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Migration Intensity and Its Determinants

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This paper develops the concept of migration intensity, defined as the degree to which a migrant shifts his attachment, association and engagement from his place of origin to the migration destination. Among male Mexican migrants to the United States, we find strong complementarities among remittances, migration patterns, and localized investments in physical, social and human capital. Based on these, we derive a unidimensional Index of Migration Intensity (IMI). The IMI reveals that Mexicans use a continuum of migration strategies. The majority of Mexicans are characterized by low levels of migration intensity, but migration intensity has been growing over time. Cross-sectional variation of migration intensity is in accordance with *a priori* expectations: education, prior migration experience, foreign family ties, and original residence in communities with few economic opportunities all promote higher migration intensity. From the standpoint of sending countries, low migration intensity has the desirable effects of enhancing positive financial transfers and mitigating the resource losses connected to the human outflow. From the standpoint of receiving countries, low migration intensity may also be desirable depending on policy goals.

JEL Classification: F22, J61, J18
Keywords: International Migration, Migration Strategies, Assimilation, Return Migration, Remittances

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1. Introduction

When thinking about socio-economic development, policy makers in recent decades often have considered out-migration as an indication of failed policies. Migration was rarely regarded as having the potential to aid the development of the sending country. Indeed, its relationship to development was sometimes depicted as harmful, creating "dependency" but no growth impulses [e.g. Reichert 1981]. However, researchers, international organizations, and governments have recently (re)discovered the potential of migration to spur domestic development. The potential of remittances, knowledge transfers and "tapping the diaspora" prompted the former UN Secretary General to initiate a "High-Level Dialogue on Migration" in late 2006. Yet since they generally ignore important aspects and interdependencies of migration behavior, existing economic theories offer little guidance as to the conditions under which migration is most beneficial, or regarding which types of migration are preferable.

A great share of the literature on international migration has restricted itself to one specific aspect of migration behavior: the choice of whether or not to migrate. In this paper, I term this "extensive migration behavior". What this reduction of migration behavior to one choice misses is that a migrant also chooses a level of "migration intensity," or how strongly to reorient himself to the destination and relinquish economic and social ties to his place of origin. In an attempt to fill this gap, this paper develops the concept of migration intensity, defined as the degree to which a migrant shifts his attachment, association and engagement from his place of origin to the migration destination. Migration intensity is a concise summary of several choices that reflect socio-economic reorientation, such as remittance behavior, choice of migration strategy, and localized investment behavior; decisions that are likely to be highly complementary.

While migration intensity cannot be observed, these decisions are observable, thus allow me to suggest a general measurement procedure for migration intensity and to compute it for male Mexican migrants: starting with a set of indicators for these choices I use principal component analysis to create an Index of Migration Intensity (IMI). Regression analysis of the determinants of IMI reveals variations across both individuals and communities. These accord with *a priori* expectations, suggesting that such an index can provide a robust empirical measure of a dimension of migration behavior that is of considerable policy relevance.

The paper is structured as follows. The next section reviews the inter-disciplinary literature on international migration behavior to motivate the concept of migration intensity. The third section develops the concept of migration intensity, and the fourth section proposes a general technique to measure it. In the fifth section, this is applied to the Mexican-U.S. case, and the determinants of variations in migration intensity are examined. The final section summarizes and concludes.

2. Motivating Migration Intensity: An Interdisciplinary Literature Review on Migration

Migration, Return and Remittance Decision

International migration is a complex, multi-faceted phenomenon. As a result, researchers have commonly divided the analysis of international migration behavior into various broad questions, mostly according to disciplines, and have then considered each separately, generally ignoring possible interconnections. Much migration research has focused on the question of what determines an agent's decision to migrate or not. While migration theories differ with regard to motive - be it migration-cost deducted wage differentials (Sjaastad 1962) or joint household strategies in response to risk and credit market failures (Stark & Bloom 1985) - they typically restrict their focus to the "go-no-go" decision. Many empirical analysts, particularly proponents of regression analysis, have shared this focus on what I shall refer to as "extensive migration behavior."

Extensive migration behavior captures only one policy-relevant dimension of migration behavior. It misses other important economic and social decisions that migrants face: Which migration strategy to choose, such as "emigration" or "seasonal migration"? Whether to remit money or not, and if so, how much? Whether to invest at home or abroad? Most fundamentally, migrants must decide whether and to what extent they will maintain economic, social, and cultural ties to their home communities.[2] Some of these questions have been addressed by distinct parts of the migration literature. Economists have explained return migration as resulting from either failed migration aspirations or the fulfillment of a pre-set saving target (e.g. Djajic & Milbourne, 1988). Remittances, a focal point for economists, have been attributed to altruism, selfishness or reciprocal exchanges (for a summary, see Rapport & Docquier, 2005). Others have analyzed migrants' "localized investment" choices, such as small-scale enterprises (Woodruff & Zeteno 2001), housing (Mooney 2004) or social networks (Lomnitz 1977, Massey et al. 1987).] Treating return behavior, remittance behavior and localized investment behavior independently of each other ignores the connections among these decisions. They

[2] Throughout the paper "home" refers to the community of origin.

are related in that each decision requires the migrant to make a choice how strongly he wants to "be invested" at home or abroad. [3] Hence, it would be sensible for him to consider them jointly.

Migration Types and Assimilation

Anthropologists and sociologists have long observed that migrants have diverse motives, characteristics and strategies. They have tried to summarize these differences by postulating certain migration types.[4] Temporary and permanent migrants are commonly separated. Many scholars further distinguish target earners (or "return migrants") and recurrent migrants (sometimes also "seasonal" or "circular" migrants). Recently some have proposed an additional category, "transmigrants," to describe individuals who engage simultaneously in origin and destination societies (Schiller et al. 1995). While most anthropologists and sociologists agree that different migration types exist, no unified typology has emerged and existing classifications are often defined in an *ad hoc* fashion. One difficulty is that migrants cannot be neatly classified into distinct types. There is a multitude of possible criteria and boundaries are arbitrary; for example, when does "temporary" become "permanent"? For these reasons, continuous and multi-indicator scales would be preferable. Moreover, it would be desirable that the scales have a clear foundation in a related theory.

The sociological literature on assimilation, acculturation and incorporation focuses on how well the migrant adapts to his new host environment. The orthodox theory, due to Gordon (1964) and others, describes a staged process by which the migrant gradually incorporates into the destination society. Pluralists, transnationalists and others have criticized the unilinear and automatic fashion by which migrants are assumed to assimilate, pointing to the fact that migrants continue to rely on ethnic ties. Socio-economic and medical paradoxes of reverse assimilation are mentioned.[5] The determinants of adaptation and integration remain largely unknown; various individual and structural factors have been proposed, but empirical studies point to strong historical specificity. Economists have mirrored orthodox assimilation theory in studies of educational and employment catch-up, mainly focusing on

[3] Lucas (2006, p. 9) remarks "certainly return migration and the propensity to remit are linked.". Dunstmann (2000, p. 226) argues that migrants will make most economic decisions in a simultaneous framework with the return decision: "For contract migrants, investments into human capital which is specific to the host country labour market depend on the contract length. A Polish immigrant to Sweden is unlikely to invest in the Swedish language if he has only a one year working contract, since the investment will not pay off. [...] As with contract migration, the migration duration again influences important economic decisions (such as skill investments). However, the migrant's economic decisions are now jointly taken with the decision whether and when to return."

[4] In this paper we restrict ourselves to labor migration and ignore other types of migration.

[5] Portes & Rumbaut (1996) have argued that assimilation depends on the "modes of incorporation" which an ethnic group faces, resulting in "segmented assimilation."

the closure of the native-immigrant wage gap. Recent evidence suggests that inter-generational catch-up occurs, but that significant ethnic wage gaps can persist across generations (Borjas 2006).

While the concept of assimilation is related to migrants' socio-economic reorientation, the literature has focused exclusively on the destination country. Implications for the sending country are largely unexplored and would be uncertain. For example, the counterpart of assimilationists' gradual integration could be gradual detachment from the home community.[6] Yet transnationalists would counter that even apparently settled migrants remain incorporated at home (Schiller et al. 1995). Furthermore, questions such as language acculturation or the closure of the wage gap are of secondary importance to the development economist who is interested in the welfare effects of migration in the country of origin.

Welfare

Migration can have profound effects on sending countries. Out-migration constitutes a resource loss to the sending society, not only in labor power but also in financial, social, and political capital. On the other hand, migrants often generate various positive resource transfers, such as money remittances. The net welfare effect of migration on sending communities has been debated, but recent research suggests that the overall effect often appears to be positive.[7] The question generally left unanswered is what determines the sign and size of the cost-benefit calculation? The few studies that have addressed this question have emphasized dependence on local conditions, such as investment opportunities (Taylor 1999a, Durand et al. 1996a, Lindstrom 1996). They miss the possibility that migrants' migration strategies and the degree of their continuing attachment to the community of origin could also strongly impact their willingness to engage in positive transfers. As Massey and Mines (1985, pp. 115-116), comparing two similar communities, remark:

> "The standard of living in Guadalupe is far above that in Los Animas. Larger migrant contributions have allowed village leaders to make more improvements in roads, schools, churches, water systems and sewerage

[6] Indeed Massey et al. (1987, p. 284) argue that "[p]rogressive integration into U.S. society brings a gradual shift of orientation away from migrants' communities of origin to the Unites States."

[7] Taylor et al. (2005) report that remittances have reduced Mexican poverty. Multiplier effects (Adelman et al. 1988), capitalization of micro-enterprises (Woodruff & Zenteno 2001) and "collective remittances" – group organized transfers that benefit community projects (Goldring 2004) - can further enhance migrants' positive impacts. The World Bank (2006), using a global general equilibrium model, suggests that the benefits of free labor movement would greatly surpass the benefits of freer trade. On the other hand, some researchers have blamed migration for labor shortages, "dependency," conspicuous consumption and inflated prices [Wiest 1984]. Whether migration worsens inequality and how parental migration affects children's educational attainment and health are still debated.

> than in Las Animas.[..] *These differences in levels of living relate directly to the different kinds of migrancy* that predominate in each community. The legal shuttle migrants prevalent in Guadalupe still view themselves as town residents [..] they see migration as a 'temporary' necessity [i]ntending to return to the home community [..] therefore investing earnings in ways destined to improve living standards in their home community. They improve their houses [..] and are willing to organize and contribute toward town projects [..] On the other hand, the beginner and permanent settlers that typify Las Animas *are less attached* to the home community. They stay in their U.S. schools and are often U.S. home owners. Their life is "in the north" [.] Their money is spent on furnishing houses in California, leaving little left over to improve living conditions in the home village." [Emphasis added.]

Lucas (2006), summarizing the migration literature, notes that male, temporary, undocumented, non-family accompanied migrants without tertiary education remit most (see also Durand et al. 1996b, Mooney 2004, Amuedo-Dorantes et al 2005, Grieco 2003, Reyes 2004).[8] These patterns suggest that migrants with a stronger attachment to their community of origin may be more willing to engage in positive financial transfers. At the same time, greater attachment may mitigate the loss in human, financial and political capital that migration imposes on sending communities.

Destination countries often prefer (regularized) circular migration, as exemplified in a recent surge of interest in policies to promote this type of migration (e.g. IOM 2006b, MPI 2006, Portes 2006, World Bank 2007). Circular migrants constitute a flexible labor supply and may be less likely to make use of public health, education and welfare programs. On the other hand, some immigration policies aim to promote the fuller integration of immigrants. In either case, an index that captures the "intensity of migration" would be useful for policy analysis in both sending countries and destination countries.

[8] Family ties may be especially important. As Portes (2006, p. 11) notes: "More important still is the character of migration itself. When it is comprised of young adults who travel abroad for temporary periods and return home after accumulating enough savings, the direct and indirect positive effects described previously have every chance to materialize. On the other hand, [..] [e]ntire families seldom return and migrant workers have less incentives to send large remittances or make sizable investments in places of origin when their spouses and children no longer live there."

3. The Concept of Migration Intensity

The concept of migration intensity refers to the degree to which a migrant shifts his attachment, association and engagement from his place of origin to the migration destination. Migration intensity is reflected in a migrant's decisions regarding socio-economic reorientation – choice of migration pattern, remittance behavior, and localized investment behavior – choices that are likely to be highly complementary. [9] Migration intensity succinctly summarizes these decisions, making it a variable of considerable policy relevance.

Extensive migration behavior is clearly related to intensive migration behavior. However, the concepts are distinct. While extensive migration behavior refers to whether a non-migrant decides to become a migrant, migration intensity refers to how completely those who do migrate choose to disconnect themselves from their origin. Some individuals choose to migrate at the lowest possible migration intensity - keeping all their assets, social ties and most leisure consumption at home. Others decide to emigrate –cutting most or all of their home-town relationships. Migration intensity is related to assimilation, but again distinct. Assimilation compares immigrants with natives, whereas migration intensity compares migrants with each other.

The concept of migration intensity assumes that socio-economic reorientation choices are complementary. Remittance behavior, choice of migration pattern, and localized investment behavior are likely to be correlated as they share a joint dependence on location. Sending remittances makes most sense if a migrant remains attached to the origin and plans to return. For example, sending remittances to hire somebody to tend to one's assets or further one's odds to inherit (see de Laat 2005 and Lucas 1985, respectively), will make sense only if the migrant intends to return. At the same time, remitting is likely to increases the value of returning home.[10] Similarly, since most investment choices for migrants regarding physical, human and social capital are tied to a choice of location, we can expect the choice of where to invest to be correlated with the return and remittance behavior of a migrant.

[9] This concept differs from Conapo's (2000) use of the term "migration intensity." Conapo uses different indicators to describe migration prevalence by location, which we consider a measure of extensive not intensive migration behavior.

[10] The complementarity between return and remittances has also been noted by other scholars (e.g. Lucas 2005, Rapoport & Docquier 2005). In a companion paper I model this complementarity more formally (see Kaufmann 2007).

4. Measuring Migration Intensity: A General Framework

Although migration intensity is not directly observable, choices that reflect migration intensity can be observed and these can be used to create an Index of Migration Intensity (IMI). In doing so, we face two methodological issues: which indicators to select, [11] and how to aggregate them into an index.

Indicators for the IMI

We have defined migration intensity as the degree to which a migrant shifts his attachment, association and engagement from his place of origin to the migration destination. Hence, any observable choice that indicates either an important association to the origin or the destination is relevant. This includes both economic and social variables, since for migrants decisions about their economic life (e.g. employment) are inseparably bound to their social life (e.g. living together with their family or not). In general, purchases of localized consumption goods and investments in localized assets can be taken as valuable signals. "Localized" here indicates that the value or utility of the good depends on the location in an important way.

A good example of localized consumption is "home-time consumption." This refers to migrants' decisions to return home to spend time together with family and friends or just to be in their homeland. The proportion of time (e.g., days per year) that a migrant spends at home is one indicator of home-time consumption. Return frequency is a second indicator of home-time consumption since it approximates the expenditure a migrant is willing to afford in order to spend time at home. Monetary or other transfers sent home constitute another signal of a spatial tie. Total remittances are not a good indicator since these are affected by other factors such as wealth. The proportion of income remitted is a preferable indicator (in the absence of income data, another option is to use a dummy variable indicating if any money was transferred). Communication with the community of origin could be another signal for migration intensity, particularly if communication is expensive. Finally, evidence that a migrant has changed his consumption habits as to strongly value goods which are only available at the destination could be taken as signs of elevated migration intensity.

We consider investments as local if they can only be transferred at a considerable loss in value, e.g. because markets are absent or weak. The higher the loss in value, the stronger is the signal of

[11] Since the identification of the set of indicators will circumscribe the latent phenomenon, it is crucial to select a balanced set that neither favors only one façade of migration intensity (e.g. remittances or language) nor is congruent to measures of related concepts (e.g. extensive migration behavior or assimilation).

spatial preference. The set of localized investments should include not only local physical assets but also local human and local social capital goods. Often migrants possess the same type of good at home and abroad. Therefore we prefer the use of indicators of proportional ownership: the proportion of item X owned at the destination over total ownership of item X. A higher score implies higher migration intensity.

For localized physical assets, business ownership is one useful indicator, since migrants typically work in their enterprises and cannot easily transfer their full value abroad. House ownership can also be used, particularly if the housing market is weak or transaction costs are high. Again, it is best to use proportional rather than absolute indicators to attenuate wealth effects.

Localized human capital goods include skills that are costly and valued differently at the origin and destination. A good example is immigration documentation, worthless in the home labor market but highly valuable abroad. The ability to speak the destination language is another good indicator, if this knowledge is uncommon at home and not valued in the home labor market. If there are indications that work experience is localized, this may be used. Human capital indicators sometimes assumed to signal low migration intensity, like "ethnic skills" or "ethnic education" (Chiswick 2006), are less likely to be useful since migrants often continue to depend on these skills when abroad or their acquisition is too customary to signal an intentional tie.

Localized social capital may be approximated by the location of social networks. This can provide useful information about migration intensity under either of two conditions: first, if the migrant actively invested in gaining membership to the network, e.g. by marrying a native or joining a social or professional organization, or second, if he influenced the (re)localization of the network itself by influencing the decisions of other members as to whether to stay or to leave. The location of the spouse and minor children is a good indicator for household heads in many societies.

Aggregation of the Migration Intensity Indicators: Principal Component Analysis

When several indicators are combined to form an index, linear aggregation is common, and this is the procedure that will be used here. This requires that we choose an appropriate set of weights. Theory does not suggest specific weights, and choosing some weight structure, such as equal weights, without

empirical support would require strong assumptions. Instead we use a statistical technique for aggregation, principal components analysis.[12]

Principal components analysis (PCA) is part of a set of multivariate statistical techniques, which are referred to as factor analysis techniques. One of PCA's uses is dimensional reduction. The idea is that several observed variables are somehow interdependent or correlated, such that most of their information may be expressed by a set of fewer composite variables, called components. Each component is a linear combination of the original variables. PCA's main advantage lies in the fact that it is the most efficient technique to accrue as much as possible of the original information to as a few as possible components. Consecutive components carry less and less additional information, such that latter components might be dropped at little cost.

Technically PCA computes the eigenvalues and eigenvectors of the observed variables' covariance matrix. The solution is unique and each eigenvalue and eigenvector corresponds to one component. The eigenvectors can then be used as "weights" which, if multiplied by the observed variables, give the components. Depending on how many components we decide to use, our Index of Migration Intensity (IMI) will have one or more dimensions.[13] Before calculating index scores for each observation, commonly called "component scores," we standardize eigenvectors and variables in order for the IMI to have a zero mean and a standard deviation of one (a common procedure).

[12] A more formal description of principal components analysis is presented in the Appendix, drawing on Basilevsky (1994). Kline (1994) offers an intuitive and readable introduction to factor analysis techniques in general.

[13] Deciding on how many components to include is a tricky decision and authors have combined various statistical techniques as well as rule of thumbs. Furthermore, authors commonly choose to construct the components in such a way as to achieve maximal interpretability. Therefore, components are often rotated. However, for data reduction purposes this seems less common (see, e.g. Kline 1994).

5. Migration Intensity: The U.S. - Mexican Case

Data Source

This study uses data from the Mexican Migration Project (MMP), a publicly accessible, collaborative research project based at Princeton University and the University of Guadalajara. Since 1982, the MMP has surveyed migrants and non-migrants in Mexican communities during the months of November to February, to take advantage of the regular return visits of migrants. Each community was visited once, and about five communities were surveyed in a given year.[14] The MMP database for the years 1982 to 2006 includes data from a total of 114 communities, in each of which roughly 170 households were randomly chosen and interviewed. This gives a total of 19,003 surveyed households. We use the information on household heads, since only this subset contains all information we need. As only a very small fraction of the household heads are female (4.7 %), we restrict the analysis to males. There are 6,389 households that are headed by a current or former male migrant and 4,315 of them have complete data.

Since communities are selected non-randomly, the MMP is strictly representative only for the 114 surveyed communities. Fortunately, the selected communities reflect a broad range of sizes and socio-economic conditions. According to Massey & Durand (2005) comparison of the MMP to a nationally representative survey has shown great accordance. The geographic focus, favoring western Mexican states, with southern and northern states added only recently, seems to be the only major bias. Representativeness within the communities themselves is often difficult to achieve in communities with significant out-migration. The MMP deals with this problem in several ways. First, surveying in Mexico is executed in the traditional months of return. Secondly, spouses frequently remain in Mexico and are interviewed in the absence of the household head. Thirdly, emigrated households are tracked by "snowball" sampling techniques and interviews are conducted in the U.S. A total of 972 households were interviewed in the U.S., along with 5,778 interviews of migrant-headed households in Mexico. Despite these problems, no other dataset comes as close as the MMP to obtaining a representative image of Mexico's former migrants, current migrants and emigrants.

We first construct a cross-sectional sample in which we include the most recent observation of each migrant household head (i.e. the survey year). We then assemble a panel data set using

[14] The MMP includes cities as well as towns and *ranchos*. At the beginning the MMP personnel delimit a "survey site," which, in the case of *ranchos*, normally correspond to the whole *rancho,* in the case of a city, refers to a neighborhood or a part of the city. Within the survey site all dwellings are then enumerated in order to create a sampling frame from which households are randomly selected, and sampling weights are then created. All of our analysis will incorporate these weights.

individuals' retrospective account from age 18 to the survey year.[15] Due to the panel's retrospective nature, and to the fact that different communities were interviewed at different points in time, the age of the interviewee at the survey point and the community to which he belongs determine the calendar years for which his life-time history is available. Hence, it is not appropriate to use calendar years as fixed points around which to define the panel. Instead we sample each individual in five year time-steps, ending with the survey year.[16]

Mexican Migration Intensity: Indicators

The following indicators are used to construct the Index of Migration Intensity: [17]

Home-time consumption: We construct a continuous indicator of the proportion of total time that Mexican migrant household heads spend abroad during a five-year interval surrounding the observation year.[18]

Remittances: Using MMP data on average monthly remittances during the last U.S. trip, we construct a continuous variable of the proportion of income remitted.

Localized physical assets: Our measure of localized physical assets is an index of U.S. home ownership. Unfortunately, while information on home ownership is broadly available, only one-third of the sample contains information as to the location of the house. However, the location of the interview, U.S. or Mexico, is very accurate in predicting the location of the house: for 99 percent of all home owners, the location of the house is correctly predicted in the sub-sample for which the information is available. Hence, we combine ownership data with interview location. Non-owners were assigned a "zero," clearly distinguishing them from Mexico owners (-1) or U.S owners (1), these latter two "being invested" as opposed to former.

Localized social capital: We construct a continuous variable of the proportion of the non-head household members (spouse and children) who have migrated during the last three years. Wives or

[15] Recall bias is therefore an issue. However, Smith & Thomas (1997) report that recall bias is least problematic for salient events such as important migration moves. Moreover, our results would be biased only if recall errors were systematic, for which we have no indications.

[16] We choose period lengths of five years since several of our indicators vary only infrequently over time. The results are not sensitive to different period lengths, such as two or three years.

[17] Except for remittances, higher indicator scores relate to higher levels of migration intensity.

[18] The results are not sensitive to different period lengths, such as 2, 3, or 7 years.

children born in the U.S. are considered equivalent to those who have immigrated as an indicator of investment in U.S. social capital. [19].

Localized human capital: We construct a dummy of long-term U.S. immigration documentation (residency or citizenship) to represent localized human capital. Short-term immigration documentation is excluded since it constitutes no enduring investment. We further construct an ordinal variable of migrants' ability to understand and speak English, ranging from "neither speaks nor understands" (0) to "speaks and understands much" (4).[20]

Table 1 Migration Intensity Indicators for the U.S.-Mexican Case (Cross-Section)

	Indicator	Full sample (n=4315)								MX Interview (n=3568)		US Interview (n=747)	
		Mean	SD	Max	Min	Q99	Q90	Q75	Q50	Mean	SD	Mean	SD
HT	% of time in US (a)	0.43	1.28	1	0	1	1	0.83	0.33	0.15	0.74	0.84	0.79
Remit	% Income remitted	0.18	0.64	0.99	0	0.84	0.48	0.3	0.11	0.23	0.58	0.11	0.74
PC	House Index (b)	-0.3	2.09	1	-1	1	1	0	0	-0.72	1.16	0.33	2.18
SC	% HH in US (c)	0.34	1.31	1	0	1	1	1	0	0.09	0.6	0.71	1.83
HC	English (d)	1.72	4.59	4	0	4	4	3	1	1.03	3.23	2.74	5.88
	Long-term Permit (e)	0.4	1.49	1	0	1	1	1	0	0.2	1.03	0.71	2.11

Notes: Cross-section includes last year of observation of all migrant household heads. Sub-samples are split according to interview location. (a) Values are averaged over 5 year period. (b) Mexican (U.S.) asset ownership is registered as "-1" ("1"); "0" if no asset is owned (see also text). (c) Proportion of non-head household members (spouse and kids) who migrated to U.S. during last three years or were born in US. (d) Index of English knowledge: "Neither speak nor understand" (0), "Do not speak, but understand some" (1), "Do not speak, but understand much" (2), "Speak and understand some" (3), "Speak and understand much." (e) Dummy whether individual has U.S residency or citizenship.

Table 1 presents descriptive statistics on the migration intensity indicators in the cross-section (that is, in the survey year for each migrant). Indicator averages and median values tend to be in the lower ranges of the variables' sample distributions, which indicates that Mexican migrant household heads tend to have a stronger association with Mexico than with the U.S.

Mexican Migration Intensity: Aggregation of Indicators

Since the IMI is intended to succinctly summarize several decisions that indicate a migrant's socio-economic reorientation, the underlying indicators should be correlated. For our sample, we find that

[19] In cases where the household head is single or divorced, or has no children, we take this as an indication of absent U.S. ties.

[20] We also create the following alternative indicators: We construct an index that measures the number of years during which the migrant did *not* return home (in the five-year period surrounding the observation year). We construct an index whether the migrant owns a business and where, in an analogous way as we construct the home ownership index. Furthermore, we construct a dummy whether the migrant's spouse has migrated during the last three years and a continuous variable that measures the proportion of resident minor children that have migrated during the last three years. These variables are not included in our main analysis but their correlations and alternative PCA results are shown in Table B1 and C1, respectively.

mutual correlation coefficients are statistically significant and strong with the expected signs, which are positive except for pairs that include a remittance indicator, where we expect a negative correlation since higher remittances reflect lower migration intensity (see Table 2).

Table 2: Linear Correlation Coefficients of Mexican Migration Intensity Indicators

			HT	Remit	PC	SC	HC	
			Time	Remit	House	Net	Eng	Docu
HT	% of time in U.S.	Time	-	-0.22	**0.61**	**0.63**	**0.55**	**0.57**
Remit	% of Income remitted	Remit	-0.22	-	-0.31	**-0.41**	-0.25	-0.28
PC	House Index	House	**0.61**	-0.31	-	**0.60**	**0.50**	**0.45**
SC	% HH in U.S.	Net	**0.63**	**-0.41**	**0.60**	-	**0.51**	**0.56**
HC	English knowledge	Eng	**0.55**	-0.25	**0.50**	**0.51**	-	**0.52**
	Long-term Permit	Docu	**0.57**	-0.28	**0.45**	**0.56**	**0.52**	-

Notes: Table reports Pearson correlation coefficients. All correlations are statistically significant at the 1% level (H0=no correlation). Coefficients greater than 0.4 are in bold. Except for remittances signing is such that higher values indicate stronger association to U.S.

We apply PCA to this set of indicators as described above. We first construct a cross-sectional IMI, in which we include information from the last year of observation, and then apply PCA to our retrospectively created panel to obtain a person and time-varying IMI (see Table 3). Time-variant information on English knowledge and remittances is not available and both variables are dropped in the panel. Looking at the cross-section and panel PCA results we can see that the first component is general in nature, loading strongly and with expected signs on all indicators. Moreover, the first component summarizes a large share of the indicators' information, 57 and 63 percent of the variation in the cross-section and panel, respectively. In both cases there is a clear drop in explanatory power after the first component.[21] Hence, we can conclude that our indicator variables are strongly correlated, supporting the hypothesis that they all reflect different facades of migration intensity. Given the generality of the first component, its strong explanatory power and the drop thereafter, we conclude that, for Mexican male migrants, migration intensity can be summarized by a unidimensional Index of Migration Intensity. [22]

[21] The second principal component's eigenvalue is 0.86 and 0.75 in the cross-section and panel, respectively; the proportion of variance it explains is 14%and 19%, respectively.

[22] We show in Appendix C that the construction of our index is very robust to changes in the specification, such as using a different set of indicators or a different factoring technique, or switching from the panel to the cross-sectional specification.

Table 3: Mexican Index of Migration Intensity (PCA Results)

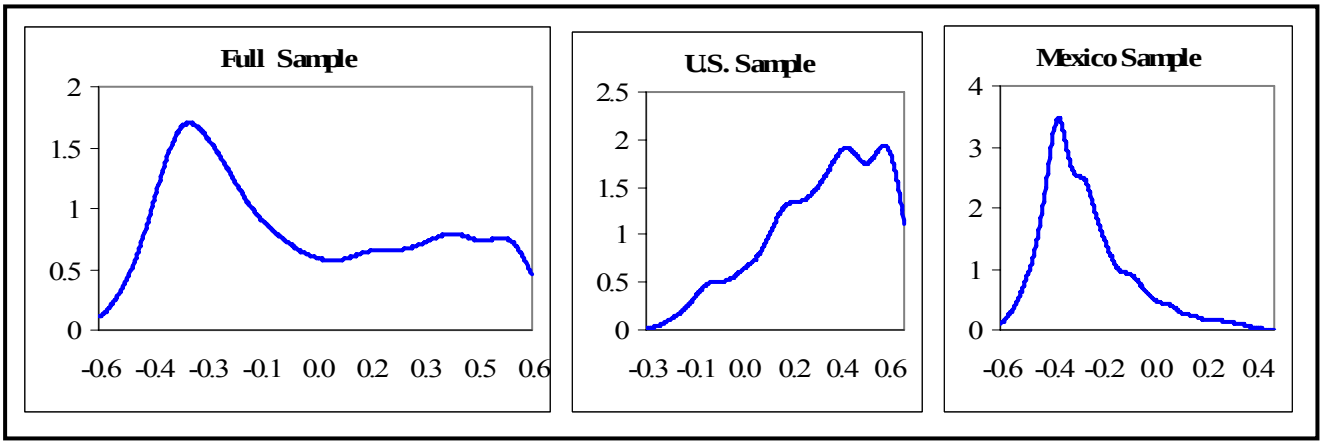
		(I) Cross-Section (n=4,315)						(II) Panel (n=34,575)
		Stand. Eigen-vector	Means in ordered sample (IMI used for ordering)					Stand. Eigen-vector
			1. Quartile	2. Quartile	3. Quartile	4. Quartile	Top 5%	
HT	% of time in US	0.24	0.02	0.07	0.28	0.76	0.86	0.34
Remit	% of Income remitted	-0.14	0.37	0.19	0.20	0.10	0.02	
PC	House Index	0.23	-0.96	-0.75	-0.53	-0.05	0.72	0.24
SC	% HH in US	0.25	0.02	0.05	0.08	0.65	0.97	0.34
HC	Long-term Permit	0.23	0.00	0.03	0.31	0.77	1.00	0.33
	English	0.22	0.22	0.76	1.51	2.69	3.65	
Eigenvalue		3.39						2.50
% of Variance explained		0.57						0.63

Notes: Standardized eigenvectors correspond to first principal components from principal component analysis without rotation. The IMI is the linear combination of all indicator variables (standardized by their mean and variance) weighted by the standardized eigenvector. Information on remittances and English knowledge is not available in panel.

Mexican Migration Intensity and Its Determinants

The cross-sectional IMI of Mexican migrant male household heads ranges between -0.56 and 0.62. A higher value indicates a stronger socio-economic reorientation to the U.S., i.e. a higher level of migration intensity. Figure 1 depicts a Kernel density estimation of the IMI's sample distribution. The peak of the distribution is skewed to the left, indicating that most migrants in the sample are characterized by very low levels of migration intensity. This is not surprising since around one half of the sample is made up of former migrants, who currently reside in Mexico. The IMI's estimated sample distribution has also a fat right tail. Rather than a few distinct migration types, a continuum of migration strategies exists, each associated with a different level of migration intensity.

Figure 1: Sample Distribution of Mexican Index of Migration Intensity (Cross-Section)



Notes: Kernel density estimation of cross-sectional IMI, using a Gaussian Kernel and Silverman's rule of thumb.

To illustrate these findings we reorder our sample according to ascending IMI values and calculate the means of the IMI indicators in each quartile (see Table 3). In the first two quartiles Mexican migrant household heads show little socio-economic reorientation to the U.S. Only in the third quartile does socio-economic reorientation to the U.S. rise noticeably. In the top quartile migrants are more attached to the U.S. than to Mexico: they spend most of their time in the U.S., have moved most of their household members to the U.S., and possess long-term U.S. immigration documentation. Migrants in the top five percent retain almost no socio-economic ties to the origin.

Are cross-sectional differences in migration intensity random, or do they vary systematically depending on individual and community characteristics? Lucas (2006) suggests that more educated migrants are more likely to stay longer abroad, to remit less and to reunify with their family aboard, i.e. they should have a higher level of migration intensity (see also Faini 2005, Amuedo et al. 2005). Massey et al. (1987, p. 286) postulate a "process of settlement" and increased "personal, social and economic ties" as migrants accumulate time abroad, implying that migration intensity should rise over time (see also Cornelius 1992). Other factors such as the costs to uphold home ties or local employment could also influence individuals' level of migration intensity. To test these hypotheses, we regress the cross-sectional IMI on several individual and community factors. Throughout we include time dummies to control for regionally invariant factors, such as changes in the U.S. economy or U.S. immigration policy.

We start by analyzing how individual characteristics affect migration intensity (see the first two regressions in Table 4). But first we note that controlling for community characteristics is important to avoid estimation bias. When we include community dummies in the second regression they are highly significant and the R-square almost doubles compared to the first regression, which excludes community controls. Hence, we prefer regression two for detecting the individual determinants of migration intensity. Consistent with the findings of Lucas and others, we find that education, as measured by years of schooling, increases migration intensity significantly. Migration intensity also varies over time: we find evidence that migrants have a tendency to "get stuck" as their experience abroad grows. There is also a life-cycle aspect: migration intensity is highest when migrants are in their twenties but lowest when they are in their sixties, perhaps because retirees come to value home attachment more highly. Consistently, family networks are a significant and strong determinant of migration intensity. As household size grows (wife and resident children) male household heads tend to reduce their level of migration intensity. On the other hand, family networks in the U.S., as

approximated by the total number of family members among the household head's nuclear or extended family who have ever migrated, tend to increase migration intensity.[23]

Comparative field studies have long noted differences in migration strategies across communities (e.g. Massey & Mines 1986). To investigate the determinants of this variation, we drop our community dummies and instead include several community characteristics. Throughout we include a control for the size of the community of origin, measured in thousands of inhabitants. Larger community size consistently causes a statistically significant but small increase in migration intensity. Local economic prospects should influence whether migrants choose a more permanent migration strategy or favor a migration strategy that incorporates work at home. Furthermore, in regions that offer good investment opportunities, but insufficient credit supply, some individuals might migrate in order to accumulate foreign savings for investments at home, as the New Economics of Labor Migration suggests. Since, such "target earners" are likely to remain attached to the origin, given their intentions to invest at home, this would suggest another reason for a negative correlation between local economic conditions and home detachment. As regression three shows, we find confirmation that improved local opportunities reduce migration intensity: migration intensity is significantly lower if the total number of factories in the municipality increases, if the average rainfall in the state goes up, or if the municipal population earning below twice the minimum wage falls.

Migrants' home attachment can be expected to increase as home-time consumption becomes more pleasant. We have already noted that having family at home lowers migration intensity. Public infrastructure may also make home-time consumption enjoyable. We find that the availability of a clinic and sports fields promote home attachment and lower migration intensity (see regression four). Elevated social capital in the community could also make home-time consumption more attractive. Goldring (1998) argues that a shared culture of return in order to socialize at home is particularly important to male Mexican migrants. We find support for this hypothesis in regression five. In communities in which it is common that migrants return for the community's patron saint's day migration intensity is lower. On the other hand, a high crime rate promotes a higher IMI.

[23] To reduce the danger of endogenous migration networks due to unobserved household level factors that affect both migrant and network members, we only include non-household members in U.S. networks. We also rerun regressions 1-7 without network variables and find that results do not change (signing and significance of parameter estimates).

Table 4: Cross-Sectional Determinants of Migration Intensity

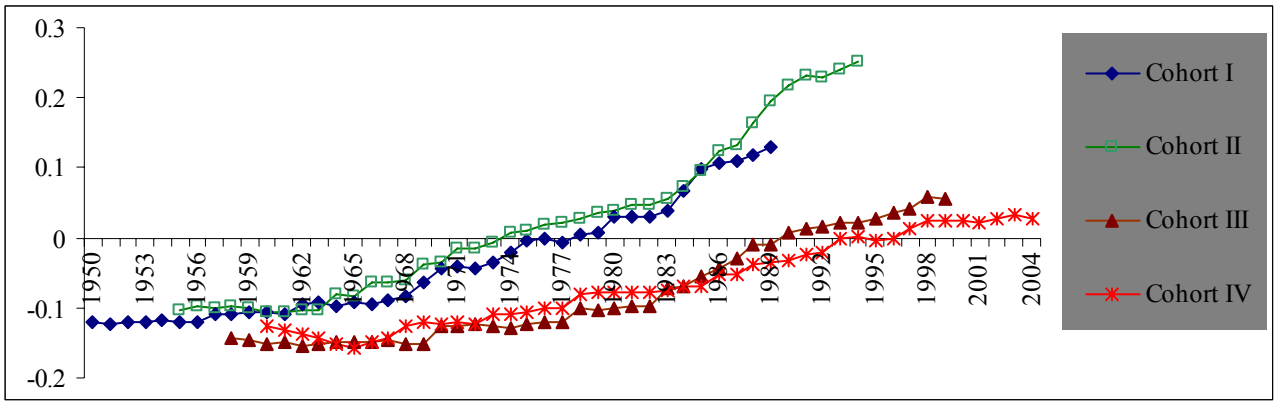
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Individual Characteristics							
Age group: 20ies	0.0270 (0.014)*	0.0306 (0.014)**	0.0243 (0.015)	0.0259 (0.014)*	0.0307 (0.015)**	0.0326 (0.015)**	0.0372 (0.014)**
Age group: 30ies	0.0023 (0.011)	0.0064 (0.011)	-0.0025 (0.011)	0.0024 (0.011)	0.0084 (0.011)	0.0085 (0.011)	0.0091 (0.011)
Age group: 50ies	-0.0576 (0.013)***	-0.0521 (0.013)***	-0.0552 (0.014)***	-0.0570 (0.013)***	-0.0568 (0.014)***	-0.0576 (0.014)***	-0.0569 (0.013)***
Age group: 60ies	-0.1187 (0.017)***	-0.1065 (0.017)***	-0.1148 (0.018)***	-0.1195 (0.017)***	-0.1217 (0.018)***	-0.1222 (0.018)***	-0.1210 (0.017)***
Years of education	0.0119 (0.001)***	0.0101 (0.001)***	0.0119 (0.001)***	0.0112 (0.001)***	0.0115 (0.001)***	0.0114 (0.001)***	0.0101 (0.001)***
Time since first U.S. trip (in years)	0.0041 (0.001)***	0.0037 (0.001)***	0.0041 (0.001)***	0.0042 (0.001)***	0.0042 (0.001)***	0.0042 (0.001)***	0.0039 (0.001)***
Household size	-0.0134 (0.002)***	-0.0147 (0.002)***	-0.0142 (0.002)***	-0.0136 (0.002)***	-0.0129 (0.002)***	-0.0127 (0.002)***	-0.0123 (0.002)***
U.S. networks (nuclear family)	0.0252 (0.002)***	0.0240 (0.002)***	0.0267 (0.002)***	0.0258 (0.002)***	0.0248 (0.002)***	0.0247 (0.002)***	0.0254 (0.002)***
U.S. networks (extended family)	0.0019 (0.000)***	0.0021 (0.000)***	0.0017 (0.000)***	0.0019 (0.000)***	0.0018 (0.000)***	0.0018 (0.000)***	0.0018 (0.000)***
Land owned before 1st U.S.trip (in hectares)	-0.0018 (0.001)	-0.0005 (0.001)	-0.0017 (0.001)	-0.0013 (0.001)	-0.0015 (0.001)	-0.0014 (0.001)	-0.0009 (0.001)
Local Employment							
Factories (per 1000)			-0.0023 (0.001)*				
% below twice minimum wage			0.0877 (0.030)***				
Average rainfall in state			-0.0001 (0.000)***				-0.0001 (0.000)***
Local Infrastructure							
Clinic in community				-0.0349 (0.010)***			-0.0451 (0.010)***
Sport fields in community (per 1000)				-0.0170 (0.003)***			
Plaza in community				0.0109 (0.012)			
Social Capital							
Culture of return					-0.0382 (0.012)***	-0.0326 (0.012)***	-0.0244 (0.012)**
Crimes in municipality (per 1000)					0.0052 (0.003)	0.0066 (0.003)**	
Communication/ Travel							
% with phone in community						0.1105 (0.029)***	0.1405 (0.026)***
Post office in community						0.0402 (0.013)***	
Distance to U.S. border (in 1000 miles)						-0.1155 (0.045)**	
Highway access is paved						0.0197 (0.014)	
Community Population (1000s)			0.0001 (0.000)***	0.0001 (0.000)***	0.0001 (0.000)***	0.0001 (0.000)***	0.0001 (0.000)***
Community dummies	No	Yes	No	No	No	No	No
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3912	3912	3526	3788	3580	3674	3782
F-value	52.39	15.19	46.10	49.82	48.54	46.52	49.88
Adj. R-Squared	0.28	0.31	0.30	0.30	0.30	0.30	0.31

Standard errors are in parentheses. ***significant at 1%; ** significant at 5%; *significant at 10%. For definition of variables see Table B2. All regressions include an intercept and regressions 3-7 include a control for community size.

Regression six tests whether communication facilities and travel costs affect migration intensity. We find that facilities that ease international communication, such as the presence of postal or telephone services in the community, increase migration intensity. This is consistent with the interpretation that communication allows migrants to keep up with friends and family or the state of their belongings, thus reducing the costs to intensive migration. We find that migration intensity falls as travel distance increases, which we approximate by distance from the state capital to the U.S. border, a result inconsistent with the expectation that an increase in travel costs reduces the likelihood that migrants will remain connected to the origin. On the other hand, a dummy for paved highway access carries the expected positive sign, but is not statistically significant at the 10 percent level. Finally, in regression seven we include explanatory variables from each category jointly, retaining those whose estimated coefficients remain statistically significant. This produces no major changes in the estimated parameter coefficients.

We conclude that the Mexican Index of Migration Intensity varies systematically across individuals and communities. We are able to "explain" around 30% percent of this variation. The signs of the effects accord with *a priori* expectations. These results corroborate the concept and measure of the IMI, since if these were flawed we would not have been able to identify and confirm *a priori* expectations about its determinants.

Figure 2: Mexican Migration Intensity over Time (Yearly Average of Panel IMI)



Notes: Panel IMI in which individual-year observations are grouped according to year of *survey* (5 year smoothing averages). Cohort I, II, III and IV were surveyed in 1987-1991, 1992-1996, 1997-2001 and 2002-2005, respectively.

Mexican Migration Intensity: Variation over Time

Figure 2 depicts the panel IMI's yearly progression, when we group communities surveyed at similar points in time (five-year cohorts). At the societal level, migration intensity was initially low and stable, but it rose as time progressed. This is consistent with Massey et al.'s (1987) postulate of rising migration intensity over time but could also be related to a policy change, such as an increase in U.S. border enforcement. Furthermore, Mexican migration intensity grew most strongly around the onset of the Immigration Reform and Control Act (IRCA) in 1986, irrespective of the cohort. Overall the IMI increased by 9.2% of its standard deviation between 1984 and 1990. In other words, the IRCA seems to have spurred Mexican migration intensity. On the one hand, the legalization program in the IRCA generated an opportunity for many Mexicans to opt for a legal, stable U.S.-oriented life (see also Massey et al. 2002). On the other hand, the IRCA marked the start of a much stronger focus on border enforcement, and this may have reduced undocumented migrants' ability to maintain home ties.

6. Summary

A sizable part of the literature on international migration has restricted itself to analyzing the choice of whether or not to migrate, here termed "extensive migration behavior". Yet migrants also choose how strongly to disconnect from their communities of origin. In an attempt to illuminate this dimension of migration behavior, this paper develops the concept of migration intensity, defined as the degree to which a migrant shifts his attachment, association and engagement from his place of origin to the migration destination.

Migration intensity summarizes several complementary choices that reflect socio-economic reorientation, such as remittance behavior, choice of migration strategy, and localized investment behavior. While migration intensity cannot be observed directly, these choices are observable, thus providing the basis for a general procedure for the measurement of migration intensity: starting with a set of indicators for these choices, we can use principal component analysis to create an Index of Migration Intensity (IMI). For the U.S.-Mexican case, this procedure yields a unidimensional index that summarizes migration intensity well. Analyzing the Mexican IMI reveals interesting patterns. First, a continuum of migration intensity exists. Ad hoc typologies of migrant types, such as "emigrants," "target earners," or "circular migrants," oversimplify this continuum. Secondly, the majority of male Mexican migrant household heads are characterized by low levels of migration intensity, but over the last 25 years migration intensity has been growing. Thirdly, cross-sectional variation in Mexican migration intensity accords with *a priori* expectations, corroborating the conceptual soundness of the

IMI. Controlling for community and time effects, we find that education, accumulated migration experience, the absence of family ties at home, and the presence of family networks abroad all are associated with a higher IMI. Migration intensity is highest when migrants are young and lowest when they are old. At the community level greater economic opportunities, more infrastructure or more social capital all reduce migration intensity.

Migration intensity may have important effects on welfare-relevant variables. Low migration intensity may be preferable to sending communities, enhancing migrants' willingness to engage in beneficial transfers, including remittances, and mitigating the resource loss inherent in the human outflow. In the receiving countries, immigrants' level of migration intensity may affect governments' ability to achieve immigration policy goals, such as securing a flexible labor supply or achieving integration of immigrants. This suggests that immigration policies should be evaluated not only by their effect on extensive migration behavior, but also by their effect on intensive migration behavior. For example, it would be interesting to examine further the effects of external border enforcement on migration intensity. Some scholars have suggested that the fortification of the U.S.-Mexican border has transformed cyclical Mexican migration into more permanent migration (Massey et al. 2002, Portes 2006). The IMI provides a measure that could be used to test this hypothesis econometrically.

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8. Appendices

Appendix A: Using Principal Components Analysis (PCA) to Construct the IMI

Suppose for each individual j we observe p indicator variables x_{ij}^* which fully describe j's level of migration intensity. Since the indicators may have different units we standardize them to $x_{ij} = (x_{ij}^* - x_i^*)/s_i^*$, where x_i^* and s_i^* is the mean and the standard deviation across all individuals, respectively. Thus, $X = (X_1, X_2, .., X_n)^T$, where $X_i = (x_{i1}, x_{i2}, .., x_{in})^T$ (i=1,..p) is the full information set on migration intensity. Our goal is to find an r-dimensional Index of Migration Intensity (IMI), $\xi = (\xi_1, \xi_2, .., \xi_r)^T$, that summarizes as much as possible of the information in X, while keeping r low. Obviously we are able to perfectly summarize X by choosing r equal to p and expressing ξ as a "full" linear combination of X_is

$$
\begin{aligned}
\xi_1 &= \pi_{11}X_1 + \pi_{21}X_2 + ... + \pi_{p1}X_p = \Pi_1^T X \\
\xi_2 &= \pi_{12}X_2 + \pi_{22}X_2 + ... + \pi_{p2}X_p = \Pi_2^T X \\
&... \\
\xi_p &= \pi_{1p}X_2 + \pi_{2p}X_2 + ... + \pi_{pp}X_p = \Pi_p^T X,
\end{aligned}
\qquad (1.1)
$$

where

$$
\mathrm{var}(\xi_i) = \Pi_i^T E(XX^T)\Pi_i = \Pi_i^T \Sigma \Pi_i \quad (i=1,2,..p), \qquad (1.2)
$$

and the Πi are vectors of random coefficients, known as component loadings (or "weights") that are assumed to be fixed across individuals (i.e. the πis are scalars). With (1.1) as is, we gain little since we replace p observed indicators with p unobserved components. The idea of PCA then is to choose the πij such that ξ1 represents as much as possible of the information (variance) contained in the indicators (X), ξ2 as much as possible of the remaining information, and so on, such that the latter ξis may be dropped without much loss of information. Technically this comes down to finding the characteristic roots or eigenvalues and the associated eigenvectors of the covariance matrix of the observed indicators (Σ).[24] Eigenvalues and eigenvectors are uniquely determined. Hence, once the eigenvectors are known (the Πi) one just needs to plug them into (1.1) to calculate a unique, likely multi-dimensional, IMI score for each individual. Commonly eigenvectors are standardized before component scores are calculated (after standardization we refer to them as "standardized scoring coefficients).

[24]Formally, the Lagrangean expressions $L_i = \Pi_i^T \Sigma \Pi_i - \lambda_i(\Pi_i^T \Pi_i - 1)$ (i=1,2,..p) are maximized by choosing optimal Π_i. The last part of L_i is a normalization requiring the ξ_i to have unit length. Facilitation of the first-order conditions results in $(\Sigma - \lambda_i I)\Pi_i = 0$, which is solved for the p Eigenvalues (λ_i) and the p associated Eigenvectors (Π_i).

Appendix B: Additional Tables and Figures

Table B1 Linear Correlation Coefficients of MI Indicators (Including Alternative Indicators)

			Mean	SD	HT		Remit		PC		SC			HC		
					1	2	3	4	5	6	7	8	9	10	11	
HT	% of time in US	1	0.43	1.28	-											
	# years **w/o** return	2	0.35	1.22	***0.95***	-										
Remit	% of Income remitted	3	0.18	0.64	-0.22	-0.21	-									
	Remittances (dummy)	4	0.76	1.29	-0.32	-0.31	**0.48**	-								
PC	House Index	5	-0.30	2.09	**0.61**	**0.58**	-0.31	-0.34	-							
	Business Index	6	-0.11	1.42	**0.41**	0.37	-0.17	-0.24	**0.43**	-						
SC	% HH in US	7	0.34	1.31	**0.63**	**0.60**	**-0.41**	**-0.45**	**0.60**	0.38	-					
	Wife in US	8	0.33	1.43	**0.61**	**0.57**	**-0.41**	**-0.46**	**0.56**	0.37	***0.90***	-				
	% res. kids in US	9	0.31	1.32	**0.55**	**0.52**	-0.34	-0.36	**0.53**	0.35	***0.86***	**0.68**	-			
HC	English knowledge	10	1.72	4.59	**0.55**	**0.49**	-0.25	-0.24	**0.50**	0.28	**0.51**	**0.49**	**0.44**	-		
	Long-term Permit	11	0.40	1.49	**0.57**	**0.48**	-0.28	-0.29	**0.45**	0.30	**0.56**	**0.52**	**0.51**	**0.52**	-	

Notes: Table reports Pearson correlation coefficients of cross-section. Coefficients greater than 0.4 (0.8) are in bold (italics).

Table B2: The Determinants of Migration Intensity – Descriptive Statistics

Variable	Description	Mean	Dev	Min	Max
IMI	Index of Migration Intensity	0.01	1.01	-0.55	0.62
Age group: 20ies	Individuals aged 18-29	0.16	1.09	0	1
Age group: 30ies	Individuals aged 30-39	0.31	1.37	0	1
Age group: 40ies	Individuals aged 40-49	0.25	1.28	0	1
Age group: 50ies	Individuals aged 50-59	0.16	1.09	0	1
Age group: 60ies	Individuals aged 60-59	0.12	0.96	0	1
Years of education	Years of education.	6.12	12.38	0	28
Time since first U.S. trip	# years since first trip to U.S.	18.34	36.19	0	64
Household size	# of household members (wife and children)	4.83	8.75	0	19
U.S. networks (nuc. family)	# of siblings and parents who have ever migrated	4.75	10.12	0	12
U.S. networks (ext. family)	# of uncles, aunts, cousins, nephews and siblings-in-law who have ever migrated	15.27	55.7	0	181
Land owned	# of hectares of land owned prior to first U.S. trip	0.33	7.7	0	115
Factories	# of factories in municipality per 1000 inhabitants	1.97	9.98	0	43.83
% below 2x minimum wage	% in municipality that earns less than twice minimum wage	0.33	0.51	0.07	0.96
Average rainfall in state	Average rainfall in state (since 1941)	740.4	738.4	203.7	1518.8
Clinic in community	Dummy if community has a clinic	0.42	1.46	0	1
Sport fields	# of sport fields in community per 1000 inhabitants	0.73	2.44	0	5
Plaza	Dummy if community has a central plaza	0.92	0.81	0	1
Return culture	Dummy if migrants usually return home for the patron saint's day of the community	0.84	1.09	0	1
Crimes	# of crimes in municipality per 1000 inhabitants	1.27	4.57	0	14.36
% phone service	% of households in community with a phone	0.33	0.53	0	0.86
Post office	Dummy if community has a post office	0.86	1.02	0	1
Distance to U.S. border	Air-line distance of state capital to U.S. border (1000 miles)	0.38	0.43	0.01	0.6
Highway access paved	Dummy if street from community to next highway is paved	0.93	0.74	0	1
Community population	# of inhabitants in community (in 1000s)	124.5	816.2	1.0	1650.0

Source: MMP and own calculations based on MMP.

Appendix C: Robustness of the IMI

We test the robustness in the construction of the cross-sectional IMI by comparing PCA results from different specifications. Judged on basis of differences in factor scores, the produced rankings and the factor structure the IMI appears to be very robust. Spearman correlation coefficients of produced rankings fall only once below 0.94, commonly more than 96 percent of the factor scores deviate by less than the standard deviation, and only once does the decomposition result in more than one principal component according to the eigenvalue criterion (see Table B4).

When we compare the specification of the panel IMI, which excludes indicators on remittances and English knowledge, to the cross-sectional specification of the IMI, we find wide-spread accordance. Both PCA results favor the use of only one principal component. The Spearman correlation coefficient of the produced rankings is 0.94 and 96 percent of the observations have a less than one standard deviation difference in factor scores (see specification 1). Replacing the IMI's indicators by alternative indicators does not seem to be a problem (see specification 3). Even if we replace all indicator variables simultaneously the results remain acceptable, as indicated by a Spearman correlation coefficient of 0.87 (see "All"). Since PCA is strictly seen only mathematically exact for continuous variables we replace all dichotomous variables by continuous substitutes or drop the indicator if no substitute is available. We find little difference to the cross-sectional IMI (see specification 2). Changing the factoring technique from principal components factoring to two other common techniques, maximum likelihood ("ML") or principal axis factoring ("PAF"), has virtually no effect (see specification 5). Lastly, even if we enlarge the set of variables to nine, the produced ranking remains very comparable (see specification 4).

Table C1: Robustness of the IMI under Various Specifications

	Panel	Dummy	Replacing Indicators (3)					Large	Factoring (5)	
	(1)	Free (2)	All	HT	Remit	PC	SC	Set (4)	PAF	ML
Spearman correlation coefficient of ranks	0.94	0.96	0.87	0.99	0.97	0.93	0.99	0.97	0.99	0.99
Mean difference in rank	110	52	472	135	276	371	64	240	148	152
% less than SD difference in factor scores	96%	89%	87%	100%	100%	96%	100%	96%	100%	100%
% less than 0.2* SD difference in rank	89%	95%	80%	99%	94%	97%	99%	99%	100%	99%
Difff. in variance explained (1. component)	-0.12	0.00	0.04	0.01	-0.01	0.04	0.01	0.05	N/A	N/A
Number of components (EV>1 criterion)	1	1	1	1	1	1	1	2	1	1
Number of indicators	4	5	7	6	6	6	7	9	6	6
Sample size	4324	1601	4324	4324	4324	4324	4324	4322	4324	4324

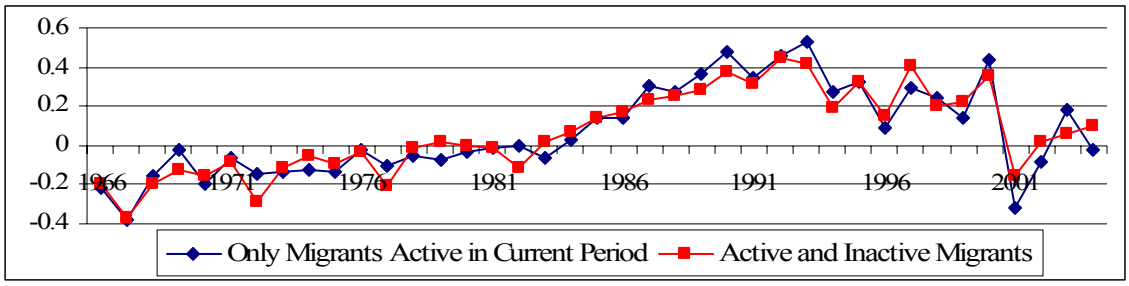
Notes: For each column a separate factor analysis was carried out (PCA for 1-4) and factors scores were computed. The sample was then ordered according to factor scores and compared to the factor scores and ranking of the cross-sectional IMI (see Table 3). (1) Only indicators from panel PCA used. (2) All non-interval indicators replaced by continuous substitutes or dropped. (3) Use of alternative indicators. For example, in "PC" house index was replaced by business index (see Table B3). "All" refers to a simultaneous replacement of all indicators. (4) All indicators of Table B3 used together (except 4 and 7) (5) Different factoring techniques used ("ML"=Maximum Likelihood, "PAF" = Principal Axis Factoring).

There is a potential danger that the IMI could be dominated by changes in extensive migration behavior rather than intensive migration behavior. For example, individuals may enter and exit the migration flow without that our panel adjusts for these changes.[25]. The question is if these variations in extensive migration behavior affect our IMI. Figure B1 depicts the standard Panel IMI against an alternative panel version, in which only active migrants are included, meaning only individual-year observations of migrants who reside in the U.S. in the current period. Despite the considerable differences in the two panels, both indexes progress almost identical over time (the Pearson correlation coefficient is 0.94). Since the active-migrant panel is by construction immune to compositional changes

[25] Irrespective of when an individual migrates for the first time, we use his full life-time history in the standard panel.

in extensive migration behavior, we conclude that our Panel IMI appears to be robust to changes in extensive migration behavior.

Figure C1: Robustness of the IMI to Changes in Extensive Migration Behavior



Notes: Figure shows yearly average of IMI using two different panels (see text for definition).

Robustness over Time

In the MMP the migrants and communities that are sampled change over time. Hence, sample selection could conceivably affect the panel IMI. In order to evaluate this danger we construct different sub-panels of our panel and perform independent PCA to compare the results (see Table A7). First, we group individual-year observations into four cohorts according to when a community way surveyed (see section I). We find that the standardized eigenvectors (i.e. the "weights") change only little across cohorts. Secondly, we group individual year-observations by decade (see section II). We find that the overall weight structure remains the same over time, but that some weights differ, notably the "weight" of the house index gains over time.[26] To be better able to judge this change we try to see what would happen if the intensive migration behavior of a migrant from the new millennium would be observed in the 1980ies or 1960es: we compare the factor scores and ranking of the 2000s sample when weighting with the "correct" weights (the 2000s weights) with the factor scores and ranking when weighting the 2000s sample with weights from a different decade (see section III). We find almost no difference.

Table C2 Robustness of the Panel IMI: Comparison of PCA Results Using Different Panels

		(I) Different Survey Years				(II) Different Observation Years				
		Cohort I	Cohort II	Cohort III	Cohort IV	1960ies	1970ies	1980ies	1990ies	2000s
Standardized Eigenvectors ("weights")	% time in U.S.	0.39	0.40	0.43	0.40	0.45	0.42	0.39	0.36	0.36
	House Index	0.18	0.17	0.16	0.14	0.10	0.16	0.23	0.26	0.30
	% HH in U.S.	0.38	0.38	0.39	0.41	0.37	0.40	0.37	0.35	0.39
	LT-Permit	0.37	0.37	0.40	0.39	0.44	0.39	0.35	0.33	0.32
Eigenvalue		2.16	2.13	1.91	2.03	1.82	1.96	2.17	2.33	2.13
% of variance explained		0.54	0.53	0.48	0.51	0.46	0.49	0.54	0.58	0.53
Survey year		1987-91	1992-96	1997-2001	2002-05			various		
Observation years		<1991	<1996	<2001	<2006	1960-69	1970-79	1980-89	1990-99	2000-05
Communitites (MMP-No.)		1-19	25-50, 52	51-53-89	90-114			various		
Sample Size		10971	10297	8924	5008	1292	1921	2463	2485	380

(III) Different Weighting of the 2000s Sample: 2000s-Weights *versus* Weights from	1960ies	1980ies
Spearman correlation coefficient of ranks	0.98	1.00
% with less than 10% difference in ranks	87.00%	100%

Notes: Results of principal component analyses of different sub-panels. Upper half shows standardized eigenvectors of first principal components ("weights"). (I) MMP panel is subdivided into cohorts 1-4 according to survey. (II) Only individual-year observations from given decades are included. (III) IMI scores of 2000s sample when using 2000s weights are compared to IMI scores of 2000s sample when using weights from 1960ies and 1980ies, respectively.

[26] Home ownership has grown over time. This implies that the variation in the house index has increased and could explain why recent decompositions load stronger on the house index.