Emigration and Wages in Source Countries: A Survey of the Empirical Literature

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Abstract

This chapter summarizes the emerging empirical literature on the effect of emigration on wages in a source country. The evidence can be broadly divided into four categories: (i) case studies, (ii) simulation exercises, (iii) studies using regional variation and finally, (iv) national level studies. Overall, a substantial body of the evidence points towards a strong and positive relationship between emigration and source country wages. Importantly, the effect has been found to be statistically and economically significant. The estimates from the national-level studies across a wide range of countries range from two percent to five and a half percent increase in wages owing to a 10 percent emigrant supply shock. The impact of emigration on wages has important implications in source countries, for wage inequality across schooling groups and for national income distribution between labor and other factors.

1 The views expressed in this paper are those of the author and do not necessarily represent those of the IMF or IMF policy.
I. Introduction

A vast theoretical and empirical literature has considered the labor-market impact of immigration. In contrast, the literature on the labor-market impact of emigration or the outflow of workers was almost exclusively theoretical for a long time till early 2000s. The absence of an empirical literature on the labor-market impact of emigration is surprising because the shares of labor force leaving many individual source countries is considerably higher than the proportionate changes in the labor force of many receiving countries due to immigration.

To cite a few examples, during 1970-2000, the labor force in Mexico, El Salvador, and Jamaica were reduced by more than 10% due to emigration to the US. For several source countries, the reduction in the labor force due to emigration to the US was in the range of 7-27%. There are countries like Turkey and Algeria where the labor force has been reduced by about 10% due to emigration to Western Europe over the same period. Elsewhere, there is anecdotal evidence of sizeable flows to the gulf countries from African and Asian countries for which no systematic data exists. (Sources: US Census, OECD Migration Statistics, World Development Indicators). In comparison, immigrants constituted about 12% of the US labor force in 2000 (Davis and Weinstein, 2002). Immigration is indeed considered to be a very important issue and has attracted a lot of attention in the literature. Given the parity in magnitudes, the sparse literature on effect of emigration on national wages is striking. In fact until recently there was no econometric study on the topic.

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More importantly, the percentage reduction in the labor force is much greater in the higher schooling categories of the labor force. As Table 1 shows, the highly educated labor force in Guyana and Jamaica has been reduced by more than 80% as a result of emigration to the OECD. These numbers are based on the censuses of destination countries and some of these migrants may have acquired their education in the OECD. Even adjusting for this, these numbers are striking.

**Table 1: Percent of Labor Force that has Migrated to the OECD (by schooling)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Primary</th>
<th>Secondary</th>
<th>Tertiary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>9</td>
<td>64</td>
<td>67</td>
</tr>
<tr>
<td>Bahamas, The</td>
<td>3</td>
<td>10</td>
<td>61</td>
</tr>
<tr>
<td>Barbados</td>
<td>18</td>
<td>28</td>
<td>63</td>
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<tr>
<td>Belize</td>
<td>7</td>
<td>58</td>
<td>65</td>
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<tr>
<td>Dominica</td>
<td>19</td>
<td>67</td>
<td>64</td>
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<tr>
<td>Dominican Republic</td>
<td>6</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>Grenada</td>
<td>25</td>
<td>71</td>
<td>85</td>
</tr>
<tr>
<td>Guyana</td>
<td>18</td>
<td>43</td>
<td>89</td>
</tr>
<tr>
<td>Haiti</td>
<td>3</td>
<td>30</td>
<td>84</td>
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<tr>
<td>Jamaica</td>
<td>16</td>
<td>35</td>
<td>85</td>
</tr>
<tr>
<td>St. Kitts and Nevis</td>
<td>32</td>
<td>42</td>
<td>78</td>
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<tr>
<td>St. Lucia</td>
<td>12</td>
<td>21</td>
<td>71</td>
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<tr>
<td>St. Vincent and the Grenadines</td>
<td>18</td>
<td>33</td>
<td>85</td>
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<tr>
<td>Suriname</td>
<td>39</td>
<td>74</td>
<td>48</td>
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<tr>
<td>Trinidad and Tobago</td>
<td>8</td>
<td>22</td>
<td>79</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>15</td>
<td>42</td>
<td>70</td>
</tr>
</tbody>
</table>

Source: Docquier and Marfouq, 2004

Starting early 2000s, there has been an emerging literature on the effects of emigration on wages in source country. This chapter will provide an overview of this strand of literature and is organized as follows. Section II discusses the methodological issues that have been encountered in this literature on emigration and wages. Section III provides a summary of
the existing evidence, Section IV discusses some welfare implications of the wage effects from emigration. Section V concludes with some policy implications.

II. Methodological Issues

The literature on emigration has encountered several measurement and estimation issues, which perhaps precluded systematic studies of emigration for a long time. Some of the key issues are presented below.

II.1. Measurement of the emigrant supply shock – who is an emigrant?

One of the most difficult issues encountered in the literature is to quantify the magnitude of emigration because source countries, in general, do not record information on those who leave. Emigration is usually measured by obtaining information on the migrants from the censuses in the recipient countries (see for example, Mishra, 2007a, Docquier and Marfouq, 2004 and Carrington and Detriagache, 1998). For example, Docquier and Marfouq (2004) estimate emigration rates to the OECD for a number of source countries. Emigrants to most OECD countries are defined by country of birth. For example, an emigrant from source country j residing in the US is defined as a person whom the US Census counts as born in country j. The migrants include naturalized citizens, temporary and permanent residents as well as unauthorized migrants. Migrants to the US also include asylum seekers who sought refuge from political turmoil, oppression and total totalitarian governments (e.g. in the case of Haiti). The exceptions are Germany, Greece, Italy, Japan and Korea where an emigrant is defined by citizenship.
Emigration rate to the OECD is defined as the fraction of labor force having migrated to the OECD countries. It is expressed as

\[
m^j_t = \frac{M^j_t}{M^j_t + N^j_t}
\]

(1)

where \( M^j_t \) is the number of migrants from country \( j \) counted in the receiving countries’ censuses at time \( t \), \( N^j_t \) is the labor force in source country \( j \) at time \( t \).

Similarly, emigration rate from country \( j \) in schooling category \( S \) is defined as

\[
m^j_{t,s} = \frac{M^j_{t,s}}{M^j_{t,s} + N^j_{t,s}}
\]

(2)

Where \( M^j_{t,s} \) is the number of migrants from source country \( j \) with schooling \( S \) who are recorded in the OECD Censuses at time \( t \), \( N^j_{t,s} \) is the labor force in source country \( j \) with schooling \( S \).

Mishra (2007a) estimates emigration rates from Mexico to the US using data on migrants from the US Census. The measure of the emigrant supply shock for the schooling group \( i \), experience group \( j \), and time \( t \) is denoted by \( m^i_{ijt} = \frac{M^i_{ijt}}{N^i_{ijt}} \), where \( M^i_{ijt} \) is the number of Mexican emigrants in the US in cell \((i,j,t)\) and \( N^i_{ijt} \) is the national workforce in Mexico in
cell \((i, j, t)\). Using emigrant share as a measure of the emigrant supply shock follows the framework in immigration literature which uses the immigrant share of the native population as a measure of the immigrant supply shock (e.g., Borjas (2003, 1994), Friedberg, 2001, Altonji and Card, 1991, for representative studies). An emigrant from Mexico in the United States is defined as a person whom the US Census records as being born in Mexico. Hence, by this definition, an emigrant is a Mexican-born person in the US who may be a naturalized citizen or a non-citizen. Using the census data, it is not possible to distinguish between legal and illegal immigrants in the US. There is also evidence of an undercount of the illegal migrants in the Census data, and hence also of emigration from Mexico (Costanzo et al (2001).

II.2. Where did the emigrant acquire schooling?

**Identify schooling of emigrants using US Census**

The problem gets aggravated in the measurement of emigration rates at a disaggregated level for example by schooling categories. Typically, the emigration rates by schooling do not take into account where the migrant acquired his/her schooling. The figures are based on the assumption that the migrants recorded in the OECD Censuses got their schooling in the source countries. Alternatively, for those who got their schooling in the OECD – the counterfactual assumption is that had they stayed behind, they would have got the same level of schooling. For the migrants who got their schooling in the destination countries, it is not clear that their emigration constitutes shocks to which schooling groups in the Caribbean. There are two possibilities:
(i) Had they stayed back, they could have got more schooling. The possibility to migrate and get a job as unskilled workers reduces their incentive to go to school. In this case, the emigration shocks would be underestimated in the high schooling groups, and overestimated in the low schooling groups.

(ii) Had they stayed back, they could have got less schooling since the opportunities, institutional structure and laws related to schooling are better in the OECD countries. In this case, the emigration shocks would be overestimated in the high skill groups and underestimated in the low schooling categories.

The Censuses in the recipient countries do not record information on where did the migrants get their schooling. Hence, given the data, it is not possible to conclude the direction of the bias. However, it is possible to try to adjust for this bias in case of migrants to the US. There is strong evidence in case of migrants from developing countries that those who migrate in the late teens or later are significantly less likely to have got their schooling in the US (e.g. Grogger and Trejo, 2002, Gonzalez, 2002, Chiquiar and Hanson, 2005, Clark and Jaeger, 2002).

The United States Census provides information for the foreign-born on the years spent in the United States. Using this information, it is possible to calculate their age at migration. Restricting the sample of migrants from say the Caribbean to those who emigrated as adults, it is less likely that these migrants would have acquired their schooling in the United States. Chiquiar and Hanson (2005), Mishra (2007a), and Mishra(2007b) use this logic to adjust for the bias.
The unadjusted as well as adjusted emigration rates from the Caribbean countries to the US in the tertiary education category (for cut-off ages of 16, 18, 21 and 25) are shown in Table 2. Given that a typical student in the Caribbean enters university at the age of 18 after 13 years of schooling, 18 years seems to be a reasonable cut-off to exclude emigrants who are likely to have gotten less than 13 years of schooling in the Caribbean. The magnitude of the adjusted emigration rates in the tertiary schooling category decreases in columns [2]-[5] (compared to column [1]). In both cases (adjusted and unadjusted), Guyana, Haiti, and Jamaica have the highest tertiary emigration rates in the region. The highly-educated labor force in Caribbean has been reduced by one-third due to emigration to the United States, even after excluding all migrants who emigrated at less than 25 years. On the upper bound, it is reduced by 56 percent, when we exclude all migrants who emigrated at less than 16 years.

### Table 2. Percent of Labor Force that has Migrated to the US in the Tertiary Education Category

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<tr>
<td>not restricting</td>
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<td></td>
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<td></td>
<td>New Immigrant Survey</td>
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<td>Survey</td>
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<tr>
<td>Age at immigration</td>
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<td>greater than or equal</td>
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<td>16 years</td>
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<td>18 years</td>
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<tr>
<td>21 years</td>
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<tr>
<td>25 years</td>
<td></td>
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</tr>
<tr>
<td>Antigua-Barbuda</td>
<td>56</td>
<td>49</td>
<td>47</td>
<td>47</td>
<td>35</td>
<td>41</td>
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<tr>
<td>Bahamas</td>
<td>58</td>
<td>51</td>
<td>45</td>
<td>19</td>
<td>13</td>
<td>48</td>
</tr>
<tr>
<td>Barbados</td>
<td>46</td>
<td>39</td>
<td>36</td>
<td>31</td>
<td>24</td>
<td>30</td>
</tr>
<tr>
<td>Belize</td>
<td>62</td>
<td>55</td>
<td>51</td>
<td>32</td>
<td>23</td>
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<tr>
<td>Dominica</td>
<td>49</td>
<td>46</td>
<td>43</td>
<td>35</td>
<td>28</td>
<td>41</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>18</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>8</td>
<td>18</td>
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<tr>
<td>Grenada</td>
<td>75</td>
<td>72</td>
<td>70</td>
<td>43</td>
<td>33</td>
<td>50</td>
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<tr>
<td>Guyana</td>
<td>80</td>
<td>77</td>
<td>75</td>
<td>66</td>
<td>59</td>
<td>53</td>
</tr>
<tr>
<td>Haiti</td>
<td>79</td>
<td>75</td>
<td>73</td>
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<td>59</td>
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<tr>
<td>Jamaica</td>
<td>78</td>
<td>72</td>
<td>70</td>
<td>63</td>
<td>56</td>
<td>51</td>
</tr>
<tr>
<td>St. Kitts-Nevis</td>
<td>65</td>
<td>59</td>
<td>57</td>
<td>47</td>
<td>37</td>
<td>44</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>53</td>
<td>48</td>
<td>46</td>
<td>16</td>
<td>11</td>
<td>36</td>
</tr>
<tr>
<td>St. Vincent &amp; Grens.</td>
<td>71</td>
<td>66</td>
<td>63</td>
<td>29</td>
<td>19</td>
<td>48</td>
</tr>
<tr>
<td>Trinidad &amp; Tobago</td>
<td>68</td>
<td>63</td>
<td>60</td>
<td>54</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>Average</td>
<td>61</td>
<td>56</td>
<td>54</td>
<td>40</td>
<td>32</td>
<td>44</td>
</tr>
</tbody>
</table>

Sources: U.S. Census (2000); Docquier and Marfouq (2005); NIS (2003), and author's calculations. Tertiary: >12 years of schooling
Note that the estimates of the emigration rates in the tertiary schooling categories by restricting the age at migration at 25 years are likely to be underestimates because (i) those who migrated at less than 25 years of age could have got part or all of their secondary (9-12 years of schooling) and tertiary education (defined as more than 12 years) in the Caribbean or (ii) for those who got their schooling in the US, the possible counterfactual is that they could have gotten the same or more years of schooling, had they not migrated.

**Alternative sources of data on immigrants**

Another option is to use sources other than the censuses to identify the emigrants. An alternative source of data on immigrants is the *New Immigrant Survey* (NIS). The NIS is a public-use database on new legal immigrants to the US. The age at entry into the US in the US Census is based on a question, which asks “when did you come to live in the United States?” According to Rosenzweig (2005), the question can be subjective since it is not clear whether the respondents answer the question when they got a permanent visa (not a student visa), or when they first came. Moreover, if a person emigrated at an age of 25 or more years, it is not guaranteed that the person acquired schooling in the home country.

The NIS improves on the US Census in this respect and asks a question directly about the years of completed schooling in the US. For tertiary educated immigrants born in Dominican Republic, Haiti and Jamaica respectively, 97, 73 and 65 percent did not acquire schooling in the US. Column [6] in Table 2 shows the adjusted estimates for emigration rates in the tertiary education category using the NIS data. Though the magnitudes of emigration rates are smaller compared to Column [1], nonetheless – even the adjusted rates are
extremely high. The tertiary educated labor force in the Caribbean has reduced by more than 40 percent due to emigration to the US. As in Column [1], Guyana, Haiti, Jamaica, and Grenada have the highest tertiary emigration rates followed by St. Vincent and Grenadines, Trinidad and Tobago, and St. Kitts and Nevis.

**Source country data on emigration**

There have been very few attempts in the literature to use data from source countries to identify the emigrants. For example, Mishra (2007b) use administrative enrollment data from some key institutions for higher education in the Caribbean in order to gauge the number of tertiary educated immigrants counted in the US Census. These institutions include the University of West Indies (UWI, which includes three campuses in Barbados, Jamaica and Trinidad and Tobago), University of Technology, Jamaica, and University of Guyana. The data from the UWI includes (i) on-campus student registration at one of the three campuses, and (ii) registration in affiliated institutions and distance education programs. The statistics on the UWI is prepared by the Office of Planning and Institutional Research at the MONA Campus in Jamaica. The data on all these institutions is available since 1991.

Based on the US Census data, on average, close to 11,000 Caribbean migrants with some tertiary education leave for the US in any given year. Making the NIS adjustment this translates to about 8000 emigrants every year. As a benchmark, close to 30,000 students are registered in the three principal institutions of higher learning viz.- the University of West Indies, University of Technology Jamaica, and the University of Guyana. These figures suggest that the number of emigrants counted in the US Census as emigrating in any
particular year from the Caribbean is only about a third or lower compared to the total number of students enrolled only the key institutions. Therefore, the count of high-skilled emigrants in the US Census who came to the US since 1991 does not seem to be overestimated in comparison with the administrative enrollment data. Yet, with a significant potential of measurement errors, using micro data from source countries to identify the emigration shock more accurately (in the aggregate and by skill) remains a promising area for future research.

II.3. Identification of the effect of emigration on wages

Overlooking the measurement issues in emigration shocks, an important issue is the identification strategy to estimate the impact on source country wages. The immigration literature struggled for a long time to find any significant impact of immigration on wages of US natives. The general approach in this literature had been to use variation in immigrant shares across different US cities (Borjas (1994, 2001), Friedberg and Hunt (1995)). These papers generally found an insignificant impact of immigration on US wages. There could be several concerns related to identification of the true effect of immigration on wages of natives when using cross-city variation. First immigrants are mobile across cities (Borjas, Freeman, and Katz, 2001) implying that nation as a whole might be the preferable unit of analysis. The key innovation in Borjas (2003) is to use national level data and use experience as an additional source of variation (in addition to schooling and time). Given the identification challenge, emigration literature has used both regional and national level data (e.g. Hanson (2007) use regional variation, whereas Aydemir and Borjas (2007) and Mishra (2007a) use national level approach).
II.4. Selection bias in estimating the effect of emigration

Another potential source of bias in the estimated effect of emigration on wages is due to self-selection that would render the emigrants to be a non-random sample from the population. Selection bias may arise because wages in source country are observed only for the workers who decide not to migrate. If the “lowest ability” individuals are most likely to migrate from every skill group, then the positive correlation between emigration and wages might not be due to the favorable impact of emigration on wages. Instead it could be due to the “lowest ability” individuals leaving and raising the average wage in that skill group. Very few studies in the emigration literature have tried to address this potential bias from selection.

II.5. Endogeneity of emigration and wages

Finally, another potential concern in identifying true effects of emigration on source country wages is the issue of endogeneity. It is possible that the emigrant supply shock may be correlated with the unobserved component of source country wages. Consider the case of Mexico. There is some evidence that migration from Mexico to the US tends to increase when wages decline in Mexico (Hanson and Spilimbergo, 1999, Hanson et al., 2001). If wage falls precede emigration, the estimated coefficient on emigration would clearly be an underestimate of the impact of emigration on wages. Even though this concern is commonly known, existing studies on emigration have not used any exogenous variation or a natural experiment – as e.g. in Card (1990), which studied the effects of the Mariel Boatlift on the Miami labor market, a natural experiment.
II.6. Labor demand shocks as determinant of wages

The literature on emigration and wages aims to isolate the impact of emigration, controlling for other covariates that affect wages. One of the confounding factors in this regard is labor demand shocks that are correlated with emigration and drive up the wages. Two standard sources of labor demand shocks are technological changes and capital flows. Productivity enhancing technological change as well as capital flows would increase wages and thus discourage emigration. Emigration would thus be negatively correlated with the unobserved component of wages implying that the positive estimates that appear from the studies discussed below would actually be biased downwards. Alternatively consider technology shocks, which are positively correlated with emigration. Here the impact of emigration on wages would be overestimated and raise more serious concerns because of the direction of the bias. An example of this scenario could be positively correlated labor demand shocks in the US and Mexican labor markets that raise labor demand and wages in Mexico but also attract Mexican migrants to the US. To address this concern, studies typically control for average wages in the destination countries (see e.g. Mishra (2007a)).

III. Overview of the Evidence

The empirical evidence in the literature on emigration can be broadly divided into four categories: (i) case studies, (ii) simulation exercises, (iii) studies using regional variation, and finally (iv) national level studies. This section discusses the evidence in each of these categories.

III.1. Case studies on emigration and wages
There are a few case studies on the effects of emigration on wages by the International Labor Organization (Stalker, 1994). These case studies provide very useful background information on emigration. However, they do not use rigorous identification strategies to address the issue whether the observed change in wages is caused by an outflow of workers or is due to other factors. Mahmood (1991) also addresses the issue of emigration and wages in the context of Pakistan. Based on the predictions of 3-good, 3-factor Heckscher Ohlin model, the paper proposes that the rise in real wages in Pakistan in the mid 1970s could be due to emigration.

III.2. Simulation exercises on effects of emigration on wages

Another methodology that has been applied to estimate the effects of emigration on wages has been based on using simulation models. O’Rourke and Williamson, 1999 and Boyer et al 1994 analyze the impact of emigration from Europe in the 19th century simulating shocks in calibrated general equilibrium models conclude that emigration significantly increased real wages in Ireland and Sweden. The results from such studies are however specific to the model and its parameterization.

More recently, Budnik (2012) develops a partial equilibrium search and matching model with migration flows for Poland following the EU enlargement. Between 2003 and 2007, the fraction of Polish permanent residents staying abroad increased from 3% to 9%. She simulates the model to assess the effect of emigration on Polish wages; and calculates the deviation of the predicted wage rate from the actual as well from a counterfactual scenario that assumes emigration rate stabilized at the 2002 level. The implied half-elasticity (log
wage to emigration rate) from Budnik (2012) equals 0.13; and is lower than the estimate in Mishra (2007a) or Aydemir and Borjas (2007). The increase in the emigration rate explains about 8% of the increase in wages between 2003 and 2007 in Budnik (2012).

III.3. Econometric studies using region-level variation

In general studies using regional variation either focus on specific cities or address the question of how different regions are affected relative to one another. Hanson et al (2002), Hanson (2004), and Hanson (2007) comprise econometric studies on labor-market effects of emigration where the source of variation used is across regions. Hanson et al (2002) examine the impact of illegal migration measured by the number of person-hours the US Border Patrol spent policing the border from 1987-1997 on the wages in the border cities of the US and Mexico. Hanson (2004) addresses the question of how globalization after NAFTA affected the regional wage structure in Mexico including a measure of regional opportunities to migrate to the United States.

Similarly, Hanson (2007) examines how emigration has affected regional labor supply and regional earnings in Mexico. Mexico has a long history of sending migrants to the United States. Since the early 1900s, emigration rates have varied widely across Mexican regions, with individuals from west-central states having the highest propensity to migrate. The paper exploits regional persistence in emigration behavior by classifying states as either high migration or low migration to the United States, as measured by state emigration rates in the 1950s. Evidence in Hanson (2007) shows that controlling for observable factors, wages in high-migration states rose relative to low-migration states by as much as 6–9 percent. This
implies an elasticity of wages with respect to the labor supply of 0.7–0.8. It can be seen below that this elasticity is higher than those estimated based on national level studies. This is expected since it captures both the direct effects of emigration on the labor supply and any indirect effects of historical emigration patterns on current regional wage growth.

More recently, Dustmann, Frattini, and Rosso (2012) use region-level variation to estimate the effect of emigration on wages in Poland, a large European country. One unique feature of this study is that rather than identifying emigrants based on census data and survey information from the destination countries, they use detailed information on all emigrants measured in the source country. Specifically, when a household member is not present, another member of the household is asked about the person’s whereabouts. Using within-region variation, the authors find that emigration has a positive effect on the wages of those who do not migrate. Similar to the case of Mexico, the effect is strongest in the middle of the income distribution. The results in Dustmann, Frattini, and Rosso (2012) are supported by an instrumental variables strategy using variations in economic conditions in the main destination countries. Their estimates suggest that a 1% increase in the size of the emigrant labor force increases wages by between 0.01 and 0.02 percent in Poland. This compares with Mishra (2007a)’s partial elasticity of 0.033 (evaluated at 10% emigrant share, and the coefficient estimate of 0.33).³

Similarly, looking at a specific sector, Lucas (1987) examines the effect of temporary labor emigration to South Africa’s mines on wages in tea and tobacco plantations in five African

³Note that the explanatory variable in Mishra (2007) is the ratio of emigrants to residents. $\beta = \frac{\partial \ln w}{\partial (N/M)} = \frac{\partial \ln w}{\partial \ln M} \ast \frac{M}{N}$. 
countries. He finds that in both Malawi and Mozambique, emigration to South Africa’s mines has increased wage costs for the local estate and plantation operators.

The potential problems associated with using variation across regions have been discussed extensively in the context of immigration (Borjas, Freeman, and Katz, 1997). Applying the same logic, non-emigrants may respond by moving labor into or capital away from high emigration regions. Such neutralizing flows of labor or capital within the country would underestimate the impact on wages. Just as in case of immigration, the labor market impact may be measurable only a national-level. Moreover, regional level studies analyze how emigration has a differential effect across regions – in other words, how earnings in states/regions which experienced higher emigration were affected relative to those which sent fewer migrants – and does not address the question of how emigration affects source country wages for the nation as a whole. This brings us to the discussion of national level studies on emigration and wages in the next section.

III.4. National level studies

Mishra (2007a) is the first econometric study of the effect of emigration on national wages in a source country that examines empirically the effect of Mexican emigration to the US on wages in Mexico using data from the Mexican and the US censuses from 1970-2000. The questions addressed in the paper are: how does emigration affect real wages in Mexico? What is the direction and magnitude of the impact? What are the implications of emigration for (i) wage inequality across schooling groups and (ii) national income distribution between labor and the other factors in Mexico?
The identification strategy to estimate the impact of emigration on Mexican wages follows Borjas (2003) in that she utilizes variation across schooling and experience groups in the labor force, and over time. Emigration is assumed to be exogenous in the baseline specification. However, she also address concerns about endogeneity and self-selection biases in the estimates.

Mishra (2007a) finds a strong and positive impact of the outflow of workers on wages in Mexico. A 10% decrease in the number of Mexican workers due to emigration in a skill group (defined by schooling and experience), increases the average wage in that skill group by about 4 percent. The estimates suggest that the outflow of Mexican workers to the US between 1970 and 2000 has increased the wage of an average Mexican worker by about 8%.

The impact on wages, moreover, differs dramatically across schooling groups, with the greatest increase in wages being for the higher wage earners (those with 12-15 years of schooling). Hence, the estimates in this paper suggest that emigration could serve as one possible explanation for the increasing wage inequality in Mexico. However, emigration as a channel to explain the increasing wage inequality in developing countries has received little attention in the literature.4

In the context of national level studies, Mexico offers an ideal case to study because almost all emigration from Mexico is to the US. More than 95% of the international migrants from Mexico go to the US (Woodruff and Zenteno, 2002). This gives an excellent opportunity to

4 Robbins (2002) and Zhu and Trefler (2005) provide evidence for increasing wage inequality in developing countries.
use the U.S. data sources to study the effect on a source country’s labor market.\textsuperscript{5} Further, the outflow of workers is sizeable in proportion to the Mexican labor force. In 2000, Mexican emigrants constituted about 16% of the labor force, or approximately one out of seven Mexican workers migrate to the US. The rate of outflow is particularly striking in the higher schooling categories. Mexican emigrants in the US with 12-15 years of schooling constituted a little less than a half of the corresponding labor force in Mexico.\textsuperscript{6} Hence, there is evidence of some brain drain from Mexico.\textsuperscript{7} There are several countries, which lose even higher proportions of their educated labor-force because of migration. Hence, the estimated impact on wages of highly educated workers in Mexico would only serve as a lower bound of the effect in many other source countries.

Since Mishra (2007a) provides a generic framework for looking at the issue of emigration on wages, I discuss the methods in Mishra (2007a) briefly here. Following Borjas (2003), the regression equation in Mishra (2007a) is specified as:

$$w_{ijt} = \delta m_{ijt} + s_i + v_j + \pi_t + s_i \cdot \pi_t + v_j \cdot \pi_t + s_i \cdot v_j + e_{ijt} \quad (3)$$

Where $w_{ijt}$ is the mean value of monthly earnings (in logs) for workers in Mexico with education level $i$, experience $j$ and observed in year $t$. $s_i, v_j$ and $\pi_t$ are vectors of fixed

\textsuperscript{5} Chiquiar and Hanson (2005) also merge US and Mexican Census data for 1990 to examine who migrates from Mexico to the United States. They find evidence of intermediate/positive self-selection in terms of observable skills, which is consistent with the findings in this paper.

\textsuperscript{6} Source: Author’s calculations from Mexican and the US census. The figures are for individuals in the age group 16-65 years, and are a part of the labor force. Individuals in the labor force are those who are defined by the Censuses as being at work or seeking work in a particular reference week.

\textsuperscript{7} See Commander et al. (2002) for a survey of the literature on brain drain. The term brain drain is used to denote migration of high skilled workers. I do not quantify any “drain” effect in the paper e.g. due to negative human capital externalities. Hence the term “brain migration” could also be used alternatively.
effects indicating the group’s schooling, work experience and time respectively, which control for differences in wages across schooling, experience groups and over time. The interaction terms \((s_i \times \pi_i)\) and \((v_j \times \pi_i)\) are introduced to control for the possibility that the returns to schooling and experience could change over time. The interaction terms, \((s_i \times v_j)\), control for the possibility that the experience profile for the wages could differ across schooling groups. Further the last several decades have been a period of turmoil for Mexico with four currency crises since 1970 for which adequate controls are needed in (5).^8

The regressions are weighted by the number of workers in Mexico in cell \((i, j, t)\). The parameter \(\delta\) gives the percentage change in wages due to a 1 percent change in the number of Mexican workers due to emigration. \(\delta\) is identified by within skill-group changes in emigrant shares over time.

### III.5. Self selection and endogeneity issues

Mishra (2007a) addresses the issue of self-selection of emigrants from the population of Mexico. To address this concern, she estimates the impact of emigration on the wages of a sub-sample of Mexican workers from low migration states of Mexico. The sample selection problem can be expected to be less severe in this sub-sample because it has “all” the workers

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^8 Following the 1980s crises, there were a series of trade and investment reforms in Mexico, including the GATT membership in 1985, investment reforms in the 1980s and the implementation of the North American Free Trade Agreement (NAFTA) in 1994. These shocks are likely to be correlated with emigration from Mexico. The impact of the economy-wide shocks would be captured through the period fixed effects. The shocks, which have differential impact on schooling and age groups, would be captured through the interaction of the period fixed effects with schooling and experience respectively.
and not just the ones who decide not to migrate. As a validation, she finds that emigration has a strong and positive effect on the wages in low migration states as well. The fact that the impact of emigrant supply shocks gets transmitted to the country as whole is striking and provides evidence that results are not likely to be driven by sample selection but rather through supply effects that are transmitted throughout the integrated Mexican labor market.

In order to address the other concern of endogeneity, Mishra (2007a) applies the idea from the sociology literature that social capital formation (based on social connections to the US migrants) is an important factor explaining US-Mexico migration. This allows use of an instrumental variables strategy with historical migration rates (as a proxy for networks) as an instrument for current migration rates. The strong and positive impact of emigration on Mexican wages is reinforced after addressing the potential bias owing to endogeneity.

Mishra (2007a) was followed by a new strand of literature looking at the effect of emigration on wages in various source countries. Aydemir and Borjas (2007) use data from the Canadian, Mexican, and U.S. censuses, and find that labor supply shifts are associated with opposite-signed change in wages for migrant in receiving and in sending countries. For Mexico, they confirm the finding in Mishra (2007a) of a positive correlation between log monthly earnings of Mexican workers in a particular skill group and the emigration rate of that group. The estimated wage elasticity in Aydemir and Borjas (2007) is 0.56, indicating that a 10% emigrant-induced reduction in labor supply increases monthly earnings by 5.6%. Further, as in Mishra (2007a), Aydemir and Borjas (2007) also find that emigration is associated with increased wage inequality in Mexico, with a reduction in relative wages of workers at the bottom of the skill distribution.
Bouton, Paul, and Tiongson (2011) estimate the effect of emigration from Moldova on Moldovan wages. Moldova’s emigrant population comprises 30% of its labor force. In the baseline specification, the authors estimate an individual-level wage regression including the emigrant share as an explanatory variable. They find that a 10% increase in Moldova’s emigration rate is associated with a 3.2% increase in wages. Their estimates are similar to Mishra (2007a). One interesting finding in the study is that the effect differs significantly across sectors. For example, they find that the wage elasticity in construction and service sectors is double those in agriculture and industry. The authors argue that the differences across sectors could be explained by recent changes in labor demand in each sector. For example, the lack of job creation in the agricultural sector and the expansion of the construction and service sectors could be driving the results.

Borjas (2008) uses the national-level approach to analyze the effect of both labor inflows into and outflows from Puerto Rico. His preferred estimates suggest that a 10% migration-induced reduction in the number of workers increases the wages of Rican workers left behind by 2.1%, whereas a 10% immigration-induced increase in supply reduces wages by 4%. The Puerto Rican case is unique in that it allows estimation of wage responses to both immigration and emigration in the same market at the same time. The estimates of labor inflows are similar to those in Borjas (2003), whereas that of outflows is broadly similar to Mishra (2007a), and Aydemir and Borjas (2007). The paper also estimates the effect of “net migration rates” (calculated as the difference between in-migration and out-migration rates), and finds that the wage elasticity associated with a 10% migration-induced net shift in supply is -0.30.
Finally, Gagnon (2011) applied the national-level approach to study the effect of emigration on wages in Honduras. Honduras is a good example to study as Hurricane Mitch in 1998 constituted an exogenous shock, which was followed by a wave of emigration. By 2006, more than 11% of households in Honduras had at least one migrant abroad. As a proportion of the country’s population emigrants comprised 5.8%, lower than that in Mexico. Using the same empirical specification as in Mishra (2007a) with schooling-experience-time as the unit of analysis, the study finds that a 10% labor supply shift due to emigration yields a 2% increase in wages in Honduras. However, using individual-level data, and instrumenting for the emigration rate by US wages, they find much bigger estimates; a 10% increase in emigration is associated with a 10% increase in wages. These estimates are significantly higher than any other study on emigration; which raises the question of the validity of the instruments, which is not established rigorously in the paper.

Overall, the national level studies provide robust evidence that emigration raises wages in source countries. Importantly, the effect is statistically and economically significant. Table 3 provides a summary of the estimates from the national level studies. The baseline estimates in these studies range from two percent to five and a half percent increase in wages owing to a 10 percent emigrant supply shock. An interesting area for further research would be to explore the wage effects of emigration using cross-country data on wages and emigrant supply shocks and to determine what country characteristics drive differences in estimates across countries.
IV. Welfare Implications

There are at least two key quantifiable implications of the estimated impact of emigration on real wages. First, the variation across schooling groups has implications for wage inequality within the source countries. Second, the estimated elasticity can be used to compute simple welfare measures based on a standard partial equilibrium model of labor demand and labor supply.

IV.1. Emigration and wage inequality

The estimates of the effect of emigration on wages can be used to calculate the wage impact in different schooling groups. For example, Mishra (2007a) looks closely at the estimated increase in wages due to emigration between 1990 and 2000 because the Mexican Census data shows increasing wage inequality during this period. As shown in Fig. 1 below, between 1990 and 2000, the relative wages of high school graduates increased by 11%, of those with some college education by 21% and of college graduates by 8% (relative to high school dropouts). Using the estimated coefficients, the outflow of workers between 1990 and 2000 increased the relative wages of high school graduates by 4% and those with some college

<table>
<thead>
<tr>
<th>Country</th>
<th>Estimate</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>4.4%</td>
<td>Mishra (2007a)</td>
</tr>
<tr>
<td>Mexico</td>
<td>5.6%</td>
<td>Aydemir and Borjas (2007)</td>
</tr>
<tr>
<td>Moldova</td>
<td>3.2%</td>
<td>Bouton, Paul, and Tiongson (2011)</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>2.1%</td>
<td>Borjas (2008)</td>
</tr>
<tr>
<td>Honduras</td>
<td>2.0%</td>
<td>Gagnon (2011)</td>
</tr>
</tbody>
</table>

Table 3. Effect of 10% Emigrant Supply Shock on Source Countries
education by 3% (relative to high school dropouts). Thus, the estimated impact of emigration accounts for approximately 37% of the increase in relative wages of high school graduates and 14% of the increase in relative wages of those with some college education. The greater impact of emigration on wages of workers with 12–15 years of schooling is driven by highest emigration rates of this group and since the labor demand elasticity is assumed constant across schooling groups. Further, emigration does not explain the increase in relative wages of college graduates.

The magnitude of the positive effect of emigration on the wages of high school dropouts is higher than that on the wages of college graduates; hence emigration leads to a decrease in the relative wage of college graduates. Since emigration does not explain the entire rise in wage inequality, Mishra (2007a) argues that it should be treated as a complementary explanation for the rising wage inequality in Mexico. The estimates in the case of Mexico suggest that it could potentially be an important factor. Yet, emigration as a channel to explain increasing wage inequality in developing countries has received little attention in the literature (Robbins, 2002). An interesting area for future research would be to explore the distributional effects of emigration on source countries, and to correlate them with country characteristics.
Figure 1. Emigration and Increase in Wage Inequality in Mexico: 1990-2000

The figures are for males, in the labor force, who are not enrolled in school, and have work experience of 1–40 years, and report positive monthly earnings. HSD=High School Dropouts, HSG=High School Graduates, SC=those with some college, CG=College Graduates. Relative wages are measured by the ratio of the real monthly earnings in schooling category $s$ ($s = \text{HSG, SC, CG}$) to the real monthly earnings of HSD. Monthly earnings are deflated by the CPI from the IMF.

IV.2. Welfare implications

The estimated impact of emigration on wages can potentially be used to compute simple welfare measures based on the standard model of labor demand and supply. The simple economic model of labor demand and supply is an important starting point to quantify the welfare implications. It has been used in the literature before in the context of immigration and capital flows (Borjas (1995), MacDougall (1960)). The aim of the simple model is to
Welfare is measured by GDP accruing to those who have stayed behind (TSB) in Mexico. Consider a single numeraire good and its production function given as:

\[ Q = F(K, L) \]  

(4)

Where \( K \) is the fixed factor assumed to be internationally immobile, \( L \) is the labor employed in production and \( Q \) is the gross domestic product. Figure 2 shows the simple model of labor demand and supply.

---

9 Davis and Weinstein (2002) simulate the welfare impact due to inflow of both labor and capital into the US.
The pre emigration equilibrium wage is $w_0$. A large emigration flow of a magnitude $M$ of workers reduces the labor force from $(N+M)$ to $N$. Wage rate as a result increases from $w_0$ to $w_1$. The workers who have stayed behind gain an area equal to $W_0W_1ab$ (rectangle region $A$), owners of the fixed factors in the economy lose an area equal to $W_0W_1ac$ (rectangle region $A$ + triangle region $B$) and the country as a whole loses the triangle $abc$ (region $B$). The triangle $abc$ (region $B$) can be termed as the “emigration loss”. The emigration loss arises because the cost of employing the infra-marginal workers who migrate is less than the value
of their marginal product. The surplus on these workers is therefore lost due to emigration, which imposes a cost on those who stayed behind.

As a fraction of the post-emigration GDP:

Emigration loss (triangle B in Figure 1) = \( (1/2)sem^2 \)  

Gain to workers who have stayed behind (rectangle A in Figure 1) = \( sem \)  

Loss to the owners of fixed factors (A + B in Figure 1) = \( \frac{1}{2}sem^2 + sem \)  

Where \( e = \frac{\Delta w}{\Delta L} \), \( s = \frac{wN}{wN + rK} \), \( m = \frac{M}{N} \), \( s \) is the share of labor in GDP, \( e \) is the percent change in wages due to a 1% change in the labor force, where the elasticity is measured at the post-emigration labor-force and \( m \) is the ratio of emigrants to the workforce in the home country. \(^{10}\) The emigration loss and distributive impact as a result of flow of workers between 1970 and 2000 can be estimated using (5) – (7).

In Mishra (2007a), the estimated change in wages of a typical worker in Mexico due to flow of emigrants between 1970 and 2000 \((e \cdot m)\) is around 8%. The assumed share of labor income in GDP \((s)\) is 0.7 (Borjas (1995, 2003), Hall and Jones, 1999). The emigrant share of the Mexican workforce \((m)\) estimated from the 2000 Mexican and US censuses is about 16%. The estimated emigration loss to Mexico is about 0.5% of Mexico’s GDP in 2000. The economic loss from emigration in a $580 billion economy is about $3 billion per year. The estimated welfare loss is lower than the official worker remittances to Mexico, which were about 1% of GDP in 2000 (IMF). \(^{11}\) The emigration loss would also be easily outweighed by

\(^{10}\) The expressions in (11)-(13) are analogous to Borjas (1995) study of immigration.  
\(^{11}\) It is however, important to note that the official remittance figures are under-reported since they exclude the large amounts of unrecorded remittances.
the big gains of the migrants themselves. The emigration loss, however, is higher in percentage terms than the estimate of immigration surplus of 0.1% of GDP for the US economy in Borjas (1995). Borjas (1995) simulates the partial equilibrium model using outside information on labor demand elasticity while the Mishra (2007a) is based on estimated elasticity from Mexican data.

Though aggregate losses are somewhat small, there is a significant distributional impact. The gain to the workers who have stayed behind is about 5.9% of GDP and the loss to the owners of the fixed factors is about 6.4% of GDP, the difference being the estimated aggregate economic loss to Mexico. Thus, the estimated distributive impact is about 12-13 times the aggregate economic loss to Mexico.

Mishra (2007b) also estimates the emigration losses for several Caribbean countries. Table 4 shows the estimates of emigration loss to individual Caribbean countries as a percent of the GDP. Since elasticities and the share of labor in GDP are assumed to be the same for all countries, the differences in emigration losses comes only from differences in the emigration rates across countries. On average, official remittances outweigh the emigration loss for the region. Even under the assumption of high elasticity, except for Guyana, Suriname and Trinidad and Tobago, official remittances outweigh emigration loss in all countries. Also, since the wage differentials between the Caribbean and OECD countries are large, the emigration loss would be easily outweighed by the gains of the migrants themselves. However, redistributive impact of emigration is significant. On average, the gain to the workers who have stayed behind is 6 percent of GDP and the loss to the owners of the other factors is about 8 percent of GDP. Even for Trinidad and Tobago, where the
emigration losses are relatively small (in relation to remittances), a sizable redistribution exists in favor of the workers.

Further, ceteris paribus the emigration loss due to emigration of skilled labor is significant. The estimates in Table 5 show that the emigration loss as a fraction of GDP due to movement of high skilled workers (everything else remaining unchanged) is much larger. The aggregate emigration rate combines the emigration rates of the high- as well as the low-skilled. As lower-skill groups have smaller emigration rates, their inclusion results in a smaller measure of emigration rate. If instead, only the high-skilled workers are considered, the emigration rates are considerably higher. Consequently the emigration loss is also larger. Still, remittances outweigh or almost equal the emigration loss due to high-skilled migration for

<table>
<thead>
<tr>
<th>Table 4. Emigration Loss and Remittances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emigration Loss e=0.3</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
</tr>
<tr>
<td>Barbados</td>
</tr>
<tr>
<td>Belize</td>
</tr>
<tr>
<td>Dominica</td>
</tr>
<tr>
<td>Dominican Republic</td>
</tr>
<tr>
<td>Grenada</td>
</tr>
<tr>
<td>Guyana</td>
</tr>
<tr>
<td>Haiti</td>
</tr>
<tr>
<td>Jamaica</td>
</tr>
<tr>
<td>St. Kitts and Nevis</td>
</tr>
<tr>
<td>St. Lucia</td>
</tr>
<tr>
<td>St. Vincent and the Grenadines</td>
</tr>
<tr>
<td>Suriname</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
</tr>
<tr>
<td>Average</td>
</tr>
</tbody>
</table>

Source: Author's calculations.
Note: e denotes the elasticity of factor price of labor (i.e., percentage change in wages resulting from a 1 percent change in the size of the labor force). See text for details on calculation of emigration loss.
the region as a whole and for most of the countries (except Guyana, Suriname, and Trinidad and Tobago).

### V. Conclusions and Policy Implications

This survey summarizes the empirical literature on the effect of emigration on wages in a source country. Overall, the literature finds substantial evidence that there is a strong and positive relationship between emigration and wages in source countries. The impact of emigration on wages has important implications also for wage inequality across schooling groups and for national income distribution between labor and other factors. The measured welfare impact on who have stayed behind in the sending country is based on the very simple static partial equilibrium framework.

#### Table 5. Emigration Loss Due to High-Skilled Migration

<table>
<thead>
<tr>
<th>Country</th>
<th>Emigration Loss e=0.3</th>
<th>Emigration Loss e=0.4</th>
<th>Remittances (As a percent of GDP) Average 1980–2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antigua and Barbuda</td>
<td>2.0</td>
<td>2.7</td>
<td>3.0</td>
</tr>
<tr>
<td>Barbados</td>
<td>1.8</td>
<td>2.4</td>
<td>2.3</td>
</tr>
<tr>
<td>Belize</td>
<td>1.9</td>
<td>2.6</td>
<td>4.7</td>
</tr>
<tr>
<td>Dominica</td>
<td>1.9</td>
<td>2.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>0.2</td>
<td>0.3</td>
<td>5.3</td>
</tr>
<tr>
<td>Grenada</td>
<td>3.3</td>
<td>4.3</td>
<td>11.0</td>
</tr>
<tr>
<td>Guyana</td>
<td>3.6</td>
<td>4.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Haiti</td>
<td>3.1</td>
<td>4.2</td>
<td>10.1</td>
</tr>
<tr>
<td>Jamaica</td>
<td>3.3</td>
<td>4.3</td>
<td>7.4</td>
</tr>
<tr>
<td>St. Kitts and Nevis</td>
<td>2.8</td>
<td>3.7</td>
<td>6.9</td>
</tr>
<tr>
<td>St. Lucia</td>
<td>2.3</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>St. Vincent and the Grenadines</td>
<td>3.2</td>
<td>4.3</td>
<td>7.2</td>
</tr>
<tr>
<td>Suriname</td>
<td>1.0</td>
<td>1.4</td>
<td>0.5</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>2.8</td>
<td>3.8</td>
<td>0.3</td>
</tr>
<tr>
<td>Average</td>
<td>2.4</td>
<td>3.2</td>
<td>5.2</td>
</tr>
</tbody>
</table>
Importantly, there may be other counteracting forces like the impact on human capital formation (see for example Beine, Docquier, and Rapoport, 2008), positive external effects through networks and diaspora, remittances, that can outweigh this loss and result in a net benefit to the source country. Also, if source countries have some market power in the world market, emigration may also affect terms of trade of Mexico. Quantifying these additional channels through emigration can affect the welfare of source countries workers who have stayed behind, are a subject for further research.

Even if countries incur a net loss due to emigration as predicted by a static partial equilibrium model, a border tax might not be the most reasonable policy response. Appealing to the pioneering work of Bhagwati in the 1970s and 1980s on policy responses to emigration, an argument could be made for a border tax on migrants (similar to a Tobin tax). The tax was proposed by Bhagwati (1976), with the prior that developing countries lose due to migration. It is in principle also an extension of the idea of progressive income taxation—the improvement of the well being of migrants to be taxed for the benefit of those left behind. The main reasons for the border tax not being reasonable are the problems in implementing such a tax. Taxes can also have distortionary effects. Since the absolute number of migrants from say the Caribbean countries is not very large, the per capita tax rate will have to be onerous to raise a sizeable revenue. In fact, the United States is the only country that taxes individuals on the basis of citizenship rather than place of residence.

Retaining workers particularly the high skilled without the possibility of taxes would be facilitated by reorienting education. The high rates of emigration from many regions, particularly Africa and the Caribbean are due not only to the “pull factor” i.e., higher wages
abroad, but also the limited opportunities for highly, but similarly, educated people at home (the “push factor”). One approach to creating the right incentives is to reorient the higher education system towards providing skills in demand within the region, in particular the services sector, which dominates these economies. Such reorientation could include, for example, the establishment of hotel management institutes or specialized banking and finance institutes. It is particularly important for those regions to consider the possibilities for reorienting education, where a major portion of the cost of education of their citizens is covered by education subsidies. Governments might reap higher returns by investing in education infrastructure that leads to more retention of the high skilled.

Since the international experience has been that it is difficult to prevent emigration, the real policy challenge is how countries can maximize the benefits from their population living and working overseas. Remittances should be the most immediate focus, as they can affect growth through investment, both physical and human. Evidence from micro-level studies suggests that remittances lead to greater human and physical capital investment (Cox and Ureta (2003) study of El Salvador, Hanson and Woodruff (2003) and Woodruff and Zenteno (2001) studies of Mexico, Lucas (1987) study of Africa). Countries need to recognize the importance of remittances and improve recording of the data.

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