Burstein, Neves, and Rebelo 2003). *Trade* openness also plays an important role in explaining cross-country differences in pass-through from exchange rates to prices (Campa and González Mínguez, 2006, and Goldberg and Campa, forthcoming); in contrast, our paper uses *labor* openness/integration to explain differences in pass-through across countries from exchange rates to wages.

of trade in the framework; and differential effects on high and low-skill wages.

Alternative measures of labor market integration

Our principal measure of labor market integration is based on past migration rates on the assumption that past migration rates are a good proxy for how easy it is to move between countries. While this measure captures an important feature of the labor market integration, stocks of migrants or remittances are also plausible measures of labor market integration. Columns [1] and [2] of Table 5 present our preferred specification (column 6 of Table 2) using emigration stocks and remittances as proxies for labor market integration. Columns [3] and [4] use longer lags of emigration rates to measure labor-market integration. The results are qualitatively similar; in particular, the coefficients on the interaction between exchange rates and the measure of integration are always statistically significant (at the 1 percent level) and positive. The last column of Table 5 presents the results using the index of "super-integration" as described in the data section. The interaction between exchange rates and the measure of super-integration continues to be positive, though not statistically significant at conventional levels.

Developing vs. developed countries

The results described so far do not distinguish between developed and developing countries. After all, from a theoretical point of view, it should not matter whether the sending countries are rich or poor. However, in practice, labor markets work very differently in many developed countries, where there are well-established systems of social protection, and in developing countries, where the informal sector plays an important role. These could have important implications for the response of wages to exchange rate shocks.

In order to test this hypothesis, Table 6 presents the same specifications (columns [1], [2], [5] and [6]) as Table 2 with the additional interaction term between real exchange rate, migration rates and the dummy for developing country to check if the results for developing countries

differ systematically. This interaction term is positive and statistically significant (at the 5 percent level) in Columns [3] and [4], which provides evidence that the effect of exchange rates on wages through the labor supply channel is stronger for developing countries.[25]

Control for composition of trade

Standard trade models predict that the composition of trade determines the movement of wages in a country. Labor-abundant developing countries have a comparative advantage in labor-intensive goods; the Stolper-Samuelson theorem predicts that increased trade would benefit labor relative to capital.[26] For our analysis, this would imply that controlling for exports and imports may not be sufficient without particular attention to the capital intensity of trade. In order to address this concern, we interact exports and imports with the share of capital-intensive exports and imports in overall respectively.[27] The results show that controlling for the composition of trade does not alter our main result (Table 7). The interaction between the real exchange rate and labor market integration continues to be positive and statistically significant, with a magnitude similar to that in Table 2. The interaction between capital intensity and trade is statistically insignificant in most of the specifications.

Interaction of labor-demand with measures of labor-market integration

In the theoretical framework, we assume that labor demand shifts identically between countries with low and high labor market integration. In order to relax this assumption, we also introduce

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[25] Table A8 shows the results using a consistent sample. The interaction effect is stronger for developing countries in all the specifications.

[26] For a recent overview of the impact of trade on wages, see Davis and Mishra (2007).

[27] The information on capital intensities is taken from the NBER-CES Manufacturing Industry Database and is averaged for each country across 4-digit products at the Standard Industrial Classification (SIC) level over the period 1986–97. The top 100 products that rank the highest in capital intensities define capital-intensive exports and imports respectively. In additional robustness check, we also interact exports and imports with dummies for the share of K-intensive exports and imports in overall being larger than 50 percent; the results are unchanged (available upon request).

as additional controls, interactions of the two key measures of labor demand -- exports and imports (as a share of GDP) with measures of labor market integration. Table 8 shows the results. The effect of exchange rates on wages depends significantly on the degree of integration in all the specifications. The estimated coefficients on the interaction between measures of labor market integration and trade are insignificant in most specifications.

Alternative sources of data on wages

We so far have used average manufacturing wage data from the ILO, which cover many countries but are quite noisy. To check if our results are valid using different datasets, we look at two additional sources from the International Financial Statistics (IMF, various years) and the Freeman-Oostendorp database. The results are shown in Table 9. Columns [1] and [2] correspond to our preferred specification in Column [6] in Table 2. The data on wages from the Freeman-Oostendorp database are averaged across all occupations. The estimated effect of the interaction between the real exchange rate and labor market integration on IFS wages is positive, though statistically insignificant at conventional levels, and is positive and strongly significant at the 5 percent level on wages from Freeman-Oostendorp. The number of observations, however, is very limited relative to Table 2.

Skilled and unskilled wages

We use the information on occupations in the Freeman-Oostendorp database to categorize occupations into skilled and unskilled (Table A6)**.** Next, we take the average of wages in skilled and unskilled occupations to explore the effect of labor market integration on wages of skilled and unskilled workers separately. Table 10 shows the results. Columns [1] and [2] correspond to unskilled and skilled wages respectively. Notice that in Columns [1] and [2] we continue to use the overall emigration rates to the OECD (since the data on emigration rates from IMS is not available by disaggregated skills). The effect of the interaction between labor market integration

and real exchange rates is positively and statistically significant at the 5 percent level on both skilled and unskilled wages. The estimated magnitude of the interaction is not statistically different between skilled and unskilled wages.[28] [29]

6. Results for receiving country—the case of the U.S.

We so far have focused on the effects of exchange rate movements on the wages in the *sending* countries. Labor market integration should also matter for the pass-through from exchange rate to immigrants' wages in receiving countries if immigrants from different countries are imperfect substitutes.[30]

We analyze how labor market integration has an impact on the immigrants' wages in the U.S. because this country absorbs a large fraction of world migrants —on average 36 percent between 1980 and 2005— and because of the availability of data on wages of immigrants.[31] We estimate the following equation:[32]

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[28] We also use the low-skilled and high-skilled emigration rates to the OECD from Docquier and Marfouq (2005). The data are available for only two years – 1990 and 2000. We interpolate and extrapolate the data to cover the sample period with existing data on low and high skill wages from 1981-2005. With the alternative source of data on emigration rates by skill, we do find some evidence that the estimated coefficient on the interaction between labor market integration and exchange rate is significantly higher (about one and a half times) for skilled rather than unskilled wages (columns [3] and [4]). The results however, should be interpreted with caution given the limited coverage of the data.

[29] We argue in the introduction that the changes in the world economy over the past twenty years (e.g. ease of cross-border communication and ease of sending remittances), imply that we may need to update our international macro models to take into account cross-border to mobility. In order to assess this hypothesis we split the sample pre- and post-1993. The estimates (not shown) suggest that the elasticity of pass-through with respect to labor market integration is indeed significantly higher in the post-1993 period. Since most of the existing country-specific evidence presented above on exchange rates and labor mobility comes from Mexico and Philippines, we repeat Table 2 dropping these two countries in order to be sure that our results are not driven by these two countries. Our results go through even after excluding these two countries.

[30] On the imperfect substitutability of immigrants from different countries, see footnote 11.

[31] See data section for a description of wages in the U.S. by country of birth of immigrants. Note that also Hanson, Robertson, and Spilimbergo (2002) analyze the effects on sending (Mexico) and receiving (U.S.) countries at the same time when there are impediments to labor mobility (in that case a shock to border enforcement).

[32] See the appendix for how this equation can be derived.

$$\ln \frac{w_i^{US}}{P^{US}} = I_{i,US} + I_{i,US} * \ln \frac{e_i}{P_i} + \ln \frac{e_i}{P_i} + x^{US} + x^i \quad (8)$$

The dependent variable, $\frac{w_i^{US}}{P^{US}}$ is the real wage of immigrants from country i in the U.S., and $\frac{e_i}{P_i}$ is the bilateral real exchange rate between U.S. and country *i*. Table 11a reports the results. Column [1] presents the basic specification, whereas columns [2]–[4] include additional push and pull factors that could influence emigration to the U.S. The interaction between a country's exchange rate and labor market integration with the U.S. is negative and statistically significant (in columns [1], [2] and [3]), implying that a given exchange rate depreciation leads to a larger decline (or a smaller increase) in real wages of migrants in the U.S. from countries that are more integrated with the U.S.. The estimates turn statistically insignificant in Column [4], though this could be driven by the much smaller sample rather than by the addition of these controls.[33] Table 11b shows the estimated elasticities for different deciles of emigration rates to the U.S. For a country highly integrated with the U.S. (defined by the 90th percentile of emigration rates), a 1 percent depreciation of the real exchange rate vis-à-vis the U.S. dollar is associated with a 0.17 percent increase in real wages of immigrants from that country in the U.S.; for a country that is poorly integrated with the U.S. (defined by the 10th percentile of emigration rates), real wages increase by 0.61 percent. Hence, while the elasticities are not negative (as predicted by the model), we do find evidence that a given exchange rate depreciation is associated with a smaller increase (instead of a larger decline as predicted by the model) in real wages of immigrants in the US from a particular country, the more integrated the country is with the United States.

[33] We replicate the regression in column [3] of Table 11 on the restricted sample of column [4] (not shown); the estimated coefficient on the interaction between exchange rate and emigration to the US is negative and insignificant in the restricted sample as well.

7. Exchange Rate and Migration

In theory, following an exchange depreciation, the threat of migration itself can have an impact on wages even in absence of migration. In practice, however, we do expect some migration after a depreciation. This effect, however, may be difficult to measure because high frequency data on migration are noisy.[34] Nevertheless, checking the effects of different labor integration on migration rates is an exercise worth pursuing as an additional piece of evidence. In Table 12, we analyze the effect of exchange rates on emigration rates and remittances. The regressions control for standard push and pull factors, e.g., wages in the home and destination countries, indicators of crisis and country, and time effects. As expected, real exchange rate depreciations are associated with higher emigration rates as well as higher remittances to GDP. A 1 percent depreciation of the real exchange rate is associated with a half to one percent increase in the emigration rate and a 1/10—2/3 percent increase in remittances/GDP. These results support the main finding in the paper that exchange rate movements affect wages through the labor supply channel.

8. Conclusions

The world economy has become increasingly integrated in the past few decades. While international labor mobility has always been an important feature of the world, nowadays mobility has become quicker and more responsive to economic incentives. In a globalized world, it is much easier to get information on wages in other countries.

The goal of this paper is to study the effect of globalization on the responsiveness of domestic wages to exchange rate movements. In order to do this, we present a simple analytical framework that explicitly includes reservation wages abroad and derive testable implications

[34] In cases in which good data are available, there is a sizeable effect on migration flows (see Hanson and Spilimbergo, 1999).

from this model. We evaluate the implications of this model by looking at the effect of exchange rates on four different variables: wages in the sending countries, wages of foreign-born individuals in the U.S., migration rates, and remittances. We identify the effect of exchange rate movements on domestic wages using variation across countries in the degree of integration between domestic and international labor markets. We show that the effect of exchange rate movements on wages depends on the degree of integration as predicted in our framework. The results are robust to including several controls, different definitions of exchange rates, different concepts of labor market integration, different definitions of migrants, and different samples of countries. In addition, there is direct evidence for a strong relationship between exchange rate movements, emigration, and remittances.

The contributions of this paper are several. First, we present a simple framework to show how the integration of labor markets may affect wages and the pass-through from exchange rates to wages. Second, we propose several measures of labor market integration. Third, we present an empirical analysis of the impact of labor market integration on wages in the sending countries, on the wages of foreign-born workers in the U.S. and on the direct effect of exchange rates on migration rates and remittances.

Our paper has implications for the empirical and the theoretical literature in macroeconomics and development. On the empirical side, future research should focus on defining more nuanced measures of labor market integration. In this paper, we analyze labor markets as a whole; in reality, labor markets are very fragmented, and one market can be deeply integrated while another can be poorly integrated.[35] Future research should aim at constructing skill-specific labor

[35] Note that in some cases, labor markets for unskilled workers are integrated as is the case for Mexico and the United States. In other cases, the labor markets for skilled workers are integrated as is the case for many African countries whose francophone elites can migrate relatively more easily than unskilled workers.

market integration indices. Another direction of future research is the study of specific information channels through which markets become more integrated.

Our paper has broader implications also for the theoretical literature. If the direct effect of exchange rate movements on labor markets is sizeable in presence of labor market integration, future macroeconomic models of devaluation and crisis should explicitly take into consideration the effect on labor markets. This could have important implications for welfare analysis and on the policy dialogue.

8. References

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Figure 1. Depreciation of exchange rate and wages

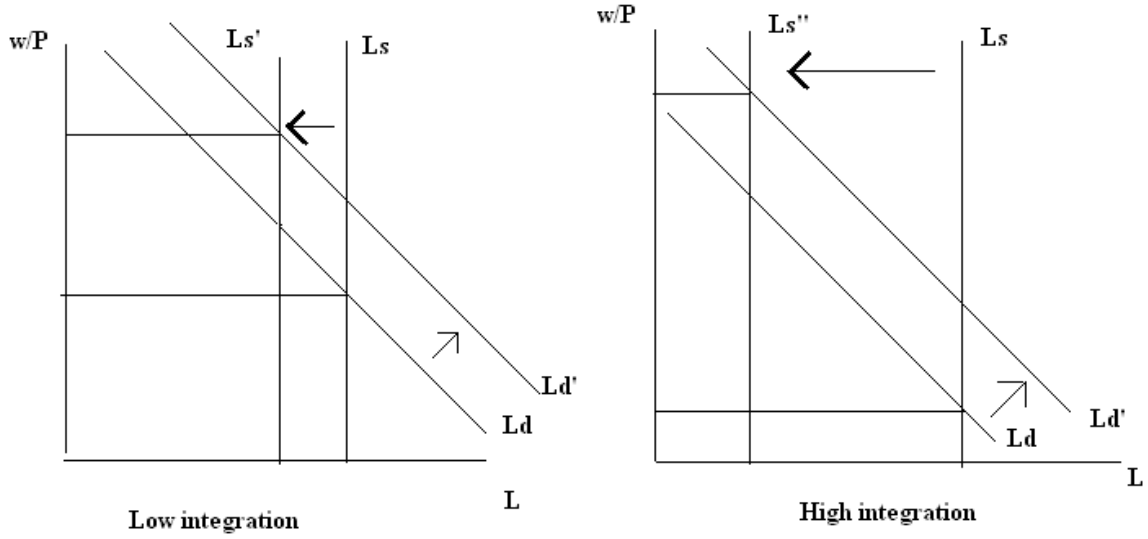

Table 1. Effect of Exchange Rates on Wages

Dependent variable: ln(real wage)		
	[1]	**[2]**
Ln migration-weighted real exchange rate$_{t-1}$	0.257***	0.271***
	(0.067)	(0.093)
Ln (exports/GDP)$_{t-1}$		0.059
		(0.123)
Ln (imports/GDP)$_{t-1}$		-0.466***
		(0.108)
Country fixed effects	Y	Y
Year fixed effects	Y	Y
Observations	801	740
Number of countries	66	66

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants.

Table 2. Effect of Exchange Rates on Wages-Interaction With Labor Market Integration

Dependent variable: ln(real wage)

	[1]	[2]	[3]	[4]	[5]	[6]
Ln migration-weighted real exchange rate$_{t-1}$	0.353***	0.250**	0.295**	0.294	0.338*	0.343
	(0.117)	(0.114)	(0.134)	(0.186)	(0.196)	(0.212)
Ln migration-weighted real exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$	**0.013****	**0.014****	**0.015***	**0.041*****	**0.049****	**0.050****
	(0.005)	**(0.006)**	**(0.009)**	**(0.016)**	**(0.020)**	**(0.021)**
Ln emigration rate$_{t-1}$	0.042**	0.061***	0.058**	0.124***	0.140***	0.137***
	(0.017)	(0.017)	(0.024)	(0.032)	(0.039)	(0.041)
Ln (exports/GDP)$_{t-1}$	0.034	-0.078	0.049	0.003	0.077	0.214
	(0.122)	(0.105)	(0.178)	(0.258)	(0.276)	(0.308)
Ln (imports/GDP)$_{t-1}$	-0.432***	-0.273***	-0.343*	-0.268	-0.28	-0.373
	(0.113)	(0.100)	(0.177)	(0.239)	(0.246)	(0.262)
Dummy for crisis$_{t-1}$		-0.156	-0.152	0.003	0.033	0.07
		(0.100)	(0.128)	(0.091)	(0.101)	(0.099)
Ln unemployment rate$_{t-1}$			-0.088*	-0.071	-0.084	-0.143*
			(0.046)	(0.071)	(0.078)	(0.084)
Ln tax wedge$_{t-1}$				-0.318***	-0.310**	-0.264**
				(0.117)	(0.124)	(0.118)
Ln (FDI/GDP)$_{t-1}$					0.046*	0.026
					(0.028)	(0.028)
Ln migration-weighted OECD wage$_{t-1}$						0.065
						(0.082)
Ln migration-weighted OECD price$_{t-1}$						-0.089
						(0.068)
Country fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
Observations	740	710	574	419	393	378
Number of countries	66	66	58	47	44	44

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

Table 3a. Correlation between Different Real Exchange Rate Measures

	Migration-weighted I	Migration-weighted II	Migration-weighted III	Migration-weighted IV	US$ (local currency/US$)	Trade weighted
Migration-weighted I	1					
Migration-weighted II	0.9774**	1				
Migration-weighted III	0.9755*	0.9984*	1			
Migration-weighted IV	0.9355*	0.9856*	0.9891*	1		
US$ (local currency/US$)	0.8272*	0.9145*	0.9205*	0.9504*	1	
Trade weighted	0.015	0.011	0.0129	0.0124	0.0008	1

Notes. Migration-weighted I, II, III and IV are alternative measures of migration-weighted exchange rates. Migration-weighted I is used as the primary measure in all the regressions, it uses share of migrants in destination countries in the initial sample period as weights; Migration-weighted II uses time-varying share of migrants in different destination countries; Migration-weighted III uses migrant shares averaged over the sample as weights; Migration-weighted IV uses migrant shares in 1995 (year with data on migrantion for maximum number of countries) as weights

Table 3b. Effect of Exchange Rates on Wages-Interaction With Labor Market Integration: Alternative Measures of Exchange Rates

Dependent variable: ln(real wage)					
	US$ real exchange rate [1]	Time-varying weights [2]	Constant weights (average over sample) [3]	Constant weights (1995) [4]	Trade-weighted real exchange rate [5]
Ln real US$ exchange rate$_{t-1}$	0.129				
	(0.289)				
Ln real US$ exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$	**0.082*** **				
	(0.031)				
Ln real migration-wt (II) exchange rate$_{t-1}$		0.366**			
		(0.159)			
Ln real migration-wt (II) exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$		**0.081*** **			
		(0.029)			
Ln real migration-wt (III) exchange rate$_{t-1}$			0.216***		
			(0.078)		
Ln real migration-wt (III) exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$			**0.078** **		
			(0.031)		
Ln real migration-wt (IV) exchange rate$_{t-1}$				0.178	
				(0.276)	
Ln real migration-wt (IV) exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$				**0.084*** **	
				(0.032)	
Ln real trade-wt exchange rate$_{t-1}$					-0.083
					(0.070)
Ln real trade-wt exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$					**0.072** **
					(0.035)
Ln emigration rate$_{t-1}$	0.206***	0.093***	0.200***	0.213***	-0.047
	(0.062)	(0.024)	(0.061)	(0.065)	(0.055)
Ln (exports/GDP)$_{t-1}$	0.317	0.278	0.322	0.314	0.489**
	(0.303)	(0.271)	(0.266)	(0.311)	(0.224)
Ln (imports/GDP)$_{t-1}$	-0.460*	-0.478*	-0.525*	-0.462*	-0.802***
	(0.263)	(0.263)	(0.273)	(0.267)	(0.229)
Dummy for crisis$_{t-1}$	0.067	0.05	0.057	0.061	0.095
	(0.098)	(0.098)	(0.102)	(0.099)	(0.105)
Ln unemployment rate$_{t-1}$	-0.141*	-0.194**	-0.181**	-0.158*	-0.210**
	(0.082)	(0.085)	(0.086)	(0.082)	(0.083)
Ln tax wedge$_{t-1}$	-0.224*	-0.227**	-0.292**	-0.222*	-0.17
	(0.120)	(0.111)	(0.123)	(0.120)	(0.140)
Ln (FDI/GDP)$_{t-1}$	0.02	0.028	0.034	0.026	0.022
	(0.028)	(0.027)	(0.029)	(0.028)	(0.030)
Ln migration-weighted OECD wage$_{t-1}$	0.06	0.042	0.047	0.064	0.056
	(0.081)	(0.083)	(0.082)	(0.079)	(0.082)
Ln migration-weighted OECD price$_{t-1}$	-0.07	-0.039	-0.025	-0.066	-0.065
	(0.067)	(0.064)	(0.065)	(0.066)	(0.064)
Country fixed effects	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
Observations	378	378	378	378	378
Number of countries	44	44	44	44	44

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD. Migration-weighted II, III and IV are alternative measures of migration-weighted exchange rates. See notes to Table 3a.

Table 4. Estimated Ealsticity of Real Wages to Real Exchange Rates

Weights →		Migration-weighted exchange rates				Real exchange rates (US$)
		Initial sample [1]	Time-varying [2]	Sample average [3]	1995 [4]	None [5]
Mean emigration rate		0.29	0.29	0.14	0.10	0.05
Emigration rates (deciles) ↓						
	10	0.15	0.05	-0.09	-0.15	-0.19
	20	0.22	0.17	0.02	-0.03	-0.07
	30	0.25	0.22	0.07	0.02	-0.02
	40	0.28	0.26	0.11	0.07	0.02
	50	0.32	0.33	0.18	0.14	0.09
	60	0.34	0.36	0.21	0.17	0.12
	70	0.35	0.38	0.23	0.20	0.15
	80	0.37	0.40	0.25	0.22	0.17
	90	0.39	0.45	0.30	0.26	0.21

Notes. The elasticities shown above are based on the estimated coeficients from the final specifications in Tables 2 and 3.

Table 5. Effect of Exchange Rates on Wages-Interaction with Other Measures of Intergration

Dependent variable: ln(real wage)					
	Emigration stocks	Remittances/ GDP	Emigration rate (2-year lagged)	Emigration rate (3-year lagged)	Composite Measure
	[1]	[2]	[3]	[4]	[5]
Ln migration-weighted real exchange rate$_{t-1}$	0.103	-0.196	0.282	0.303	0.183
	(0.194)	(0.186)	(0.225)	(0.234)	(0.194)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration stocks$_{t-1}$	0.046**				
	(0.019)				
Ln emigration rate$_{t-1}$	0.126***				
	(0.037)				
Ln migration-weighted real exchange rate$_{t-1}$ * Ln (remittances / GDP)$_{t-1}$		**0.112*** **			
		(0.037)			
Ln remittances to GDP$_{t-1}$		0.142			
		(0.102)			
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-2}$			**0.031*** **		
			(0.011)		
Ln emigration rate$_{t-2}$			0.099***		
			(0.025)		
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{-3}$				**0.030****	
				(0.014)	
Ln emigration rate$_{t-3}$				0.062	
				(0.038)	
Ln migration-weighted real exchange rate$_{t-1}$ * Ln composite emigration measure$_{t-1}$					**0.051**
					(0.157)
Ln (exports/GDP)$_{t-1}$	0.203	-0.003	0.104	0.262	0.247
	(0.310)	(0.274)	(0.285)	(0.238)	(0.305)
Ln (imports/GDP)$_{t-1}$	-0.363	-0.354	-0.290	-0.559***	-0.410
	(0.261)	(0.265)	(0.240)	(0.214)	(0.252)
Dummy for crisis$_{t-1}$	0.071	-0.064	-0.052	0.046	0.058
	(0.099)	(0.076)	(0.049)	(0.104)	(0.096)
Ln unemployment rate$_{t-1}$	-0.150*	0.005	-0.068	-0.129**	-0.142*
	(0.085)	(0.091)	(0.077)	(0.065)	(0.080)
Ln tax wedge$_{t-1}$	-0.229**	0.209	-0.267**	-0.143	-0.079
	(0.116)	(0.167)	(0.108)	(0.125)	(0.129)
Ln (FDI/GDP)$_{t-1}$	0.023	0.043	0.015	0.029	0.034
	(0.028)	(0.042)	(0.019)	(0.031)	(0.030)
Ln migration-weighted OECD wage$_{t-1}$	0.065	0.040	0.158*	0.002	0.063
	(0.083)	(0.083)	(0.090)	(0.085)	(0.081)
Ln migration-weighted OECD price$_{t-1}$	-0.091	-0.067	-0.107	-0.080	-0.066
	(0.069)	(0.083)	(0.085)	(0.075)	(0.064)
Country fixed effects	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y
Observations	378	295	349	340	392
Number of countries	44	39	44	42	44

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD. Note that the composite measure of integration does not appear as a regressor, as it does not vary over time and is absorbed by the country fixed effects.

Table 6. Effect of Exchange Rates on Wages-Interactions-Developing Countries

Dependent variable: ln(real wage)				
	[1]	[2]	[3]	[4]
Ln migration-weighted real exchange rate$_{t-1}$	0.359***	0.245**	0.171	0.165
	(0.117)	(0.113)	(0.182)	(0.198)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$	0.015***	0.013***	0.027***	0.026***
	(0.004)	(0.004)	(0.009)	(0.009)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$ * developing	**-0.004**	**0.003**	**0.048****	**0.051****
	(0.005)	**(0.006)**	**(0.024)**	**(0.025)**
Ln emigration rate$_{t-1}$	0.042**	0.062***	0.145***	0.144***
	(0.018)	(0.018)	(0.036)	(0.038)
Ln (exports/GDP)$_{t-1}$	0.026	-0.073	0.204	0.342
	(0.123)	(0.106)	(0.286)	(0.318)
Ln (imports/GDP)$_{t-1}$	-0.436***	-0.269***	-0.290	-0.372
	(0.114)	(0.102)	(0.254)	(0.272)
Dummy for crisis$_{t-1}$		-0.155	0.061	0.100
		(0.101)	(0.105)	(0.104)
Ln unemployment rate$_{t-1}$			-0.069	-0.126
			(0.075)	(0.081)
Ln tax wedge$_{t-1}$			-0.308**	-0.278**
			(0.121)	(0.115)
Ln (FDI/GDP)$_{t-1}$			0.047*	0.026
			(0.028)	(0.028)
Ln migration-weighted OECD wage$_{t-1}$				0.066
				(0.080)
Ln migration-weighted OECD price$_{t-1}$				-0.063
				(0.066)
Country fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Observations	740	710	393	378
Number of countries	66	66	44	44
R-squared	0.97	0.98	0.97	0.97

Notes. significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

Table 7. Effect of Exchange Rates on Wages-Interaction With Labor Market Integration - Control for Composition of Trade

Dependent variable: ln(real wage)						
	[1]	[2]	[3]	[4]	[5]	[6]
Ln migration-weighted real exchange rate$_{t-1}$	0.324***	0.226**	0.267**	0.304	0.313	0.327
	(0.112)	(0.109)	(0.124)	(0.189)	(0.196)	(0.210)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$	**0.012****	**0.014****	**0.015***	**0.038****	**0.044****	**0.046****
	(0.005)	**(0.006)**	**(0.008)**	**(0.017)**	**(0.020)**	**(0.021)**
Ln emigration rate$_{t-1}$	0.022	0.052***	0.051**	0.108***	0.115**	0.116**
	(0.019)	(0.018)	(0.023)	(0.041)	(0.046)	(0.048)
Ln (exports/GDP)$_{t-1}$	-1.414	-2.276	-3.02	0.426	-0.821	-0.478
	(1.543)	(1.467)	(2.229)	(3.001)	(3.165)	(3.111)
Ln (imports/GDP)$_{t-1}$	-5.490***	-2.945**	-2.322	-4.532***	-4.249**	-3.763**
	(1.617)	(1.281)	(1.769)	(1.726)	(1.760)	(1.814)
Dummy for crisis$_{t-1}$		-0.156	-0.145	-0.001	0.032	0.068
		(0.096)	(0.114)	(0.090)	(0.101)	(0.099)
Ln unemployment rate$_{t-1}$			-0.074	-0.08	-0.092	-0.149*
			(0.047)	(0.072)	(0.079)	(0.085)
Ln tax wedge$_{t-1}$				-0.378***	-0.382***	-0.324***
				(0.115)	(0.122)	(0.114)
Ln (FDI/GDP)$_{t-1}$					0.053*	0.033
					(0.029)	(0.030)
Ln migration-weighted OECD wage$_{t-1}$						0.057
						(0.081)
Ln migration-weighted OECD price$_{t-1}$						-0.08
						(0.067)
Ln (exports/GDP)$_{t-1}$* Share of capital-intensive exports	0.37	0.571	0.807	-0.11	0.236	0.181
						(0.808)
Ln (imports/GDP)$_{t-1}$* Share of capital-intensive imports	1.335***	0.706**	0.52	1.118**	1.045**	0.891*
						(0.471)
Country fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
Observations	740	710	574	419	393	378
Number of countries	66	66	58	47	44	44

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

Table 8. Effect of Exchange Rates on Wages-Interaction of Labor-DD With Labor Market Integration

Dependent variable: ln(real wage)						
	[1]	[2]	[3]	[4]	[5]	[6]
Ln migration-weighted real exchange rate$_{t-1}$	0.295***	0.189*	0.167	0.131	0.035	0.074
	(0.113)	(0.107)	(0.128)	(0.165)	(0.174)	(0.189)
Ln migration-weighted real exchange rate$_{t-1}$ * ln emigration rate$_{t-1}$	**0.012****	**0.013****	**0.015***	**0.031****	**0.019****	**0.017***
	(0.005)	**(0.006)**	**(0.008)**	**(0.014)**	**(0.010)**	**(0.009)**
Ln emigration rate$_{t-1}$	0.153	0.164*	0.304**	0.329	0.263	0.177
	(0.095)	(0.091)	(0.125)	(0.268)	(0.208)	(0.201)
Ln (exports/GDP)$_{t-1}$	0.123	0.005	0.163	0.177	0.227	0.294
	(0.134)	(0.111)	(0.185)	(0.245)	(0.291)	(0.306)
Ln (imports/GDP)$_{t-1}$	-0.490***	-0.324***	-0.455**	-0.442*	-0.523**	-0.475**
	(0.119)	(0.105)	(0.187)	(0.245)	(0.226)	(0.215)
Dummy for crisis$_{t-1}$		-0.176	-0.179	0.049	-0.125**	-0.107**
		(0.145)	(0.173)	(0.122)	(0.061)	(0.054)
Ln unemployment rate$_{t-1}$			-0.086*	-0.064	-0.029	-0.046
			(0.046)	(0.071)	(0.077)	(0.079)
Ln tax wedge$_{t-1}$				-0.320***	-0.238**	-0.230**
				(0.120)	(0.097)	(0.099)
Ln (FDI/GDP)$_{t-1}$					0.022	0.000
					(0.022)	(0.021)
Ln migration-weighted OECD wage$_{t-1}$						0.147**
						(0.071)
Ln migration-weighted OECD price$_{t-1}$						-0.076
						(0.067)
Ln (exports/GDP)$_{t-1}$* ln emigration rate$_{t-1}$	0.037	0.034	0.025	0.072	0.018	0.027
	(0.029)	(0.030)	(0.036)	(0.091)	(0.060)	(0.058)
Ln (imports/GDP)$_{t-1}$* ln emigration rate$_{t-1}$	-0.068**	-0.063*	-0.096**	-0.133***	-0.070	-0.052
	(0.033)	(0.033)	(0.043)	(0.050)	(0.055)	(0.049)
Country fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
Observations	740	710	574	419	355	343
Number of countries	66	66	58	47	44	44

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses.

All variables refer to the origin country of migrants except wages and prices in OECD.

Table 9. Effect of Exchange Rates on Wages - Alternative Sources of Data on Wages

Dependent variable: ln(real wage)		
	IFS	Freeman-Oostendorp
	[1]	[2]
Ln migration-weighted real exchange rate$_{t-1}$	-0.026	3.992***
	(0.069)	(1.037)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$	**0.010**	**0.570*** **
	(0.012)	**(0.063)**
Ln emigration rate$_{t-1}$	0.175***	1.120***
	(0.052)	(0.167)
Ln (exports/GDP)$_{t-1}$	-0.099	0.128
	(0.083)	(0.752)
Ln (imports/GDP)$_{t-1}$	0.115	-4.047***
	(0.080)	(1.348)
Dummy for crisis$_{t-1}$	-0.040	-0.150
	(0.032)	(0.396)
Ln unemployment rate$_{t-1}$	0.015	-0.409
	(0.023)	(0.295)
Ln tax wedge$_{t-1}$	0.107	1.604
	(0.080)	(1.245)
Ln (FDI/GDP)$_{t-1}$	-0.022**	-0.310***
	(0.008)	(0.090)
Ln migration-weighted OECD wage$_{t-1}$	-0.007	-0.547*
	(0.009)	(0.313)
Ln migration-weighted OECD price$_{t-1}$	-0.024	0.471
	(0.022)	(1.490)
Country fixed effects	Y	Y
Year fixed effects	Y	Y
Observations	208	151
Number of countries	26	30

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

Table 10. Effect of Exchange Rates on Wages-Low and High Skill Wages

	Dependent variable			
	ln(low-skill real wage)	ln(high-skill real wage)	ln(low-skill real wage)	ln(high-skill real wage)
Ln migration-weighted real exchange rate$_{t-1}$	3.937***	3.992***	0.202	-0.329
	(1.049)	(0.995)	(0.131)	(0.411)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$	**0.573*** **	**0.572*** **		
	(0.063)	**(0.059)**		
Ln migration-weighted real exchange rate$_{t-1}$ * Ln low-skill emigration rate $_{t-1}$			**0.220***	
			(0.114)	
Ln migration-weighted real exchange rate$_{t-1}$ * Ln high-skill emigration rate $_{t-1}$				**0.336***
				(0.18)
Ln emigration rate$_{t-1}$	1.124***	1.111***		
	(0.168)	(0.160)		
Ln low-skill emigration rate$_{t-1}$			0.202	
			(0.242)	
Ln high-skill emigration rate$_{t-1}$				1.223
				(0.862)
Ln (exports/GDP)$_{t-1}$	0.253	0.117	0.74	0.593
	(0.752)	(0.714)	(0.91)	(1.096)
Ln (imports/GDP)$_{t-1}$	-4.131***	-4.020***	0.17	-0.471
	(1.382)	(1.289)	(0.805)	(1.196)
Dummy for crisis$_{t-1}$	-0.127	-0.16	1.366	1.571
	(0.400)	(0.377)	(1.051)	(0.976)
Ln unemployment rate$_{t-1}$	-0.39	-0.43	-0.396	-0.729*
	(0.300)	(0.280)	(0.369)	(0.431)
Ln tax wedge$_{t-1}$	1.58	1.46	-0.012	-0.281
	(1.276)	(1.180)	(0.558)	(0.54)
Ln (FDI/GDP)$_{t-1}$	-0.322***	-0.288***	-0.774***	-0.852***
	(0.092)	(0.087)	(0.237)	(0.252)
Ln migration-weighted OECD wage$_{t-1}$	-0.560*	-0.512*	0.232***	0.472***
	(0.319)	(0.299)	(0.082)	(0.103)
Ln migration-weighted OECD price$_{t-1}$	0.542	0.287	3.706*	3.217
	(1.500)	(1.383)	(2.226)	(2.123)
Country fixed effects	Y	Y	N	N
Year fixed effects	Y	Y	Y	Y
Observations	151	151	151	151
Number of countries	30	30	30	30

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

Table 11a. Effect of Exchange Rates on US Immigrant Wages-Interactions

Dependent variable: ln(real wage of immigrants in the US)

	[1]	[2]	[3]	[4]
Ln real exchange rate wrt US_{t-1}	0.376	0.361	0.914**	0.751*
	(0.242)	(0.244)	(0.438)	(0.397)
Ln real exchange rate wrt US_{t-1} * Ln emigration rate to the US_{t-1}	**-0.106****	**-0.111****	**-0.158***	**-0.098**
	(0.048)	**(0.049)**	**(0.099)**	**(0.104)**
Ln emigration rate to the US_{t-1}	-0.226	-0.213	-0.603**	-0.582*
	(0.142)	(0.144)	(0.293)	(0.311)
Ln $(exports/GDP)_{t-1}$	-0.152*	-0.144	-0.286	-0.206
	(0.089)	(0.090)	(0.220)	(0.214)
Ln $(imports/GDP)_{t-1}$	0.082	0.077	0.007	0.004
	(0.141)	(0.141)	(0.303)	(0.317)
Dummy for $crisis_{t-1}$		0.001	0.223	0.193
		(0.136)	(0.178)	(0.186)
Ln unemployment $rate_{t-1}$			-0.127	-0.149
			(0.151)	(0.154)
Ln tax $wedge_{t-1}$			-0.103	-0.031
			(0.332)	(0.356)
Ln $(FDI/GDP)_{t-1}$			-0.029	-0.037
			(0.063)	(0.065)
Ln average US $wage_{t-1}$				-1.561
				(2.924)
Ln average US $price_{t-1}$				2.192
				(3.635)
Country fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	N
Observations	546	537	289	264
Number of countries	74	73	47	47

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All explanatory variables refer to the origin country of migrants except wages and prices in the US.

Table 11b. Estimated Ealsticity of Real Wages in the US to Real Exchange Rates

	Specifications			
	[1]	[2]	[3]	[4]
Emigration rates (deciles) ↓				
10	0.61	0.61	1.14	0.89
20	0.53	0.52	1.10	0.87
30	0.49	0.48	1.04	0.83
40	0.44	0.44	0.98	0.79
50	0.39	0.37	0.92	0.76
60	0.35	0.34	0.88	0.73
70	0.32	0.30	0.85	0.71
80	0.26	0.25	0.81	0.69
90	0.17	0.18	0.67	0.60

Notes. The elasticities shown above are based on the estimated coeficients from the corresponding specifications in Table 11a.

Table 12. Effect of Exchange Rates on Migration

Dependent variable:	ln(emigration rate)			ln(remittances / GDP)		
Variable	[1]	[2]	[3]	[4]	[5]	[6]
Ln migration-weighted real exchange rate$_{t-1}$	**0.471*** **	**1.168*** **	**1.157*** **	**0.094**	**0.349** **	**0.644*** **
	(0.117)	**(0.245)**	**(0.245)**	**(0.094)**	**(0.160)**	**(0.159)**
Ln real wage$_{t-1}$		0.226	0.391**		-0.145*	-0.224***
		(0.141)	(0.157)		(0.075)	(0.083)
Dummy for crisis$_{t-1}$		0.101	0.195		-0.192*	-0.221*
		(0.228)	(0.238)		(0.115)	(0.117)
Ln migration-weighted OECD wage$_{t-1}$			-0.028			-0.023
			(0.039)			(0.038)
Ln migration-weighted OECD price$_{t-1}$			-0.172**			0.021
			(0.080)			(0.062)
Country fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
Observations	2295	824	770	2213	805	702
Number of countries	161	66	65	143	63	60

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

APPENDIX NOT FOR PUBLICATION

Wage data

The statistics on wages are from the ILO's Key Indicators of the Labor Market (KILM). The ILO reports average earnings per worker or, in some cases, average wage rates. Some of the series cover wage earners (i.e., manual or production workers) only, while others refer to salaried employees (i.e., non-manual workers), or all employees (i.e., wage earners and salaried employees). The series cover workers of both sexes, irrespective of age.[36]

The concept of earnings relates to remuneration in cash and in kind paid to employees, as a rule at regular intervals, for time worked or work done together with remuneration for time not worked, such as for annual vacation, other paid leave or holidays. In general, earnings exclude employers' contributions in respect of their employees paid to social security and pension schemes and also the benefits received by employees under these schemes. However, some countries report any such payments made. Earnings also exclude severance and termination pay. Statistics on earnings relate to employees' gross remuneration, i.e., the total before any deduction is made by the employer in respect of taxes, contributions of employees to social security and pension schemes, life insurance premiums, union dues and other obligations of employees.

Specifically, earnings include: direct wages and salaries, remuneration for time not worked (excluding severance and termination pay), bonuses and gratuities and housing and family allowances paid by the employer directly to this employee. The detailed components are as follows: (a) direct wages and salaries for time worked, or work done, cover: (i) straight time pay of time-rated workers; (ii) incentive pay of time-rated workers; (iii) earnings of piece workers (excluding overtime premiums); (iv) premium pay for overtime, shift, night and holiday work; (v) commissions paid to sales and

[36] See also Hassett and Mathur (2008), who provide details on the ILO wage data.

other personnel. Included are premiums for seniority and special skills, geographical zone differentials, responsibility premiums, dirt, danger and discomfort allowances, payments under guaranteed wage systems, cost-of-living allowances and other regular allowances. (b) Remuneration for time not worked comprises direct payments to employees in respect of public holidays, annual vacations and other time off with pay granted by the employer. (c) Bonuses and gratuities cover seasonal and end-of-year bonuses, additional payments in respect of vacation period (supplementary to normal pay) and profit-sharing bonuses. (ii) Statistics on earnings distinguish cash earnings from payments in kind. Wage rates: These include basic wages, cost-of-living allowances and other guaranteed and regularly paid allowances, but exclude overtime payments, bonuses and gratuities, family allowances and other social security payments made by employers. Ex gratia payments in kind, supplementary to normal wage rates, are also excluded.

The coverage of the data differs for countries because of the following reasons (1) whether the reported statistic is wages or earnings; (2) whether it covers employees, wage earners or salaried employees; and (3) whether it includes social security contributions by employer. When we studied the descriptions more closely, we found that certain countries like Chile, Turkey, Colombia, Ecuador, Kenya, Kyrgyzstan, Mexico, Malaysia, Panama and Ukraine included social security contributions by employers in the earnings data. Another difference arises because the industrial classification changed during this period. Since the beginning of the 1990s, an increasing number of countries have made a switchover in their data reporting systems for industrial statistics from Revision 2 to Revision 3 of the International Standard Classification (ISIC). We include country fixed effects to allow for all these differences in coverage in the panel regression.

Data on Migration

The main sources of the OECD migration statistics are population registers, residence or work permits, censuses and surveys. However, a wide variety of other data sources (e.g., special surveys, counts at border crossings, analysis of landing cards) are also used.

In the data, the immigrant population is usually defined in one of two ways. Some countries, including European countries, Japan, and Korea, have traditionally defined immigrants as foreign *nationals* living in the country whilst others, including Australia, Canada, New Zealand and the United States, define immigrants as foreign-*born* living in the country. This difference in definition relates in part to the nature and the history of immigration systems and legislation on citizenship and naturalization.

The foreign-born population can be viewed as representing first-generation migrants, and may consist of both foreign and nationalized citizens. The size and composition of the foreign-born population is influenced by the history of migration flows and mortality amongst the foreign-born. For example, where inflows have been declining over time, the stock of the foreign-born will tend to age and represent an increasingly established community.

On the other hand, the population of foreign nationals may represent second and higher generations as well as first generations of migrants. The characteristics of the population of foreign nationals depend on a number of factors including (i) the history of migration flows, (ii) the natural increase in the foreign population, and (iii) the naturalization rate. Higher generations of immigrants arise in situations where they retain their foreign citizenship even when native-born. The nature of legislation on citizenship and the incentives foreigners have to naturalize both play a role in determining the extent to which this occurs in practice. In some countries, such as the United States, those who are native born but who are foreign nationals are a non-existent or negligible group as legislation is such that birth within the country usually entitles individuals to citizenship.

In addition to the problem of the comparability of statistics, there is the difficulty of

the partial coverage of illegal migrants. Part of this population can be counted through censuses. The number of immigrants who entered legally but then overstay after their residence permits (or visa) have expired can be calculated from permit statistics, but without it being possible to determine what the number of these immigrants that have left the country. Regularization programs, when they exist, make it possible to account for a far from negligible fraction of illegal immigrants after the fact. In terms of measurement, this makes it possible better to evaluate the volume of the foreign population at a given time, although it is not always possible to classify these immigrants by the year when they entered the country.

Derivation of labor demand

The labor demand in equation (1) can be derived from a Cobb-Douglas production function and a standard Keynesian framework. Given the production function $Y = L^{\alpha} K^{1-\alpha}$, the demand for labor is $L^d = \alpha \frac{P}{w} Y$ where P is the price of output. In a very simple macro framework, aggregate demand is $Y^d = C + G + I + NX\left(\frac{eP^*}{P}\right)$, which can re-written as $Y^d = \frac{1}{1-\beta}\left[\left(\bar{C} + G + I + NX\left(\frac{eP^*}{P}\right)\right)\right]$ where β is the marginal propensity to consume. C, G are private and government consumption respectively. I is investment demand.

Putting together aggregate demand and the production functions yields:

$L^d = \alpha \frac{P}{w} Y = \left(\frac{P}{w}\right) \frac{\alpha}{1-\beta}\left[\bar{C} + G + I + NX\left(\frac{eP^*}{P}\right)\right]$ or $L^d = \left(\frac{P}{w}\right)\alpha'\left[\bar{D} + NX\left(\frac{eP^*}{P}\right)\right]$ which forms the basis for the labor demand presented in the text in Equation (1): $L^d = \left(\frac{w}{P}\right)^{-\alpha} [NX\left(\frac{eP^*}{P}\right)]^{\eta} \bar{D}$.

Note that we allow for a richer specification than Cobb-Douglas production function, which imposes $\alpha=1$.

Derivation of labor supply

The labor supply presented in equation (2) can be derived from the following household utility function $U = C - \frac{1}{\delta}\left(L^{s^\eta} + \sum_{i=1}^{N} \frac{1}{\phi_i} L_i^{\ \eta} \right)^{\frac{\delta}{\eta}}$ with $\eta < 1, \delta > 1,$ and the constraint $L^s + \sum_{i=1}^{N} L_i \le \bar{L}$ where L^s is the domestic labor supply and L_i is the labor supply by nationals abroad in country i. This functional form is an extension of the form $U = C - \frac{1}{\delta} L^{\delta}$ which is used in macro models of (labor-closed) economies with the resulting labor supply $L^s = \left(\frac{w}{p} \right)^{\frac{1}{\delta - 1}}$. The parameter $\frac{1}{\phi_i}$ measures the disutility from working in country i. The maximization problem for the household is:

$$\max_{L^s L^* C} U \equiv C - \frac{1}{\delta}\left(L^{s^\eta} + \sum_{i=1}^{N} \frac{1}{\phi_i} L_i^{\ \eta} \right)^{\frac{\delta}{\eta}} \quad s.t. \quad PC = wL^s + \sum_{i=1}^{N} e_i w_i L_i$$

Maximizing with respect to L^* and L_i yields:[37]

$$L^s = \left(\frac{w}{P} \frac{1}{\bar{P}\left(\frac{\phi_i e_i w_i}{P_i} \right)} \right)^{\frac{1}{\delta - 1}} \quad \text{where } \bar{P}\left(\frac{\phi_i e_i w_i}{P_i} \right) \text{ is the standard price index in CES functions}$$

This motivates the empirical specification used in the text.

[37] This is an approximation under the assumption that the number of foreign countries is large.

Derivation of the relationship between wages of immigrants in the U.S. and labor market integration with the U.S.

Consider two countries, the U.S. and the origin country of immigrants (i). Assume that labor is homogenous and that the labor market in the U.S. is segmented according to the nationality of immigrants.

Labor demand for immigrants from country i in the U.S.

As discussed in the text, we assume that immigrant workers are imperfect substitutes for domestic workers. The resulting labor demand for immigrant workers from country i is:

$$L_i^{d,US} = (\frac{w_i^{US}}{P^{US}})^{-\beta} X^{d,US} \quad \text{(A1)}$$

Where $L_i^{d,US}$ is the labor demand for immigrants from country i in the U.S., w_i^{US} is the nominal wage of immigrants from country i in the U.S., P^{US} is the price index in the U.S., $X^{d,US}$ is a composite term that captures the other factors like income in the U.S., which affect labor demand.

Labor supply of immigrants from country i in the U.S.

Labor supply of immigrants in the U.S. is specified as follows.

$$L_i^{s,US} = (\frac{w_i^{US}}{P_i} * e_i)^{\delta I_{i,US}} X^{s,i} \; X^{s,US} \quad \text{(A2)}$$

Where $L_i^{s,US}$ is the labor supply of immigrants in the U.S. from origin country i; P_i is the domestic price in origin country i and e_i is the nominal exchange rate in local currency units per US$ in origin country i.[38] $X^{s,US}$ and $X^{s,i}$ are composite terms that reflect other factors respectively in the

[38] Note that for simplicity we are deflating wages in the U.S. by origin country price index; in other words, we assume that a migrant even if he works in the U.S. consumes his wage in the origin country. If we assume that only a share of

(continued)

U.S. and in the origin country, affecting labor supply of immigrants in the U.S.. These capture the push and pull factors that are likely to affect labor supply of immigrants in the U.S.. The key innovation once again in the paper is to introduce $I_{i,US}$ in the labor supply equation. We assume $\delta > 0$, i.e., ceteris paribus, an increase in the real exchange rate in the origin country increases the labor supply of immigrants in the U.S. Moreover, higher is the degree of integration of the labor market with the U.S., a given increase in the real exchange rate leads to a bigger increase in labor supply. In equilibrium, assuming segmented labor markets for immigrants in the U.S.,

$$L_i^{d,US} = L_i^{s,US} \tag{A3}$$

Taking logs of (A3) and simplifying:

$$\ln \frac{w_i^{US}}{P^{US}} = -f(I_{i,US}) * \ln \frac{e_i}{P_i} + x^{US} + x^i \tag{A4}$$

Where $f(I_{i,US}) = \frac{\delta I_{i,US}}{\beta + \delta I_{i,US}} > 0; f'(I_{i,US}) > 0;$ x^{US} and x^i are control variables in the U.S. and origin country i respectively that affect real wages of migrants in the U.S.. Equation (A4) forms the basis of our empirical specification with real wages of immigrants in the U.S. as the dependent variable. Equation (A4) implies that the higher the degree of labor market integration of an origin country with the U.S., a given change in real exchange rate leads to a larger drop in wages.

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wages earned abroad β is spent at home and the rest is spent in the U.S., the labor supply equation can be modified as $L_i^{s,US} = (\frac{w_i^{US}}{P_i^{\beta}(P^{US})^{1-\beta}} * e_i)^{\delta I_{i,US}} X^{s,i} X^{s,US}$. While all results go through, we prefer to keep the simple notation in Equation (A2).

Table A1. Countries in the Sample and Top Destination Countries, 1981-2005 (share of migrants in parentheses)

Origin Country	First Destination	Second Destination	Third Destination	Fourth Destination	Fifth Destination
Australia	US (46)	UK (37)	Japan (6)	Germany (4)	Ireland (2)
Austria	Germany (61)	US (22)	Switzerland (10)	Italy (3)	Netherlands (1)
Azerbaijan	Greece (84)	Poland (55)	Italy (31)		
Belgium	US (23)	Netherlands (20)	Germany (18)	Luxembourg (12)	Spain (10)
Bolivia	US (96)	Italy (3)	Sweden (2)	Netherlands (.3)	
Botswana	Netherlands (82)	Italy (18)			
Brazil	Japan (49)	US (33)	Portugal (10)	Italy (4)	Spain (2)
Bulgaria	Turkey (89)	Germany (40)	Greece (17)	Italy (12)	Czech Rep (4)
Canada	US (89)	UK (3)	Australia (3)	Germany (1)	Greece (1)
Chile	US (61)	Australia (20)	Sweden (8)	Spain (5)	Italy (2)
China	US (44)	Japan (17)	Canada (15)	Australia (7)	Korea (3)
Colombia	US (89)	Spain (8)	Italy (2)	Norway (.6)	Netherlands (.3)
Costa Rica	US (99)	Italy (.6)	Netherlands (.2)		
Croatia	Germany (55)	Australia (14)	Austria (13)	Switzerland (11)	Italy (4)
Cyprus	Australia (56)	Turkey (26)	Greece (17)	Hungary (.8)	Italy (.4)
Czech Rep	US (51)	Germany (33)	Slovak Rep (6)	Italy (5)	Netherlands (2)
Denmark	Sweden (25)	Germany (20)	US (19)	Norway (18)	Spain (6)
Dominican Rep	US (94)	Spain (4)	Italy (2)	Netherlands (.2)	Greece (.0)
Ecuador	US (79)	Spain (17)	Italy (4)	Netherlands (.1)	
El Salvador	US (99)	Mexico (.8)	Italy (.4)	Sweden (.1))	Netherlands (.0)
Estonia	Finland (84)	Sweden (12)	Italy (2)	Poland (2.)	
Finland	Sweden (61)	US (18)	Germany (10)	Norway (4)	Belgium (2)
France	US (26)	Germany (14)	Belgium (14)	UK (10)	Canada (9)
Germany	US (57)	Canada (9)	Austria (6)	Australia (6)	Switzerland (6)
Ghana	US (65)	UK (20)	Italy (13)	Netherlands (2)	Greece (.3)
Guatemala	US (99)	Mexico (3)	Italy (.1)	Netherlands (.0)	
Hungary	US (31)	Germany (21)	Canada (18)	Australia (9)	Austria (9)
Iceland	Denmark (40)	Sweden (28)	Norway (27)	Netherlands (3)	Luxembourg (2)
Israel	US (89)	Italy (3)	Netherlands (2.)	Denmark (2)	Hungary (1)
Jamaica	US (73)	Canada (20)	UK (8)	Netherlands (.0)	Italy (.0)
Japan	US (82)	Germany (6)	UK (5)	Korea (2)	New Zealand (1)
Kazakhstan	Greece (98)	Poland (41)	Italy (23)	Hungary (7)	
Kenya	US (93)	New Zealand (2)	Italy (2)	Sweden (1)	Netherlands (.8)
Korea	US (55)	Japan (39)	Australia (3)	Germany (1)	New Zealand (1)
Kyrgyz Rep	Greece (65)	Italy (26)	Hungary (9)		
Latvia	US (84)	Ireland (8)	Sweden (4)	Italy (3)	Poland (.5)
Lithuania	US (91)	Ireland (4)	Sweden (2)	Poland (2)	Italy (2)
Macedonia	Switzerland (30)	Germany (3)	Australia (25)	Italy (13)	Sweden (.9)
Malaysia	Australia (49)	US (26)	UK (15)	New Zealand (7)	Japan (5)
Mauritius	Italy (99)	Netherlands (.8)			
Mexico	US (99)	Germany (.1)	Italy (.1)	Netherlands (.0)	Sweden (.0)
Netherlands	Canada (19)	Germany (18)	Belgium (15)	Australia (15)	US (13)
New Zealand	Australia (86)	UK (9)	US (4)	Ireland (.3)	Netherlands (.2)
Nicaragua	US (99.832)	Italy (.1)	Netherlands (.0)		
Norway	Sweden (44)	US (22)	Denmark (17)	Germany (10.)	Netherlands (3)
Pakistan	US (55)	UK (20)	Germany (8)	Italy (5)	Spain (3)
Panama	US (99)	Italy (.5)	Greece (.2)	Netherlands (.0)	
Philippines	US (67)	Canada (12)	Japan (8)	Australia (6)	Italy (3)
Poland	US (36)	Germany (27)	Canada (15)	Australia (6)	Austria (4)
Portugal	France (44)	US (15)	Canada (14)	Switzerland (13)	Germany (12)
Romania	Italy (23)	Germany (21)	US (17)	Hungary (11)	Austria (9)
Russia	US (68)	Germany (19)	Finland (3)	Greece (3)	Italy (2)
Singapore	Australia (57)	US (36)	New Zealand (6)	Netherlands (1)	Italy (.2)
Slovak Rep	Czech Rep (46)	US (34)	Germany (14)	Italy (3)	Hungary (2)
Slovenia	Germany (46)	Austria (37)	Italy (9)	Switzerland (6)	Sweden (1)
South Africa	US (31)	Australia (30)	UK (23)	New Zealand (9)	Portugal (4)
Spain	Germany (27)	US (22)	Switzerland (17)	Belgium (10)	UK (9)
St Vincent Gr	Greece (92)	Netherlands (6)	Italy (1.6)		
Switzerland	Germany (31)	US (28)	Italy (13)	Portugal (11)	Spain (6)
Thailand	US (73)	Japan (15)	Sweden (3)	New Zealand (2)	Denmark (2)
Trinidad Tob	US (99)	Netherlands (.1)	Italy (.0)		
Turkey	Germany (70)	France (8)	Austria (.6)	Netherlands (4)	US (4.)
UK	Australia (37)	US (24)	Canada (20)	New Zealand (7)	Germany (4)
US	Canada (30)	UK (19)	Germany (14)	Australia (7)	Japan (6)
Ukraine	US (46)	Germany (21)	Portugal (12)	Czech Rep (11)	Italy (3)
Zimbabwe	UK (85)	New Zealand (12)	Greece (2)	Netherlands (.6)	Italy (.4)

Notes. For each country, the share of migrants correspond to the year in the period 1981-2005 with the maximum number of destination countries. Migrants in the OECD countries are defined by nationality or country of birth.

Table A2. Emigration Rates to the OECD 1995-2005

country	Emigration rate in 2005	country	Emigration rate in 1995
Jamaica	49.76	Jamaica	50.53
El Salvador	33.28	El Salvador	25.31
Trinidad Tobago	27.80	New Zealand	19.17
New Zealand	25.06	Portugal	19.10
Portugal	24.23	Trinidad Tobago	16.98
Mexico	21.46	Mexico	15.28
Croatia	17.87	Dominican Rep	13.88
Dominican Rep	17.59	Nicaragua	11.00
Macedonia	17.18	Iceland	9.71
Ecuador	11.46	UK	9.26
Iceland	10.77	Turkey	8.88
Guatemala	9.11	Croatia	8.80
Cyprus	8.61	Austria	7.12
Romania	7.91	Cyprus	7.00
UK	7.73	Canada	6.50
Nicaragua	7.18	Guatemala	6.41
Turkey	7.07	Netherlands	6.09
Austria	6.86	Poland	5.73
Poland	6.60	Korea	5.71
Netherlands	6.51	Finland	5.40
Canada	6.08	Macedonia	4.97
Korea	5.99	Panama	4.29
Panama	5.58	Germany	4.28
Finland	5.22	Hungary	4.24
Philippines	5.18	Philippines	4.17
Germany	4.48	Ecuador	3.66
Norway	4.46	Denmark	3.63
Hungary	4.23	Israel	3.58
Slovenia	4.11	Switzerland	2.76
Slovak Rep	3.85	Costa Rica	2.76
Denmark	3.70	Norway	2.72
Israel	3.60	Spain	2.58
Spain	3.31	Romania	2.25
Singapore	3.13	Slovenia	2.14
Colombia	3.12	Singapore	2.14
Switzerland	3.11	France	2.13
Ukraine	2.91	Colombia	1.92
Costa Rica	2.67	Belgium	1.85
Estonia	2.65	Slovak Rep	1.62
Belgium	2.60	Latvia	1.49
Bulgaria	2.52	Estonia	1.31
France	2.29	Malaysia	1.31
Latvia	2.03	Bulgaria	1.22
Australia	1.86	Chile	1.17
Ghana	1.67	Australia	0.94
Malaysia	1.59	Mauritius	0.93
Chile	1.51	Japan	0.76
Mauritius	1.50	Bolivia	0.70
Lithuania	1.34	Russia	0.69
Bolivia	1.27	Lithuania	0.63
Russia	1.17	South Africa	0.61
South Africa	1.16	Thailand	0.61
Czech Rep	1.15	US	0.45
Zimbabwe	1.05	Ukraine	0.41
Japan	0.92	Brazil	0.38
Thailand	0.88	Czech Rep	0.33
Brazil	0.86	Pakistan	0.28
Pakistan	0.58	Ghana	0.26
China	0.39	China	0.18
US	0.38	Kenya	0.05
Kenya	0.37	St Vincent Gr	0.02
St Vincent Gr	0.01	Botswana	0.00
Botswana	0.00	Kyrgyz Rep	0.00
Kazakhstan	0.00	Kazakhstan	0.00
Kyrgyz Rep	0.00	Zimbabwe	0.00

Emigration rates are calculated by the total stock of migrants in the OECD (defined by nationality or birth) as ratio of the population in the source country.

Table A3. Years in the Sample. 1981-2005

Year	Number of observations
1981	22
1982	24
1983	22
1984	22
1985	20
1986	25
1987	24
1988	24
1989	25
1990	25
1991	27
1992	29
1993	29
1994	28
1995	29
1996	38
1997	48
1998	48
1999	49
2000	50
2001	39
2002	40
2003	26
2004	22
2005	5
Total	740

Table A4. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Real wage per hour (local currency units)	378	2.62	4.89	0.01	33.79
Lag migration-weighted real exchange rate (initial sample weights)	378	-3.02	2.61	-12.30	3.41
Lag emigration rate to the OECD	378	1.24	2.14	0.00	17.55
Lag exports / GDP	378	26.16	19.80	4.75	148.25
Lag imports/GDP	378	29.74	20.47	5.24	147.33
Lag crisis (per capita real GDP growth <0)	378	0.06	0.24	0.00	1.00
Lag unemployment rate	378	8.36	4.62	0.90	25.20
Lag tax wedge	378	41.78	13.99	6.93	82.94
Lag FDI/GDP	378	2.87	3.25	0.00	22.43
Migration-weighted nominal wage per hour in the OECD (local currency units)	378	4.30	1.78	-1.35	10.42
Migration-weighted CPI in the OECD	378	4.36	0.37	1.82	4.73
Lag real exchange rate (local currency units per US$)	378	1.24	3.10	0.00	30.77
Lag real migration-weighted exchange rate (time-varying weights)	378	2.88	9.08	0.00	118.83
Lag real migration-weighted exchange rate (sample average weights)	378	0.72	2.23	0.00	28.91
Lag real migration-weighted exchange rate (1995 weights)	378	0.80	2.38	0.00	29.37
Lag real trade-weighted exchange rate	378	5.79	62.82	0.74	1,173
Lag Remittances/GDP	295	1.36	2.21	0.04	13.40
Lag stock of migrants in the OECD (in '000)	378	235.22	477.16	0.08	5,896
Share of capital-intensive exports in overall (in percent)	378	45.41	14.13	21.47	86.73
Share of capital-intensive imports in overall (in percent)	378	43.56	7.04	31.59	69.52
Real wage from IFS (index number)	208	89.70	28.75	6.45	274.46
Real wage per month; Freeman-Oostendorp (local currency units)	141	2,452	13,034	4.26	132,243
Low-skill real wage per month; Freeman-Oostendorp database (local currency units)	141	2,006	10,156	3.94	95,869
High-skill real wage per month; Freeman-Oostendorp database (local currency units)	141	3,113	17,638	4.85	189,400
Real wage per hour of immigrants in the United States	264	5.60	3.51	0.31	24.63
Lag emigration rate to the US	264	1.95	3.59	0.03	25.52

Table A5. Panel Unit Root and Cointegration Tests

	Ln (real wage)	Ln (real exchange rate)	1 % critical values	5% critical values
Unit Root Tests (Null=Unit Root, Large negative values imply rejection)				
Bootstrapped Im, Pesaran & Shin ADF statistic	-0.01	0.20	-1.28	-1.64
Bai-Ng (2004) with orthogonalized data Im, Pesaran & Shin ADF statistic	0.48	1.35	-1.28	-1.64
Pesharan (2007) cross-sectionally augmented ADF statistic	-2.34	-2.00	-5.01	-4.01
CointegrationTests (Null=No Cointegration, Large negative values imply rejection)				
Pooled Phillips-Perron statistic		-1.63	-1.28	-1.64
Pooled ADF statistic		-3.26	-1.28	-1.64
Group mean Phillips-Perron statistic		-0.41	-1.28	-1.64
Group mean ADF statistic		-3.40	-1.28	-1.64
Number of countries	53	53		
Number of periods	25	25		

Notes. We drop countries with less than 10 years of data. The missing values for intermediate years have been interpolated to apply the unit root and cointegration tests. All reported test statistics (except for Pesharan (2007) test statitic) are distributed N(0,1) under null of unit root or no cointegration). The reported values of test statistics shown in the table are calculated assuming 3 lags. The values are similar if we use 4, 5 or 6 lags.

Table A6. List of Occupations: Freeman-Oostendorp Occupational Wages Around the World Database

Occupation	Skill	Occupation	Skill	Occupation	Skill
Farm supervisor	Skilled	Mixing- and blending-machine operator	Unskilled	Bus conductor	Unskilled
Field crop farm worker	Unskilled	Labourer	Unskilled	Automobile mechanic	Unskilled
Plantation supervisor	Skilled	Mixing- and blending-machine operator	Unskilled	Motor bus driver	Unskilled
Plantation worker	Unskilled	Packer	Unskilled	Urban motor truck driver	Unskilled
Forest supervisor	Skilled	Labourer	Unskilled	Long-distance motor truck driver	Unskilled
Forestry worker	Unskilled	Controlman	Unskilled	Ship's chief engineer	Skilled
Logger	Unskilled	Occupational health nurse	Skilled	Ship's steward (passenger)	Unskilled
Tree feller and bucker	Unskilled	Blast furnaceman (ore smelting)	Unskilled	Able seaman	Unskilled
Deep-sea fisherman	Unskilled	Hot-roller (steel)	Unskilled	Dock worker	Unskilled
Inshore (coastal) maritime fisherman	Unskilled	Metal melter	Unskilled	Air transport pilot	Skilled
Coalmining engineer	Skilled	Labourer	Unskilled	Flight operations officer	Skilled
Miner	Skilled	Metalworking machine setter	Unskilled	Airline ground receptionist	Skilled
Underground helper, loader	Unskilled	Welder	Unskilled	Aircraft cabin attendant	Skilled
Petroleum and natural gas engineer	Skilled	Bench moulder (metal)	Unskilled	Aircraft engine mechanic	Unskilled
Petroleum and natural gas extraction technician	Skilled	Machinery fitter-assembler	Unskilled	Aircraft loader	Unskilled
Supervisor or general foreman	Skilled	Labourer	Unskilled	Air traffic controller	Skilled
Derrickman	Unskilled	Electronics draughtsman	Unskilled	Aircraft accident fire-fighter	Skilled
Miner	Skilled	Electronics engineering technician	Unskilled	Post office counter clerk	Skilled
Quarryman	Unskilled	Electronics fitter	Unskilled	Postman	Skilled
Butcher	Unskilled	Electronic equipment assembler	Unskilled	Telephone switchboard operator	Skilled
Packer	Unskilled	Ship plater	Unskilled	Accountant	Skilled
Dairy product processor	Unskilled	Power distribution and transmission engineer	Skilled	Stenographer-typist	Skilled
Grain miller	Unskilled	Office clerk	Skilled	Bank teller	Skilled
Baker (ovenman)	Unskilled	Electric power lineman	Unskilled	Book-keeping machine operator	Skilled
Thread and yarn spinner	Unskilled	Power-generating machinery operator	Unskilled	Computer programmer	Skilled
Loom fixer, tuner	Unskilled	Labourer	Unskilled	Stenographer-typist	Skilled
Cloth weaver (machine)	Unskilled	Building electrician	Unskilled	Card- and tape-punching- machine operator	Skilled
Labourer	Unskilled	Plumber	Unskilled	Insurance agent	Skilled
Garment cutter	Unskilled	Constructional steel erector	Unskilled	Clerk of works	Skilled
Sewing-machine operator	Unskilled	Building painter	Unskilled	Computer programmer	Skilled
Tanner	Unskilled	Bricklayer (construction)	Unskilled	Government executive official:	Skilled
Leather goods maker	Unskilled	Reinforced concreter	Unskilled	Stenographer-typist	Skilled
Clicker cutter (machine)	Unskilled	Cement finisher	Unskilled	Card- and tape-punching- machine operator	Skilled
Laster	Unskilled	Construction carpenter	Unskilled	Office clerk	Skilled
Shoe sewer (machine)	Unskilled	Plasterer	Unskilled	Fire-fighter	Skilled
Sawmill sawyer	Unskilled	Labourer	Unskilled	Refuse collector	Unskilled
Veneer cutter	Unskilled	Stenographer-typist	Skilled	Mathematics teacher (third level)	Skilled
Plywood press operator	Unskilled	Stock records clerk	Skilled	Teacher in languages and literature (third level)	Skilled
Furniture upholsterer	Unskilled	Salesperson	Skilled	Teacher in languages and literature (second level)	Skilled
Cabinetmaker	Unskilled	Book-keeper	Skilled	Mathematics teacher (second level)	Skilled
Wooden furniture finisher	Unskilled	Cash desk cashier	Skilled	Technical education teacher (second level)	Skilled
Wood grinder	Unskilled	Salesperson	Skilled	First-level education teacher	Skilled
Paper-making-machine operator (wet end)	Unskilled	Hotel receptionist	Skilled	Kindergarten teacher	Skilled
Journalist	Skilled	Cook	Unskilled	General physician	Skilled
Stenographer-typist	Skilled	Waiter	Unskilled	Dentist (general)	Skilled
Office clerk	Skilled	Room attendant or chambermaid	Unskilled	Professional nurse (general)	Skilled
Hand compositor	Skilled	Ticket seller (cash desk cashier)	Skilled	Auxiliary nurse	Skilled
Machine compositor	Skilled	Railway services supervisor	Skilled	Physiotherapist	Skilled
Printing pressman	Skilled	Railway passenger train guard	Unskilled	Medical X-ray technician	Skilled
Bookbinder (machine)	Skilled	Railway vehicle loader	Unskilled	Ambulance driver	Unskilled
Labourer	Unskilled	Railway engine-driver	Unskilled	Automobile mechanic	Unskilled
Chemical engineer	Skilled	Railway steam-engine fireman	Unskilled	Pattern makers (wood)	Unskilled
Chemistry technician	Skilled	Railway signalman	Unskilled	Permanent way labourers	Unskilled
Supervisor or general foreman	Skilled	Road transport services supervisor	Skilled	Labourers (unskilled, public parks and gardens)	Unskilled

Source: http://www.nber.org/oww/

Table A7. Effect of Exchange Rates on Wages-Interaction With Labor Market Integration: Consistent Sample

	Dependent variable: ln(real wage)					
	[1]	[2]	[3]	[4]	[5]	[6]
Ln migration-weighted real exchange rate$_{t-1}$	0.360*	0.354	0.337	0.339	0.342	0.343
	(0.216)	(0.215)	(0.213)	(0.213)	(0.213)	(0.212)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$	**0.046****	**0.046****	**0.047****	**0.050****	**0.050****	**0.050****
	(0.020)	**(0.020)**	**(0.021)**	**(0.021)**	**(0.020)**	**(0.021)**
Ln emigration rate$_{t-1}$	0.124***	0.123***	0.125***	0.138***	0.137***	0.137***
	(0.040)	(0.040)	(0.041)	(0.040)	(0.040)	(0.041)
Ln (exports/GDP)$_{t-1}$	0.094	0.093	0.205	0.191	0.193	0.214
	(0.256)	(0.256)	(0.301)	(0.301)	(0.300)	(0.308)
Ln (imports/GDP)$_{t-1}$	-0.402*	-0.391*	-0.477*	-0.387	-0.390	-0.373
	(0.239)	(0.233)	(0.258)	(0.272)	(0.270)	(0.262)
Dummy for crisis$_{t-1}$		0.042	0.055	0.066	0.067	0.070
		(0.098)	(0.099)	(0.098)	(0.100)	(0.099)
Ln unemployment rate$_{t-1}$			-0.149*	-0.136*	-0.139*	-0.143*
			(0.082)	(0.082)	(0.082)	(0.084)
Ln tax wedge$_{t-1}$				-0.274**	-0.267**	-0.264**
				(0.116)	(0.116)	(0.118)
Ln (FDI/GDP)$_{t-1}$					0.029	0.026
					(0.028)	(0.028)
Ln average OECD wage$_{t-1}$						0.065
						(0.082)
Ln average OECD price$_{t-1}$						-0.089
						(0.068)
Country fixed effects	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y
Observations	378	378	378	378	378	378
Number of countries	44	44	44	44	44	44

Notes. * significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.

Table A8. Effect of Exchange Rates on Wages-Interactions-Developing Countries: Consistent Sample

	Dependent variable: ln(real wage)			
	[1]	[2]	[3]	[4]
Ln migration-weighted real exchange rate$_{t-1}$	0.186	0.171	0.164	0.165
	(0.203)	(0.200)	(0.198)	(0.198)
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$	**0.022****	**0.022****	**0.026*****	**0.026*****
	(0.010)	**(0.010)**	**(0.009)**	**(0.009)**
Ln migration-weighted real exchange rate$_{t-1}$ * Ln emigration rate$_{t-1}$ * developing	0.051**	0.052**	0.051**	0.051**
	(0.025)	(0.025)	(0.025)	(0.025)
Ln emigration rate$_{t-1}$	0.131***	0.130***	0.144***	0.144***
	(0.037)	(0.036)	(0.037)	(0.038)
Ln (exports/GDP)$_{t-1}$	0.238	0.24	0.326	0.342
	(0.267)	(0.267)	(0.311)	(0.318)
Ln (imports/GDP)$_{t-1}$	-0.425*	-0.406	-0.393	-0.372
	(0.252)	(0.247)	(0.280)	(0.272)
Dummy for crisis$_{t-1}$		0.075	0.099	0.100
		(0.102)	(0.104)	(0.104)
Ln unemployment rate$_{t-1}$			-0.125	-0.126
			(0.078)	(0.081)
Ln tax wedge$_{t-1}$			-0.282**	-0.278**
			(0.113)	(0.115)
Ln (FDI/GDP)$_{t-1}$			0.029	0.026
			(0.027)	(0.028)
Ln average OECD wage$_{t-1}$				0.066
				(0.080)
Ln average OECD price$_{t-1}$				-0.063
				(0.066)
Country fixed effects	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y
Observations	378	378	378	378
Number of countries	44	44	44	44

Notes. significant at 10%; ** significant at 5%, *** significant at 1%. Robust standard errors in parentheses. All variables refer to the origin country of migrants except wages and prices in OECD.