Remittances and the Wage Impact of Immigration

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Abstract

This paper examines the impact of immigrant remittances on the wages of native workers in the host country. The model shows that the wage impact of immigration depends on the competing effects of an increase in labor market competition and an increase in the consumer base. Remittances provide a unique way of isolating this latter effect since they reduce the consumer base but not the workforce. The predictions of the model are tested using an unusually rich data set that follows the same individuals over time and has detailed information on remittances. As expected, the results indicate that a ten percent increase in remittances depress the wages of native workers by 2.5%. Furthermore, remittances predominantly affect workers in non-traded industries that are more reliant on domestic consumption.

Keywords: Remittances, Immigration, Wages

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1 Introduction

The amount of money immigrants send home to family and friends in the form of remittances has increased steadily over the past decade and was valued at $416 billion in 2009.[2] Remittance flows into developing countries are large (they exceed official aid and are close to foreign direct investment inflows) and the benefits to recipient developing countries are well documented.[3] However, little is known about how the outflow of remittances affect the sending country. This paper fills this gap by presenting a model that examines the relationship between immigration, remittances, and native wages and tests these predictions using a comprehensive longitudinal data set.

Critics of immigration often focus on the negative labor competing effects of immigration caused by the increase in the supply of workers. However, immigrants also demand goods and services which can alleviate this negative wage impact. Although intuitively appealing, little work has examined the impact of immigration on the consumer base. In order to clarify these competing effects, this paper presents a simple model that identifies how immigration can affect wages through an increase in labor market competition and an increase in product demand. Specifically, the model shows that the impact on wages depends crucially on the ratio of the immigration-induced change in the consumer base relative to the immigration-induced change in the workforce.

Remittances provide a unique way of identifying changes in this ratio, since remittances affect the consumer base but not the workforce. Specifically, as remittances increase, the domestic consumer base shrinks relative to the workforce, and thus native wages will decline. In addition, the model predicts that remittances will have a more negative impact on the wages of native workers in non-traded industries since these industries depend more heavily on local consumption. The wages of native workers in traded industries are less affected by changes in the domestic consumer base.

The predictions of the model are tested using data from the German Socio-Economic Panel Study (SOEP). Germany is an especially appealing country to examine because it is one of the most important remitting countries in the world. From 1984-2008, Germany sent

[2] World Bank Migration and Remittances Factbook 2011.

[3] See Yang (2011) for a survey of the literature and a comparison of remittances , FDI, and official aid.

abroad on average $9 billion a year in the form of remittances, third most in the world. In 2009, Germany remitted $16 billion which represented 0.5% of German GDP.[4]

Furthermore, the German SOEP data is a longitudinal data set that surveys the same individuals every year from 1984 to 2008 and is one of the only micro-level data sets that measures remittances sent abroad. Thus, it is possible to focus on changes in total remittances from an existing set of immigrants rather than variation in remittances that is driven by a change in the number of immigrants. The problem with the latter variation is that new immigrants may directly impact wages by increasing labor supply which would bias the estimated impact of remittances on wages. By examining changes in remittances from the same set of immigrants, this analysis focuses on a clean source of variation in the consumer base while holding the workforce fixed.

The empirical specification essentially examines how changes in the total amount of remittances leaving a German state affect the wages of individual native workers within that state after controlling for demographic characteristics, state fixed effects, year fixed effects, and industry fixed effects. One concern is that an income or productivity shock within a particular state could lead to higher native wages and lead to wealthier immigrants remitting more money abroad. To address this potential endogeneity concern, this analysis utilizes an instrumental variable estimation strategy to identify the casual impact of remittance on wages. The instrument is constructed using variation in remittances that is driven by changes in foreign country characteristics which are exogenous to local economics conditions.

The results confirm the predictions of the model. Even the OLS results, which may include a spurious positive bias due to endogeneity, indicate that remittances decrease native wages. The IV results are more negative and indicate that, a ten percent increase in remittances leads to a 2.5 percent reduction in the wages of native workers within that state. As the consumer base shrinks relative to the workforce, native wages decline. In addition, this negative impact predominantly affects workers employed in non-traded industries which are more reliant on domestic consumption. The impact of remittances on workers in traded industries is insignificant because changes in the local consumer base has a relatively small impact on the demand for these goods and remittances set abroad can

[4] World Bank Migration and Remittances Factbook 2011.

still be used to purchase these traded goods. Additional sensitivity analyses indicate that the results are robust to including immigration as an additional control, to the use of an alternate instrumental variable estimation strategy, and to using a more restricted sample.

Existing studies tend to focus on the impact that remittances have on developing countries that receive these funds. Typically remittances are found to enhance the economic performance of the receiving country, including increasing household welfare, reducing poverty, and insuring against income shocks (The World Bank 2008, Chami et al. 2008, and Rapoport and Docquier 2006). Other authors examine the characteristics of those that choose to remit and their motivation for doing so (Lucas and Stark 1985, Funkhouser 1995, de la Briere et al. 2002, Osili 2007, Dustmann and Mestres 2010, Yang 2011). However, relatively little is known about how the outflow of remittances affect the economic performance of the sending country. Given the positive impact of remittances on economic conditions in developing countries, one might suspect that the implications for the sending country would be more adverse. To the best of my knowledge, this is the first paper to specifically examine the implications of remittances on the sending country's economy. Not surprisingly, this analysis finds that remittances reduce native wages particularly of workers producing non-traded goods.

While there is limited research into the implications of remittances for developed countries, there is a large body of work examining whether immigration adversely affects the wages of similarly skilled native workers. The results are mixed, with some studies finding that immigration has a significant negative impact on native wages (Borjas, Freeman, and Katz 1997 and Borjas 2003) and others finding a smaller or insignificant impact (Card 1990, Card 2005, Ottaviano and Peri 2008). While public discourse and previous research often focuses on the labor market competing effects of immigration, the implications of immigration on the consumer base is also important but seldom studied. Mazzolari and Neumark (2012) and Olney (2012) begin to think more seriously about immigrant consumption by examining the impact of immigration on the number and type of business establishments. However, this is the only empirical paper, that I am aware of, that focuses on how an immigrant-induced change in the consumer base affects native wages.

The model presented in this paper is similar to the framework outlined in Borjas (2009),

which examines the impact of immigration on wages in a wide variety of more general functional forms. In contrast, this paper makes very simple assumptions about the utility and production functions and yet still predicts that immigration's impact on wages depends on the change in the consumer base relative to the change in the workforce. Focusing on remittances provides a unique opportunity to test the implications of the model, since remittances change the consumer base but not the workforce. The ability to empirically test the predictions of the model using an unusual longitudinal micro-level data set that has information on remittances represents an important contribution of this paper. The results of this paper provide the first empirical evidence that immigration can have an significant impact on the consumer base and thus wages.

The remainder of the paper is organized as follows. Section 2 outlines the theoretical framework and the predictions of the model. The empirical specification is discussed in section 3 and the data and descriptive statistics are described in section 4. The results and sensitivity analysis are discussed in sections 5 and 6 respectively. Finally, section 7 concludes.

2 Model

The goal of this section is to provide a simple and intuitive theoretical framework in which to examine how remittances affect native wages. This is accomplished by first identifying how immigration can impact wages through an increase in labor market competition and through an increase in the consumer base. Then the impact of remittances on the consumer base and thus native wages is examined within this framework.

Following Borjas (2009), the model assumes there are two goods in the economy, with good q produced domestically and good y imported. Complete specialization in production ensures that factor price equalization does not hold. This allows for the possibility that differences in factor prices across countries provide a motive for migration. If there was incomplete specialization then factor prices would be equalized across countries and according to the Rybczynski Theorem, immigration would alter the distribution of output without leading to any change in wages.

Assume each consumer j has the following quasilinear utility function:

$$U(y,q) = y + g_j^* \frac{q^\xi - 1}{\xi}, \tag{1}$$

where $\xi < 1$ and g_j^* reflects consumer $j's$ preference for the domestic good. Let Z be the consumer's income and thus the budget constraint is:

$$Z = y + pq, \tag{2}$$

where p is the price of the domestic good and the price of the imported good is taken as given (because it is determined in the world market) and treated as the numeraire. Maximizing utility subject to the budget constraint generates consumer $j's$ demand function for the domestic good:

$$q_j = g_j p^{-1/(1-\xi)}, \tag{3}$$

where g_j is a rescaled consumer specific preference.[5]

The three types of consumers in this economy are domestic workers, domestic capitalists, and consumers in other countries. All consumers have the same quasilinear utility function specified in (1) but the weighting factor g differs across the types of consumers. This allows for the possibility that the consumers may differ in their preference for the domestically produced good. Let C_L be the number of domestic workers, C_K be the number of domestic capitalists, and C_X be the number of foreign consumers. Thus, the market demand for the domestic good (Q) is defined as follows:

$$Q = q_L C_L + q_K C_K + q_X C_X$$

[5] Given the quasilinear utility function, product demand is not a function of income. See Borjas (2009) for an extension that includes these wealth effects.

which, after substituting in equation (3), becomes

$$Q = Cp^{-1/(1-\xi)}, \tag{4}$$

where $C = g_L C_L + g_K C_K + g_X C_X$ is the weighted number of consumers.

While often overlooked by previous research, this model provides a useful framework in which to think about how immigration affects product demand. In (4), an increase in the size of the workforce due to immigration can affect product demand in two ways. It can lead to a movement along the existing product demand curve as the price of the domestic good changes or it can shift the product demand curve itself as the weighted number of consumers, C, changes.

More specifically, let $\phi = dlogC/dlogL$ represent the change in the (weighted) number of consumers due to an immigration-induced change in the number of workers. ϕ can reflect a number of different ways in which immigration can affect the consumer base. For instance, immigration may lead to a substantial increase in the number of domestic consumers but only a trivial decline in the number of foreign consumers. Even if the increase in C_L is fully offset by a decline in C_X, there may be a home bias in consumption where immigrants preference for the domestic good increases from g_X to g_L.

If $\phi = 1$, then immigration leads to a proportionately equal increase in the size of the consumer base and the size of the workforce. Borjas (2009) refers to this case as product market neutrality. However, the impact of immigration can be non-neutral in the sense that the influx of workers can lead to a larger or smaller change in the number of consumers. For instance, if immigrants are conspicuous consumers of the domestic good than the consumer base may increase by more than the workforce ($\phi > 1$). Conversely, if the consumer base increases by less than the workforce then $\phi < 1$.

From (4) the following inverse demand function is given:

$$p = C^{\eta} Q^{-\eta}, \tag{5}$$

where $\eta = 1 - \xi > 0$ is the inverse price elasticity of demand.

The domestic good is produced using a Cobb-Douglas production function:[6]

$$Q = K^{\alpha} L^{1-\alpha}. \tag{6}$$

In a competitive market factors are paid their value of marginal product, and thus the wage and the rental rate on capital are defined as follows:

$$w = (1-\alpha) C^{\eta} Q^{1-\eta} L^{-1}, \tag{7}$$

$$r = \alpha C^{\eta} Q^{1-\eta} K^{-1}. \tag{8}$$

Using (7) and (8), it is possible to examine the impact of immigration on wages in the short-run and in the long-run, where in the short-run the capital stock is fixed ($dK = 0$) and in the long-run the price of capital is fixed ($dr = 0$). Taking logs and differentiating (7) gives the following key short-run relationship between immigration and wages (i.e. the 'wage elasticity of immigration'):

$$\frac{d \ln w}{d \ln L} = \eta(\phi - 1) - \alpha(1 - \eta). \tag{9}$$

The impact of immigration on wages consists of two terms. If there is product market neutrality ($\phi = 1$), the wage impact of immigration reduces to just the second term in (9) which is unambiguously negative since $0 < \alpha < 1$ and $0 < \eta < 1$. By comparison, in a basic one good framework, the wage elasticity of immigration is simply equal to $-\alpha$. Since the inverse price elasticity of demand is between zero and one ($0 < \eta < 1$), the short-run

[6] See Borjas (2009) for results using more general functional forms, including a CES production function. Since the results are similar, I choose to focus on the simpler Cobb-Douglas production function.

impact of immigration on wages is now less negative when one allows for immigration to affect product demand. Furthermore, the impact of immigration on wages becomes less negative as the output elasticity of labor (α) decreases and as the inverse price elasticity of demand (η) increases.

If immigrants are conspicuous consumers of the domestic product ($\phi > 1$), then the negative impact of immigration on wages is further attenuated. The first term in (9), which is now positive, partially offsets the negative effect of the second term. However, if the consumer base increases by less than the workforce ($\phi < 1$), then the first term in (9) will be negative and this will exacerbate the negative impact of immigration on wages. Thus, the impact of immigration on wages depends crucially on the immigration-induced change in the (weighted) number of consumers relative to the change in the number of workers.

It is also possible to examine the impact of immigration on wages in the long-run where the price of capital is fixed. Taking logs and differentiating (7) and (8), generates the following long-run relationship between immigration and wages:[7]

$$\frac{d\ln w}{d\ln L} = \frac{\eta(\phi - 1)}{1 - (1 - \eta)\alpha}. \tag{10}$$

With product market neutrality ($\phi = 1$), equation (10) generates the standard result that immigration has no impact on wages in the long-run. The capital stock increases by the same proportion as the immigration-induced increase in the workforce which leaves the capital to labor ratio constant and thus wages do not change. However, if $\phi > 1$, then immigration has a positive impact on wages in the long-run and if $\phi < 1$, then immigration has a negative impact on wages in the long-run. Therefore, in both the short-run and in the long-run, ϕ plays a critical role in determining the impact of immigration on wages.

Remittances offers a unique opportunity to identify changes in ϕ. Specifically, as a fixed number of immigrants send more money to foreign countries in the form of remittances, the consumer base will decrease relative to the workforce. From (9) and (10) we see that as ϕ decreases, domestic wages in the short-run and in the long-run decrease. This leads to the

[7] See the Appendix for the derivations.

following proposition:

Proposition 1 *Holding the workforce constant, as immigrants send more money abroad in the form of remittances, the domestic consumer base shrinks, and domestic wages decline.*

It is also informative to consider how the characteristics of the domestically produced good, Q, can affect the relationship between remittances and wages. Suppose, for instance, that Q is a traded good. Since, traded goods are consumed by both domestic and foreign consumers, the consumption weights g_X and g_L are going to be relatively similar. Thus, remittances will have a smaller effect on the consumer base, since the foreign residents that receive the remittances will have similar preferences for the domestically produced good. Therefore, if Q is a traded good, remittances will have relatively small impact on ϕ and on domestic wages.

However, if Q is a non-traded good than the preference for this domestically produced good is much higher among domestic consumers than foreign consumers, $g_L > g_X$. Specifically, if foreign consumers purchase none of the domestically produced good, then $g_X = 0$. Thus, as immigrants remit money abroad, the demand for the domestically produced good will decrease substantially. Little of the money sent home by immigrants will be spent on the non-tradeable domestically produced good and thus the weighted number of consumers will decrease significantly. Therefore, if Q is a non-traded good, remittances will reduce ϕ and domestic wages by relatively more.[8] This distinction between non-traded and traded goods leads to the second proposition of the model:

Proposition 2 *Holding the workforce constant, remittances will have a more negative impact on the wages of domestic workers producing non-traded goods than on the wages of domestic workers producing traded goods.*

The model laid out in this section provides a simple theoretical framework in which to examine the impact of remittances on native wages and generates two important predictions.

[8] It is worth noting that if immigrant's preferences for the domestically produced good remain exaclty the same after migrating, then remittances will have a limited impact on the consumer base and wages. Remittances will simply shift money from immigrant consumers with g_x preferences to foreign consumers with the same preferences for the domestic good. In addition, there will be no difference between the impact of remittances on wages in traded and non-traded industries. The empirical results of this paper provide no support for either of these predictions.

However, Propositions 1 and 2 are very general, intuitive results that are not specific to the assumptions of this particular model. These predictions hold under a wide array of assumptions and function forms (see Borjas 2009). The remainder of the paper examines whether there is empirical evidence supporting these two key propositions of the model.

3 Empirical Specification

To test the first proposition of the model, the empirical analysis will examine whether fluctuations in total remittances at the state level affect the wages of native workers within these states. Specifically, the following equation will be estimated using OLS:

$$\ln w_{ist} = \beta_0 + \beta_1 \ln remit_{st} + \beta_2' X_{it} + \gamma_s + \delta_t + \psi_n + \varepsilon_{ist}, \tag{11}$$

where w_{ist} is the real wage of native worker i, in state s, and in year t. $remit_{st}$ is total real remittances from state s in year t. X_{it} is a vector of control variables that include individual characteristics that often affect wages, such as education, age, age squared, marital status, and gender. Finally, γ_s are state fixed effects, δ_t are year fixed effects, ψ_n are industry fixed effects, and ε_{ist} is an error term. All specifications have robust standards errors which are clustered at the state-year level in order to account for the possibility that the error terms are correlated. This might be the case since the dependent variable is measured at the individual-year level while the independent variable of interest is at the state-year level. Finally, all regressions are weighted by the state sample size.

This empirical strategy essentially asks whether native workers in states that experience an increase in the outflow of remittances see a decline in their wage. Given the predictions of the model, we would expect that as immigrants send money abroad, the domestic consumer base shrinks relative to the workforce. As ϕ decreases, local wages decline, and thus $\beta_1 < 0$.

Despite the inclusion of state, year, and industry fixed effects and a variety of control variables, one may be concerned about endogeneity. Specifically, an income or productivity shock within a particular state could cause native wages to increase and also enable wealthier

immigrants to remit more money home. This would generate a spurious positive bias in the β_1 coefficient, which would, if anything, attenuate the results. However, to correct for this potential endogeneity issue, the subsequent analysis will use an instrumental variable (IV) estimation strategy to identify a causal impact of remittances on wages. The specific construction of this instrument will be discussed in greater detail in the next section, but essentially the instrument identifies variation in remittances that is driven by foreign country factors and eliminates variation that is driven by local state characteristics.

To test the second proposition, equation (11) is separately estimated for workers in traded and non-traded industries. Given the predictions of the model, remittances from a particular state will have a more negative impact on the wages of workers producing non-traded goods. These non-traded industries, such as services, depend more heavily on local consumption and are thus more sensitive to a reduction in demand that results from immigrants sending money abroad.

4 Data

4.1 Wages and Remittances

To empirically test the predictions of the model, one needs micro-level data on remittances and wages. While there are numerous data sets that quantify the inflow of remittances into various countries, there is very little information about where these remittances are coming from.[9] The only panel data set, that I am aware of, that has micro-level information on immigrant remittances is the German Socio-Economic Panel Study (SOEP).[10]

One appealing feature of the SOEP data set is that it is longitudinal study that follows the same residents over a long period of time (1984-2008). This provides a unique opportunity to identify a clean source of variation in remittances. Specifically, the value of remittances can increase due to existing immigrants remitting more money home or because new immigrants may also choose to remit. This latter variation in remittances can be problematic since new immigrants increase the workforce and can directly affect native wages

[9] The World Bank Migration and Remittances Factbook does provide estimates on remittance outflows but only at the country level.

[10] Both Dustmann and Mestres (2010) and D'Amuri, Ottaviano, and Peri (2010) also use this SOEP data.

through the labor supply effects shown in the model. Fortunately, the SOEP longitudinal data set, allows me to focus on changes in remittances from an existing set of immigrants. Thus, this data set provides a clean way of identifying how remittances affect wages while holding the number of immigrants and workforce fixed.[11]

Beginning in 1984 SOEP surveyed 5,921 West-German households, including those with both native and foreign heads of household. There has been some attrition over the subsequent twenty four years and new subsamples of residents have been added to the SOEP data set.[12] SOEP asks a comprehensive list of survey questions and provides information on wages, remittances, location, and demographic characteristics which are especially useful for this analysis.

The remittance data from SOEP is not available for years 1992 and 1994, and the method of surveying respondents about remittances changes slightly in 1996. Despite this, the SOEP data provides the best micro-level panel data on immigrant remittances. Immigrants can be defined using information on nationality or country of birth, both of which are provided by SOEP. These two measures are virtually identical, however the nationality measure has better coverage and is thus used to define an immigrant. One issue with the nationality measure is that some immigrants obtain German citizenship during the sample. Thus, a person is classified as an immigrant if their nationality differed from German at any point in the sample. This foreign country is then used as the immigrants country of origin.

In a given year, the sum of immigrant remittances is calculated for each West-German state.[13] These nominal remittance sums are then deflated using the German Consumer Price Index (2005=100) available from OECD.stat. Finally, the natural logarithm of this is taken to generate the following remittance variable:

[11] It is not possible to calculate the number of immigrants per state using SOEP because by definition this will not change given the longitudinal nature of the data. Instead, section 6.1 incorporates immigration data from another source and finds that the results are robust to the inclusion of this additional control.

[12] The analysis in section 6.3 shows that the results are not sensitive to excluding these changes in the sample.

[13] The West-German states are: Berlin; Schleswig-Holstein; Hamburg; Lower Saxony; Bremen; North Rhine-Westphalia; Hesse; Rhineland-Palatinate and Saarland; Baden-Wuerttemberg; and Bavaria. Given the lack of remittance data and the small sample size, East German states were not included in the analysis.

$$\ln remit_{st} = \ln \left[\frac{\sum_i (remittances_{ist})}{CPI_t} \right]. \tag{12}$$

This is the key independent variable in the analysis that follows.[14]

While immigrant remittances are aggregated up to the state-year level, the wages of native workers remain at the individual level. Thus, the key dependent variable is the natural logarithm of individual real annual labor earnings of each native worker. The different level of aggregation between the dependent and independent variable is useful because it allows individual characteristics of the native worker to be controlled for, such as years of education, age, age squared, marital status, and gender. Finally, the sample of native workers is restricted to heads of households who are between 18 and 65 years old.

4.2 Descriptive Statistics

Estimates from the World Bank, indicate that Germany is one of the most important remittance source countries in the world.[15] From 1984 to 2008, Germany remitted on average $9 billion a year, third most in the world behind only the U.S. and Saudi Arabia. In 2009, Germany remitted $16 billion which represented 0.5% of German GDP. Furthermore, German remittances increased dramatically from $4 billion in 1984 to $15 billion in 2008. This increase is consistent with the growing importance of remittance flows worldwide.

The SOEP data represents a small component of these overall aggregate remittance flows. However, changes in immigrant remittances within the SOEP data are likely correlated with more general remittance outflows from Germany. Fortunately, immigrants were overrepresented in the original 1984 SOEP sample, accounting for approximately a third of the head of households surveyed. Each immigrant remitted on average €1,122 per year which represented 6% of their income. Of those that remitted a positive amount, the average

[14] I chose not to divide total remittances by the population due to concerns that the population could be correlated with wages. Furthermore, due to the longitudinal nature of the data, the state population does not change significantly. Thus, the state fixed effects in the current specification will account for differences in remittances due to the size of the state. Not surprisingly, the results are virtually identical using the current measure of remittances or using an alternate remittance-per-person measure.

[15] World Bank Migration and Remittances Factbook 2011.

was €5,782 per year or 23% of their income.

This analysis exploits differences in remittances across West-German states. Figure 1 shows the average outflow of remittances from West-German states. Rhineland-Palatinate and Saarland are treated as one geographic unit in the SOEP data which is reflected in Figure 1. In addition, there is substantial differences across states, with Baden-Wuerttemberg and North Rhine-Westphalia remitting a large amount while Bremen, Hamburg, and Schleswig-Holstein remit relatively little. The relatively low remittance values in these northern states is a result of the limited number of immigrants in the sample and not that average remittances per immigrant is necessarily lower. However, many of these differences across states will be absorbed by the state fixed effects and thus the empirical strategy focuses on changes within states over time.

Figure 2 identifies the countries to which these remittances are sent.[16] Remittance outflows are predominantly sent to Turkey, the former Yugoslavia, Greece, Italy, and Spain. Due to strong economic growth, West Germany saw an increase in foreign-born workers from 0.6% in 1957 to 11.2% in 1973 predominantly from Southern European countries and Turkey (Dustmann and Mestres 2010). Thus, immigrants from these countries were significantly represented in the initial SOEP sample and remittances to these countries are relatively large.[17]

The SOEP data used in this analysis includes 23 years (1984-2008, excluding 1992 and 1994), spans 11 different West-German states, and includes 13,708 native Germans and 5,902 immigrants. The summary statistics are reported in Table 1. They indicate a substantial amount of variation in individual native wages and in total state remittances. In addition, Table 1 indicates that household heads have on average 12 years of education and are on average 44 years old. In addition, 60% of the heads of households are married and 68% are male.

To gain a sense of the variation in the data utilized in this analysis, the residuals are obtained from separately regressing real native wages and real remittances on the controls and fixed effects. Figure 3 then plots the average wage residuals at the state-year level

[16] It is assumed that immigrants send remittances to their country of origin.

[17] Although, in the descriptive statistics Yugoslavia is treated as one country, in the IV analysis that follows remittances are more carefully assigned to specific countries within the former Yugoslavia.

against the remittance residuals. Two things are worth noting. First, in some years the northern states mentioned earlier have relatively limited remittance outflows. Although these outlier observations attenuate the relationship between wages and remittances, I think it is preferable to include the full set of West-German states in this analysis. Instead of dropping these observations, the regressions that follow are weighted by the state sample size in order to minimize the effect of large fluctuations in remittances due to a small sample size.[18]

Second and perhaps more importantly, there is a slight negative correlation between remittances and average wages in Figure 3. This supports the predictions of the model. However, this correlation is weak, perhaps because of a positive endogeneity bias, and certainly does not imply causation. Thus, it is necessary to identify an exogenous source of variation in remittances in order to examine the causal impact of remittances on wages. The next section discusses the instrument used in this paper.

4.3 Instrument

Variation in immigrant remittances is likely driven both by factors in the foreign source country and by German economic conditions. Since the latter effect is almost certainly correlated with German wages, it would be appealing to identify and use the variation in remittances that is due to foreign country factors. To gain a sense of the variation in remittances in the data, Figure 4 plots remittances by Turkish and Yugoslavian immigrants in Germany from 1984 to 2008 and identifies some important events that may have influenced remittances.[19] A number of observations are worth noting.

First, there is a downward trend in remittances over time in Figure 4. This is likely due to the fact that remittances decrease with the length of time the immigrant has been in Germany and that there is attrition in the SOEP data set. The inclusion of year fixed effects should account for both factors.[20] Second, remittances to Turkey and Yugoslavia

[18] The results are similar if the regressions are unweighted or if these three northern states are dropped from the analysis altogether.

[19] By no means are these are the only, or even the most important, events influencing remittances. Rather these are simply some key events within Turkey and Yugoslovia that may have influenced remittances and that help motivate the choice of instrument used in this analysis.

[20] Section 6.3 more carefully addresses the issue of attrition and indicates that the basline results are robust to using an alternate, more restrictive sample.

exhibit some common trends that are likely driven by German economic conditions. For instance, remittances to both countries fall after 2001 when German GDP growth begins to slow. This type of variation in remittances is potentially problematic since slow economic growth may also reduce domestic wages, which would lead to a spurious positive bias in the OLS coefficient.[21] Third, and most importantly, remittances to Turkey and Yugoslavia are related to shocks in these foreign countries which are likely exogenous to German wages.

For instance, in 1999 a powerful 7.4 magnitude earthquake struck the Turkish city of Izmit. The earthquake killed 17,000 people, injured 50,000, left 500,000 people homeless, and caused $3 to $6.5 billion of damage.[22] Not surprisingly, the top panel of Table 4 indicates that Turkish immigrants in Germany remitted more money after this devastating earthquake. Similarly, remittances from Yugoslavian immigrants in Germany remain relatively high through the 1990's as Yugoslavia broke apart and plunged into war. These country specific events are likely exogenous to German wages and are thus the variation in remittances that will be useful for this analysis. One practical difficulty is that the source of these country specific shocks vary substantially and could include a wide range of factors, such as natural disasters, wars, elections, exchange rate fluctuations, and foreign economic conditions. Rather than trying to measure each of these factors individually, which would be difficult, this analysis uses a more general fixed effect strategy to identify variation in remittances that is driven by foreign country characteristics.[23]

Specifically, for each immigrant who remitted money abroad, there is data on their individual characteristics, their West-German state of residence, and their country of origin. Thus, remittances are regressed on individual demographic characteristics, state*year fixed effects, and country*year fixed effects. While not the focus of this analysis, this intermediate step in the construction of the remittance IV is interesting because it indicates what types of immigrants are most likely to remit. The results are reported in Table 2 and indicate that more educated, older, single, males are relatively more likely to remit money.

The state*year fixed effects in this regression capture changes in remittances that are

[21] Technically, for this to be a concern, the severity of the German recession has to vary across states and be correlated with remittances and wages. Any national trends will be controlled for by the year fixed effects.

[22] Source: U.S. Geological Survey (http://neic.usgs.gov/neis/eq_depot/1999/eq_990817/)

[23] Section 6.2 discusses an alternate IV strategy that focuses exclusively on natural disasters.

common to immigrants within a particular state in a given year. Since the goal is to eliminate the variation in remittances that could be driven by unobserved factors at the state level which may be correlated with wages, these state*year fixed effects are discarded. The individual characteristics are also discarded. Instead, the coefficients on the country*year fixed effects are used to construct the instrument. This captures changes in remittances that are driven by foreign country characteristics and that are exogenous to local economic conditions. For instance, the 1999 earthquake in Izmit likely caused Turkish immigrants to send more money home to family and friends regardless of the German state that the immigrant lived in. This variation in remittances would be captured by the country*year fixed effect but not by the state*year fixed effect. This predicted amount of remittances for each immigrant based on their country of origin is then aggregated up to the state-year level.[24] Finally, this sum is divided by the CPI and logged in the manner outlined in (12), which generates the remittance instrument.

5 Results

5.1 Wages and Remittances

The OLS results from estimating (11) are reported in Table 3. All results have robust and clustered standard errors in brackets, include state, year, and industry fixed effects, and are weighted by the state sample size. Column 1 excludes the controls while column 2 includes the individual demographic characteristics of the native worker. Consistent with Proposition 1 of the model, both specifications indicate that immigrant remittances have a negative impact on the wages of native German workers. For instance, the results in column 2 indicate that a one percent increase in the outflow of remittances from a particular state leads to a 0.03% decline in the wages of native workers within that state. The coefficients on the demographic controls are significant and of the expected sign. Wages are increasing with years of education and with age (although decreasing with age squared). Marital status does not have a significant impact on wages but males earn relatively more.

[24] Prior to the summation, a constant is added to all the remittance fitted values to ensure that they are all positive. This is necessary so that when taking logs these fitted values are not converted to missing. As long as the fitted values are positive, the results are not sensitive to the size of the constant.

The strong negative effect of remittances on wages observed in Table 3 is consistent with the predictions of the model. However, it is somewhat surprising that such a negative relationship emerges, despite the likely spurious positive endogeneity bias in these OLS results. The IV analysis will limit these endogeneity concerns by identifying a causal impact of remittances on wages. The first stage IV results are presented in Table 4 and indicate that the remittance instrument is a good predictor of actual remittances. The coefficients on the remittance IV are positive and significant at the one percent level and the F-stat on the excluded instrument is 14, which indicates that the instrument is relatively strong.

The second stage IV results are reported in Table 5. The results in both columns include state, year, and industry fixed effects while column 2 also includes individual demographic controls. Both specifications indicate that remittances have a negative impact on native wages. Specifically, the results in column 2 indicate that a one percent increase in remittances leads to a 0.25% decrease in the wages of native workers, which is significant at the one percent level. This result is, again, consistent with proposition 1 of the model. As German immigrants remit more money abroad, the domestic consumer base shrinks, and thus domestic wages fall.

While the coefficient on remittances is negative in both the OLS and IV specifications, the IV coefficient is much larger. The more positive OLS results are consistent with the endogeneity concern that should introduce a spurious positive bias in the OLS coefficients. Specifically, a local income or productivity shock within a state may increase native wages and also lead wealthier immigrants to remit more. However, in the IV analysis the variation in remittances is driven only by exogenous factors in the foreign country and thus this spurious positive bias is eliminated. Therefore, not surprisingly, the remittance coefficients in the IV regressions in Table 5 are more negative than the OLS results from Table 3. However, both the OLS and IV results indicate that remittances have a negative and significant impact on local wages which confirms proposition 1 of the model.

5.2 Traded and Non-Traded Industries

According to the second proposition of the model, remittances should have a more negative impact on native wages in non-traded industries since these industries are more reliant on

domestic consumption. Traded industries are less sensitive to changes in domestic consumption and foreign residents who receive the remittances can still purchase these traded goods. Thus, the second proposition is tested by comparing the impact of remittances on the wages of workers in traded and non-traded industries.

Column 1 of Table 6 reports the OLS results when the sample is limited to workers in traded industries and column 2 reports the OLS results when the sample is limited to workers in non-traded industries.[25] A one percent increase in remittances has no impact on the wages of workers in traded industries but decreases the wages of workers in non-traded industries by 0.05%. Consistent with Proposition 2 of the model, remittances have a more negative impact on the wages of workers in non-traded industries.

The IV results for the traded and non-traded industries are reported in columns 3 and 4 respectively. The difference between the impact of remittances on traded and non-traded industries is now even more pronounced. Specifically, in column 3, remittances have a small and insignificant impact on the wages of workers in traded industries. However, in column 4, remittances have a large, negative, and significant impact on wages. Specifically, a one percent increase in remittances leads to a 0.36% decrease in the wages of workers in non-traded industries. This is consistent with the second proposition of the model that remittances will have a more substantial impact on the demand for non-traded goods and thus more adversely affect the wages of workers in these industries. Virtually all of the estimated impact of remittances on native wages is driven by these non-traded industries. Thus, the results in Table 6 provide further evidence that remittances decrease wages and indicate that the impact is strongest in industries that are more dependent on local consumption.

One potential concern, is that a foreign country shock could affect remittances and the demand for German traded goods. This would violate the exclusion restriction of the IV analysis since a foreign country shock could affect wages through a channel other than remittances. For instance, a negative GDP shock in Turkey will lead Turkish immigrants in Germany to remit more money home. This is the type of variation is exploited by the

[25] Traded industries include Agriculture, Trade, Mining, Transport, Manufacturing, Energy, and Finance, while non-traded industries are Services, Construction, and Other. Based on this definition, 36% of workers are in traded industries and 64% are in non-traded industries. The results are robust to alternate definitions of traded and non-traded industries.

IV strategy. However, in addition, Turkey may also demand fewer German goods, due to their recession, which will depress wages in German traded industries.[26] Although this scenario could bias the results, the direction of this bias would work against the findings in Table 6. Specifically, this would generate a spurious negative bias in the traded industry coefficient only. However, despite this potential bias, the non-traded industry results in Table 6 are more negative than the traded industry results. This suggests that either this story is relatively unimportant or that the actual disparity between traded and non-traded industries is even larger than the results in Table 6 indicate.

6 Sensitivity Analysis

6.1 Controlling for Immigration

The SOEP survey follows the same individuals over time, which provides a clean way of identify changes in remittances that are unrelated to the number of immigrants. This is especially appealing for this analysis because new immigrants can affect both the outflow of remittances and wages directly through labor market competition. So the ability to identify changes in remittances from a fixed set of immigrants represents an important benefit of the SOEP data.

However, in reality the number of immigrants is likely changing over time and this could potentially violate the exclusion restriction in the IV analysis. Specifically, a negative shock in a foreign country likely increases remittances but it could also lead to an increase in immigration which may directly depress German wages. For instance, the earthquake in Izmit likely leads Turkish immigrants in German to remit more money home. The earthquake may also cause some residents of Turkey to migrate to Germany.[27] These new immigrants may directly depress wages by competing with native Germans for jobs. This example would generate a spurious negative bias in my results and would be problematic

[26] Technically, the reduction in demand for German traded goods has to occur in the German states that have a higher proportion of Turkish immigrants, which seems unlikely. These states are where the shock to remittances, driven by a fall in Turkish GDP, will be relatively large.

[27] These new immigrants may be more likely to migrate to the states where their countrymen are already located. These are the states in which remittances to Turkey are relatively high and responsive to shocks in Turkey.

for the conclusions of this paper.

In order to address this potential concern, it would be appealing to explicitly control for immigration in the empirical specification. This would alleviate the potential for foreign shocks to affect native wages through changes in the number of immigrants. However, one drawback of the SOEP data is that the longitudinal structure does not allow estimates on immigration by state and year to be calculated. Instead, population data by West-German states was obtained from the Statistisches Bundesamt (Destatis).

The foreign population data from Destatis has a number of important limitations. First, immigrant data for the years 1988,1989, and 1990 is missing. These values are calculated using linear interpolation at the state level. Second, Germany defines an immigrant as a person without German nationality. Thus, a foreign born resident that becomes a German citizen is no longer counted as an immigrant. Third, there are continuity issues due to revisions in the manner in which the data is collected. The year fixed effects should address this latter concern.[28] Despite these limitations, the foreign population data from Destitis is the best available measure of immigration. The natural logarithm of the immigrant share of the population is included in the empirical specification as an additional control.

The IV results are reported in Table 7. In column 1 the baseline results are re-estimated with the immigration variable included as an additional control. The coefficient on immigration is insignificant. More importantly, the inclusion of this variable does not significantly change the coefficient on remittances. It remains negative, significant, and of a similar magnitude to the baseline results in Table 5. This is not surprising, since, by construction, the remittance variable is independent of the number of immigrants. However, these results do indicate that there is little evidence that immigration is violating the exclusion restriction of the IV analysis.

Columns 2 and 3 separately estimate the results for traded and non-traded industries. Immigration has a negative impact on wages in traded industries which is barely significant at the 5% level but an insignificant impact on wages in non-traded industries. More importantly the inclusion of the immigration variable does not change the coefficient on remittances significantly in either specification. Consistent with earlier findings, remittances

[28] Given these concerns about the data, I chose not to include this control in the baseline specification.

have no impact on the wages of native workers in traded industries but a significant negative impact on the wages of workers in non-traded industries. Thus, the inclusion of the immigrant control does not alter the main conclusions of this paper.

One intriguing aspect of these results is that they suggest that remittances may be relatively more important than the labor competing impacts of immigration. Specifically, the potential negative wage impact of immigration might be driven more by a decline in the consumer base due to remittances than an increase in labor market competition. At the very least, these findings suggest that future studies of immigration and wages should more carefully account for remittances.

6.2 Alternate IV Strategy

One appealing aspect of constructing the instrument using the country*year fixed effect strategy, is that it can account for a wide variety of foreign country factors that could influence remittances. The baseline results indicate that this is an effective way of identifying an exogenous source of variation in remittances. However, one potential drawback is that this method lacks the transparency of a classic IV analysis. This section tries to address this concern by proposing an alternate IV strategy.

The basic premise of this alternate IV is that German immigrants will remit more to their home country in response to a large natural disaster. Foreign natural disasters are clearly exogenous to German native wages and thus should prove to be a useful instrumental variable. Using foreign natural disasters as an instrument for remittances is a much narrower approach, relative to the fixed effects strategy used earlier, since it is focusing on one specific type of event which may be correlated with remittances. However, it is more transparent which may be appealing.

Data on the number of deaths due to natural disasters by country is obtained from the International Disaster Database (EM-DAT).[29] Deaths due to natural disaster in a foreign country is linked to the immigrant's country of origin. For instance, 18,021 Turks died in 1999 due to natural disasters, the most important of which was the Izmit earthquake.

[29] Natural Disasters include Drought; Earthquake, Epidemic, Extreme Temperature; Flood; Insect Infestation; Mass Movement Dry; Mass Movement Wet; Storm; Volcano; Wildfire; Complex Disasters; Industrial Accident; Transport Accident; and Miscellaneous Accident.

Thus, each Turkish immigrant in Germany is assigned 18,021 deaths in 1999. This exercise is repeated for all years and for the five largest German immigrant source countries, which includes Turkey, former Yugoslavia, Greece, Italy, and Spain.[30] The instrument is then calculated as the sum of home country deaths for all immigrants within a particular German state and year. The outflow of remittances should increase with the number of deaths due to natural disasters in the home countries of German immigrants.

The first-stage results using this alternate instrument are reported in Table 8. Consistent with expectations, the coefficient on the IV is positive and significant. However the F-Stat on the excluded instrument is 6.7. Despite this relatively weak instrument, the second stage IV results in Table 9 are strong and consistent with earlier results. Column 1 in Table 9 indicates that a one percent increase in remittances decreases native wages by 0.39%. Furthermore, changes in remittances have no impact on the wages of native workers in traded industries but a negative and significant impact on the wages of workers in non-traded industries. The remittance coefficients in Table 9 are not significantly different from the corresponding baseline results. The fact that these two vary different IV estimation strategies generate such similar results is reassuring and provides additional support for the key conclusions of this paper.

6.3 Restricted Sample

One appealing aspect of the SOEP data is that it surveys the same individuals over time. However, as mentioned before, additional subsamples have been added to the original 1984 sample in order to expand the coverage. In addition, some individuals drop out of the sample over time due to a number of different factors. One concern is that these changes in the sample may be driving the observed relationship between remittances and wages. To be problematic for this analysis, these changes would have to be specific to individual states, since the year fixed effects will capture changes common to states over time. Furthermore, it is likely that the direction of this bias would, if anything, attenuate the results of this paper since wages and remittances both likely increase with the population and thus the

[30] I focus on the 5 largest immigrant source countries in order to avoid the potential for catostrophic outlier events (such as the cyclone in Bangladesh in 1991 which resulted in the death of 138,000 people) to significantly alter the sum of deaths in a particular German state.

sample.

Nonetheless, to more carefully address these potential issues, this section utilizes a sample that is restricted in two important dimensions. First, the sample is limited to only natives and immigrants that were part of the original 1984 sample. The later subsamples that were added to the SOEP data set are dropped. Second, any individual that is classified as having died, moved abroad, or dropped out at any point in the sample is eliminated entirely from the data set. These changes drop almost half of the native and immigrant individuals from the data set.

Table 10 reports the results using this restricted sample. Despite the fact that the number of observations has decreased substantially, the coefficient on remittances is negative and significant in column 1. The point estimate of -0.29 is very similar to the baseline results of -0.25 in Table 5 and still significant at the one percent level. Remittances have an insignificant impact on the wages of native workers in traded industries (column 2) but a negative and significant impact on the wages of workers in non-traded industries (column 3). Again, these estimated coefficients are very similar to the baseline results reported in Table 6. Thus, the key empirical finding of this paper is robust to this alternate and much more restricted sample.

7 Conclusion

This paper makes two important contributions to the existing literature. First, it provides insight into the impact of remittances on the sending country, rather than on the foreign receiving country. Second, in contrast to existing studies, it focuses on how immigration affects the domestic consumer base rather than on the labor market competing impact of immigration.

The model indicates that the effect of immigration on wages depends crucially on immigration's impact on the size of the consumer base relative to the size of the workforce. Remittances represent a unique way of identifying changes in this ratio, since they reduce the consumer base but have no impact on the size of the workforce. Thus, the model predicts that as remittances increase, the consumer base shrinks, and thus domestic wages

decline. Furthermore, since non-traded industries are more dependent on local consumption, remittances will have a more negative impact on the wages of workers in these industries.

The predictions of the model are tested using an unusual longitudinal data set that includes micro-level information on remittances. Despite the potential spurious positive bias, the OLS results indicate that remittances have a negative and significant impact on native wages. The IV results, which eliminate these endogeneity concerns by focusing on variation in remittances driven by foreign country factors, indicate an even more negative relationship. A ten percent increase in remittances reduces native wages by 2.5 percent. Finally, as predicted, remittances have a much more negative impact on the wages of workers in non-traded industries.

Using the estimates from this paper, it is possible to perform a back-of-the-envelope calculation to determine how much income declines due to remittances. According to the World Bank, German remittances abroad increased by about $1b from 2007 to 2008 or 7.7%. Based on my estimates, this would lead to a reduction in national income of 1.9% or about $730 per person in Germany in 2008. In contrast, for developing countries remittance inflows accounted for 2% of GDP in 2009 and for low-income countries remittance inflows accounted for 5.4% of GDP in 2009.[31] This is a trade-off many would be willing to make, and thus the results of this paper should not be viewed as a rational to restrict remittances. Furthermore, the ability to remit may be an important reason to migrant, which in turn may have positive implications for other aspects of the host economy. Thus, the policy implications of this paper are not a critique of remittances themselves, since the benefits to many developing countries are large and well documented, but rather provide a careful assessment of the trade-offs associated with remittances.

While the results of this paper focus specifically on the relationship between remittances and wages, the implications of these results are broader. They highlight the important impact that immigration can have on product market demand. Immigrants compete with native workers for jobs but they also consume goods and services and this can alleviate the labor market competing impact of immigration. An alternate interpretation of the results in this paper, is that as the domestic consumer base grows, native wages increase. At the

[31] Migration and Remittances Factbook 2011, World Bank.

very least, this paper indicates that future research should think more carefully about the implications of immigration on consumption.

References

Bartel, Ann P. 1989. "Where Do the New U.S. Immigrants Live?" *Journal of Labor Economics*, 7(4): 371-91.

Borjas, George J. 1994. "The Economics of Immigration." *Journal of Economic Literature*, 32(4): 1667-1717.

Borjas, George J. 2003. "The Labor Demand Curve is Downward Sloping: Reexamining the Impacts of Immigration on the Labor Market." *Quarterly Journal of Economics*, 118(4): 1335-74.

Borjas, George J. 2006. "Native Internal Migration and the Labor Market Impact of Immigration." *The Journal of Human Resources*, XLI(2): 221-58.

Borjas, George J., Richard B. Freeman, and Lawrence F. Katz. 1997. "How Much Do Immigration and Trade Affect Labor Market Outcomes?" *Brookings Papers on Economic Activity*, 1997(1): 1-90.

Borjas, George J. 2009. "The Analytics of the Wage Effect of Immigration." NBER Working Paper 14796.

Card, David. 1990. "The Impact of the Mariel Boatlift on the Miami Labor Market." *Industrial and Labor Relations Review*, 43(2): 245-57.

Card, David. 2001. "Immigrant Inflows, Native Outflows, and the Local Market Impacts of Higher Immigration." *Journal of Labor Economics*, 19(1): 22-64.

Card, David. 2005. "Is the New Immigration Really so Bad?" *The Economic Journal*, 115(507): F300-23.

Card, David and John DiNardo. 2000. "Do Immigrant Inflows Lead to Native Outflows?" *American Economic Review*, 90(2): 360-7.

Card, David and Ethan G. Lewis. 2005. "The Diffusion of Mexican Immigrants During the 1990s: Explanations and Impacts." Working Paper No. 11552, National Bureau of Economic Research.

Chami, Ralph, Adolfo Barajas, Thomas Cosimano, Connel Fullenkamp, Michael Gapen, and Peter Montiel. 2008. "Macroeconomics Consequences of Remittances." International Monetary Fund Occasional Paper Number 259.

Cortes, Patricia. 2008. "The Effect of Low-Skilled Immigration on U.S. Prices: Evidence from CPI Data." *Journal of Political Economy*, 116(3): 381-422.

de la Briere, Benedicte, Elisabeth Sadoulet, Alain de Janvry, and Sylvie Lambert. 2002. "The Roles of Destination, Gender, and Household Composition in Explaining Remittances: an Analysis for Dominican Sierre." *Journal of Development Economics*, 68(2): 309-328.

D'Amuri, Francesco, Gianmarco I.P. Ottaviano, and Giovanni Peri. 2010. "The Labor Market Impact of Immigration in Western Germany in the 1990s." European Economic Review, 54(4): 550-570.

Dustmann, Christian and Josep Mestres. 2010. "Remittances and Temporary Migration." *Journal of Development Economics*, 92(1): 62-70.

Friedberg, Rachel M. and Jennifer Hunt. 1995. "The Impact of Immigrants on Host Country Wages, Employment and Growth." *Journal of Economic Perspectives*, 9(2): 23-44.

Funkhouser, Edward. 1995. "Remittances from International Migration: A Comparison of El Salvador and Nicaragua." *The Review of Economics and Statistics*, 77(1): 137-146.

Hanson, Gordon H., Kenneth F. Sheve, Matthew J. Slaughter, and Antonio Spilimbergo. 2002. "Immigration and the U.S. Economy: Labor-Market Impacts, Illegal Entry, and Policy Choices." In *Immigration Policy and the Welfare System*, ed. Tito Boeri, Gordon Hanson, and Barry McCormick, 169-279. Oxford University Press.

Hanson, Gordon H. 2007. "Emigration, Remittances, and Labor Force Participation in Mexico." *Integration and Trade Journal*, 27: 73-103.

Lewis, Ethan G. 2003. "Local, Open Economies Within the US: How Do Industries Respond to Immigration?" Working Paper No. 04-1, Federal Reserve Bank of Philadelphia.

Lewis, Ethan G. 2005. “Immigration, Skill Mix, and the Choice of Technique.” Working Paper No. 05-8, Federal Reserve Bank of Philadelphia.

Lucas, Robert E. B. and Oded Stark. 1985. "Motivations to Remit: Evidence from Botswana." *Journal of Political Economy*, 93(5): 901-918.

Mazzolari, Francesca and David Neumark. 2012. "Immigration and Product Diversity" *Journal of Population Economics*, 25(3): 1107-1137.

Olney, William W. 2012. "Immigration and Firm Expansion." Williams College Economics Working Paper #2010-13.

Osili, Una Okonkwo. "Remittances and Savings from International Migration: Theory and Evidence Using a Matched Sample." *Journal of Development Economics*, 83(2): 446-465.

Ottaviano, Gianmarco and Giovanni Peri. 2008. "Immigration and National Wages: Clarifying the Theory and the Empirics." Working Paper No. 14188, National Bureau of Economics Research.

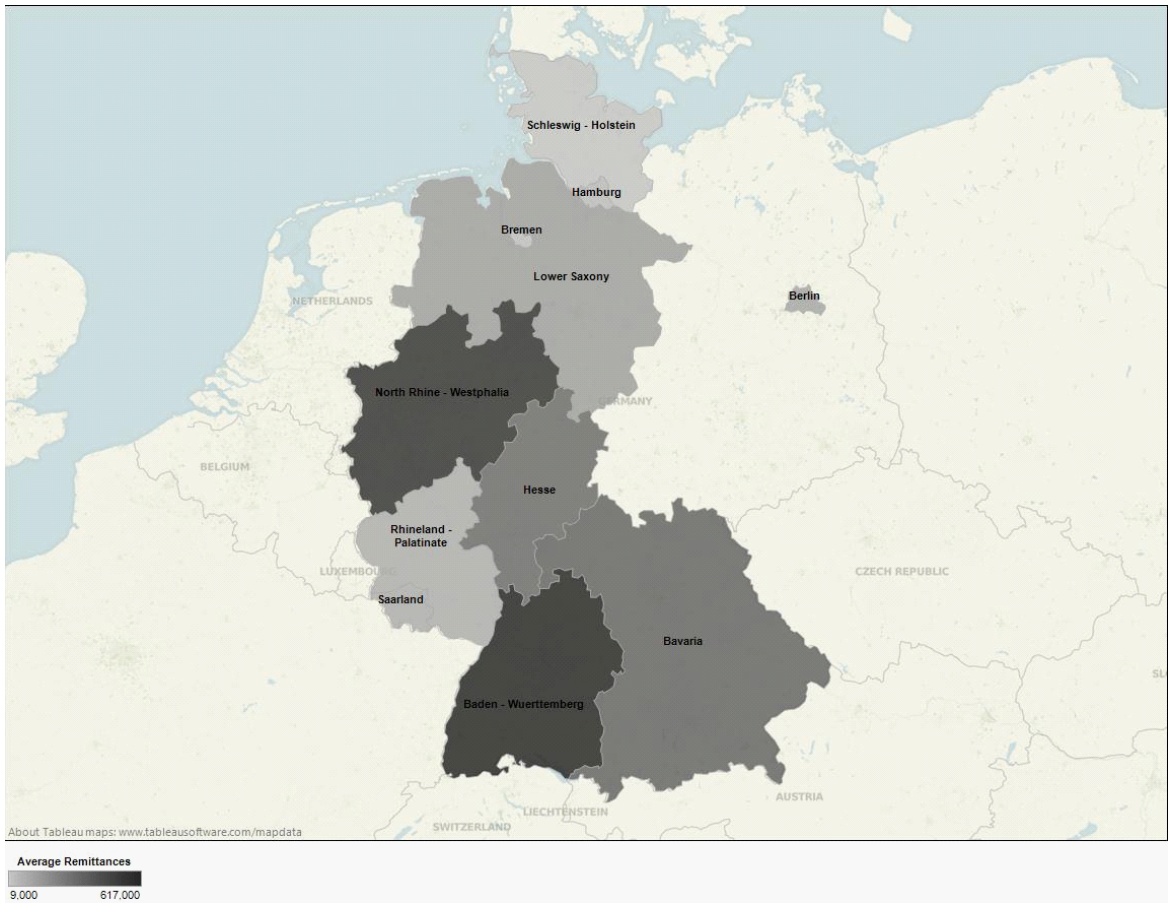
Rapoport, Hillel and Frederic Docquier. 2006. "The Economics of Migrants' Remittances." *Handbook on the Economics of Giving, Reciprocity and Altruism*, Volume 2, 1135-1198.

The World Bank. 2008. "Remittances and Development, Lessons from Latin America." Edited by Pablo Fajnzylber and J. Humberto Lopez.

Yang, Dean. 2011. "Migrant Remittances." *Journal of Economic Perspectives*, 25(3): 129-152.

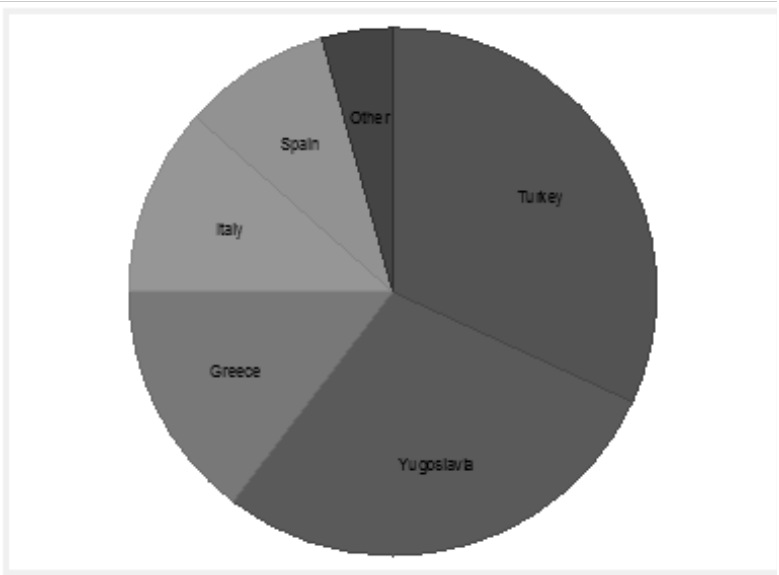
FIGURE 1

Average Annual Remittances by West German State



Average annual real remittances sent by German immigrants abroad from 1984-2008 by West-German state. Source: German Socio-Economic Panel Study (SOEP).

FIGURE 2
German Remittances by Foreign Country



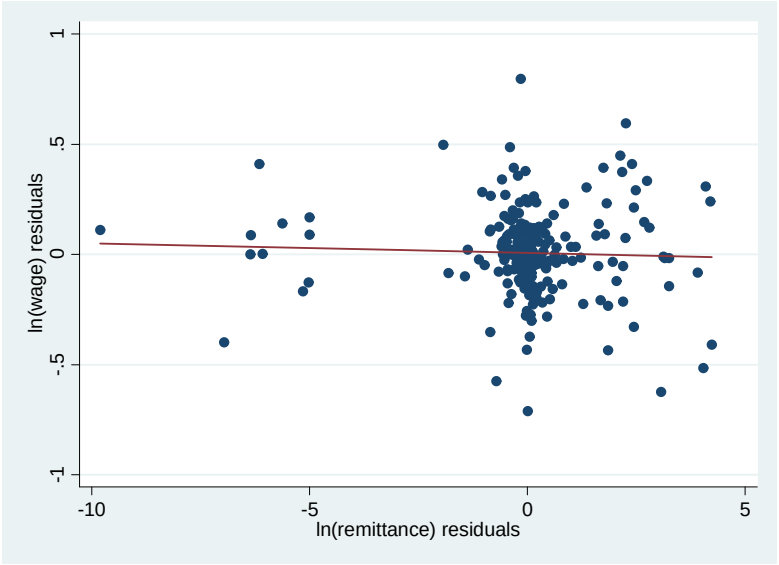
Total real remittances sent by German immigrants abroad from 1984-2008 by foreign country . Source: German Socio-Economic Panel Study (SOEP).

TABLE 1
Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ln (Wage)	96,109	8.60	3.78	0	14.04
ln (Remittances)	96,109	11.47	2.10	0	14.42
Education	94,151	12.25	2.71	7	18
Age	96,109	43.96	11.97	18	65
Age Squared	96,109	2076	1061	324	4225
Married	96,109	0.60	0.49	0	1
Male	96,109	0.68	0.47	0	1

The sample includes 23 years (1984-2008 excluding 1992 and 1994), spans 11 West-German states, and includes 13,708 native Germans and 5,902 immigrants.

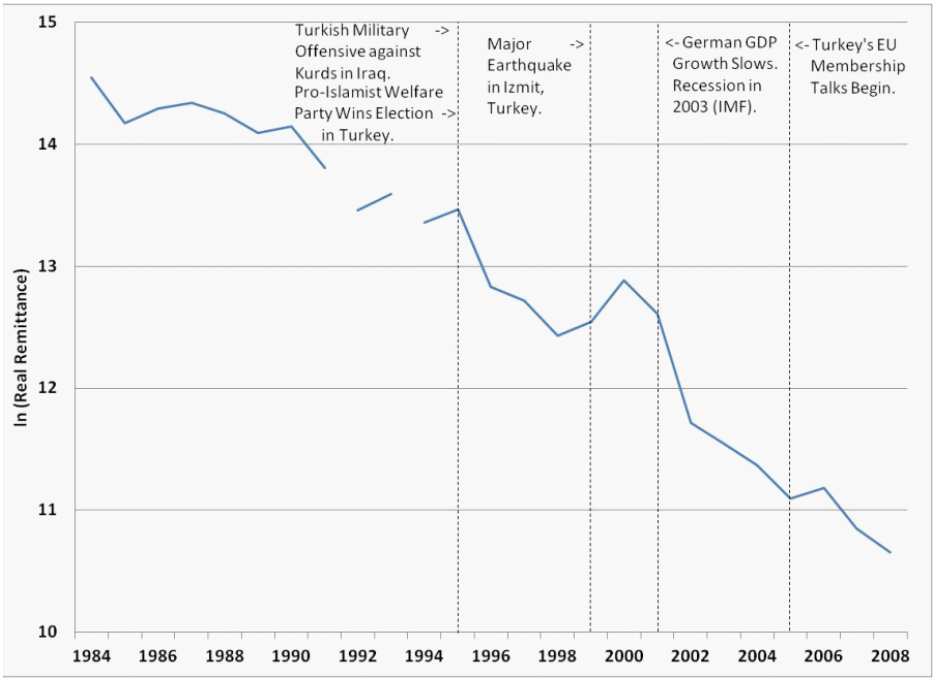
FIGURE 3
Native Wage and Remittance Scatter Plot



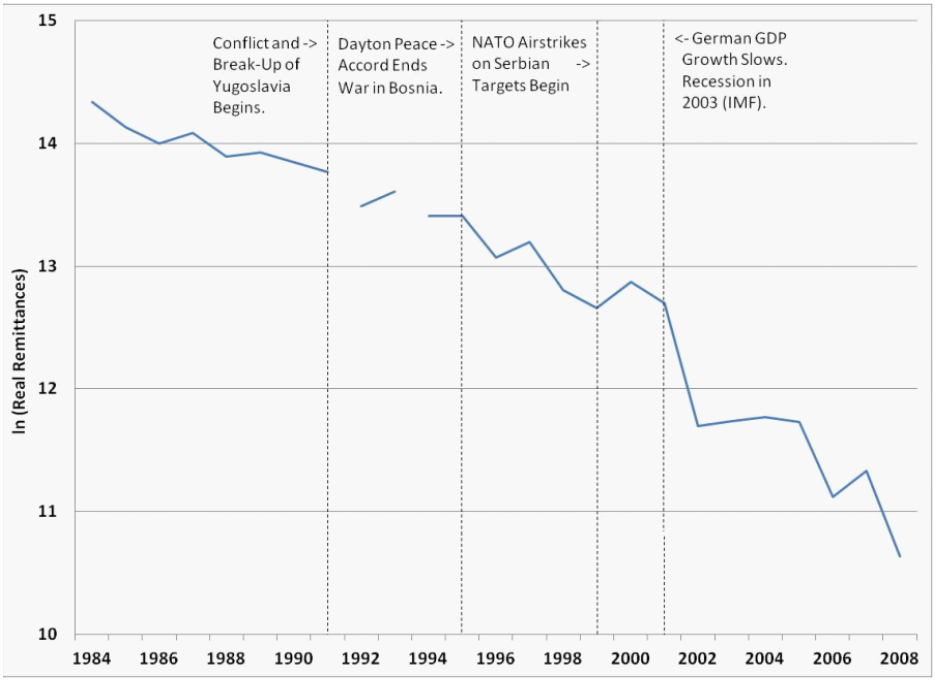
Residuals are obtained from separately regressing native real wages and real remittances on the full set of controls and fixed effects. Average wage residuals at the state-year level are then plotted against the remittance residuals.

FIGURE 4

Remittances to Turkey



Remittances to (former) Yugoslavia



Remittance data from German Socio-Economic Panel Study (SOEP). Historical timeline from BBC News.

TABLE 2
Constructing the Remittance Instrument (OLS)

	Remittances
Education	16.3**
	[6.5]
Age	184.4***
	[7.5]
Age Squared	-1.9***
	[0.1]
Married	-282.6***
	[40.4]
Male	767.4***
	[26.7]
State*Year FE	Yes
Country*Year FE	Yes
Observations	43,236
R-squared	0.115

Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1.

TABLE 3
Impact of Remittances on Native Wages (OLS)

	ln (Wage)	ln (Wage)
ln (Remittance)	-0.041**	-0.034**
	[0.016]	[0.014]
Education		0.124***
		[0.005]
Age		0.234***
		[0.010]
Age Squared		-0.003***
		[0.000]
Married		0.008
		[0.028]
Male		1.021***
		[0.033]
State FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	96,109	94,151
R-squared	0.524	0.584

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Real remittances are at the state-year level. Real native wages and all other control variables are at the individual-year level. Regressions weighted by the state sample size.

TABLE 4
First Stage IV Results

	ln (Remittance)	ln (Remittance)
ln (Remittance IV)	1.452***	1.446***
	[0.388]	[0.385]
Education		-0.001***
		[0.000]
Age		0.00
		[0.001]
Age Squared		0.00
		[0.000]
Married		0.00
		[0.002]
Male		0.00
		[0.002]
State FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	96,109	94,151
R-squared	0.913	0.914
F-Stat, Instrument	14.05	14.08

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. The Remittance IV is constructed using the variation in remittances that is due to foreign country characteristics. Regressions weighted by the state sample size.

TABLE 5
Impact of Remittances on Native Wages (IV)

	ln (Wage)	ln (Wage)
ln (Remittance)	-0.312***	-0.251***
	[0.098]	[0.084]
Education		0.124***
		[0.005]
Age		0.234***
		[0.010]
Age Squared		-0.003***
		[0.000]
Married		0.007
		[0.028]
Male		1.020***
		[0.033]
State FE	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	96,109	94,151
R-squared	0.523	0.584

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Real remittances are at the state-year level. Real native wages and all other control variables are at the individual-year level. Regressions weighted by the state sample size.

TABLE 6
Impact of Remittances on Native Wages by Traded and Non-Traded Industries

	Traded (OLS)	Non-Traded (OLS)	Traded (IV)	Non-Traded (IV)
ln (Remittance)	-0.003	-0.051**	-0.023	-0.364***
	[0.009]	[0.020]	[0.038]	[0.122]
Education	0.082***	0.143***	0.082***	0.143***
	[0.004]	[0.006]	[0.004]	[0.006]
Age	0.104***	0.264***	0.104***	0.264***
	[0.006]	[0.014]	[0.006]	[0.014]
Age Squared	-0.001***	-0.003***	-0.001***	-0.003***
	[0.000]	[0.000]	[0.000]	[0.000]
Married	0.003	0.014	0.003	0.013
	[0.016]	[0.043]	[0.016]	[0.043]
Male	0.660***	1.218***	0.660***	1.217***
	[0.019]	[0.050]	[0.019]	[0.049]
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	34,115	60,036	34,115	60,036
R-squared	0.189	0.557	0.189	0.556

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Traded industries include Agriculture, Trade, Mining, Transport, Manufacturing, Energy, and Finance. Non-Traded industries include Services, Construction, and Other. Regressions weighted by the state sample size.

TABLE 7
Impact of Remittances on Native Wages (IV) including Immigration

	Total	Traded Industries	Non-Traded Industries
ln (Remittance)	-0.218**	0.010	-0.321**
	[0.089]	[0.042]	[0.131]
ln (Immigration)	-0.372	-0.366**	-0.480
	[0.337]	[0.184]	[0.481]
Education	0.124***	0.082***	0.143***
	[0.005]	[0.004]	[0.006]
Age	0.234***	0.104***	0.264***
	[0.010]	[0.006]	[0.014]
Age Squared	-0.003***	-0.001***	-0.003***
	[0.000]	[0.000]	[0.000]
Married	0.008	0.003	0.013
	[0.028]	[0.016]	[0.043]
Male	1.020***	0.660***	1.216***
	[0.033]	[0.019]	[0.049]
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	94151.000	34115.000	60036.000
R-squared	0.584	0.189	0.556

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Real remittances and the immigrant share of the population are at the state-year level. Real native wages and all other control variables are at the individual-year level. Regressions weighted by the state sample size.

TABLE 8
First Stage Results using Natural Disaster Deaths as IV

	ln (Remittance)
ln (Natural Disaster Deaths IV)	0.412**
	[0.159]
Education	-0.001***
	[0.000]
Age	0.000
	[0.001]
Age Squared	0.000
	[0.000]
Married	-0.001
	[0.002]
Male	-0.003*
	[0.002]
State FE	Yes
Year FE	Yes
Industry FE	Yes
Observations	94,151
R-squared	0.91
F-Stat, Instrument	6.68

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. The Natural Disaster Deaths IV is constructed by summing the deaths due to natural disasters in the immigrants home country. Regressions weighted by the state sample size.

TABLE 9
Impact of Remittances on Native Wages (IV) using Natural Disaster Deaths as IV

	Total	Traded Industries	Non-Traded Industries
ln (Remittance)	-0.385**	-0.091	-0.491**
	[0.160]	[0.078]	[0.204]
Education	0.124***	0.082***	0.143***
	[0.005]	[0.004]	[0.006]
Age	0.234***	0.104***	0.264***
	[0.010]	[0.006]	[0.014]
Age Squared	-0.003***	-0.001***	-0.003***
	[0.000]	[0.000]	[0.000]
Married	0.007	0.003	0.013
	[0.028]	[0.016]	[0.043]
Male	1.020***	0.660***	1.216***
	[0.033]	[0.019]	[0.049]
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	94,151	34,115	60,036
R-squared	0.583	0.188	0.555

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Real remittances are at the state-year level. Real native wages and all other control variables are at the individual-year level. Regressions weighted by the state sample size.

TABLE 10
Impact of Remittances on Native Wages (IV) using Restricted Sample

	Total	Traded Industries	Non-Traded Industries
ln (Remittance)	-0.290***	-0.051	-0.411***
	[0.090]	[0.039]	[0.125]
Education	0.103***	0.074***	0.116***
	[0.005]	[0.004]	[0.006]
Age	0.236***	0.106***	0.272***
	[0.013]	[0.007]	[0.018]
Age Squared	-0.003***	-0.001***	-0.004***
	[0.000]	[0.000]	[0.000]
Married	0.051	-0.016	0.096
	[0.044]	[0.020]	[0.067]
Male	1.090***	0.636***	1.349***
	[0.045]	[0.028]	[0.062]
State FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	52,267	20,086	32,181
R-squared	0.562	0.173	0.536

Robust standard errors clustered at the state-year level in brackets. *** p<0.01, ** p<0.05, * p<0.1. Real remittances are at the state-year level. Real native wages and all other control variables are at the individual-year level. Regressions weighted by the state sample size. Sample only includes natives and immigrants that were included in the original 1984 sample and that did not die, move abroad, or drop out of the sample.

A Appendix

Taking the natural log of equations (7) and (8) gives:

$\ln w = \ln(1-\alpha) + \eta \ln C + (1-\eta)\left[\alpha \ln K + (1-\alpha)\ln L\right] - \ln L$

and

$\ln r = \ln(\alpha) + \eta(\ln C) + (1-\eta)\left[\alpha \ln K + (1-\alpha)\ln L\right] - \ln K$

Rearranging the latter equation and differentiating leads to the following immigration-induced change in the capital stock (where it is assumed that in the long-run $dr = 0$):

$\frac{d\ln K}{d\ln L} = \frac{\eta\phi+(1-\eta)(1-\alpha)}{1-(1-\eta)\alpha} > 0$

Not surprisingly, this term is positive which indicates that as the workforce increases due to immigration, the capital stock will increase as well. With product market neutrality ($\phi = 1$), this relationship equals one which indicates that the capital stock will grow at the same rate as the immigration-induced change in labor supply.

Differentiating the $\log w$ equation, using the immigration-induced change in the capital stock equation, gives:

$\frac{d\ln w}{d\ln L} = \eta\phi + (1-\eta)\alpha\left[\frac{\eta\phi+(1-\eta)(1-\alpha)}{1-(1-\eta)\alpha}\right] + (1-\eta)(1-\alpha) - 1$

or

$(10)\,\frac{d\ln w}{d\ln L} = \frac{\eta(\phi-1)}{1-(1-\eta)\alpha}.$