MOBILITY INFORMAL TO FORMAL SECTOR IN MEXICO 2002-2006:
THE EFFECT OF REMITTANCES

A Thesis
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Georgetown Public Policy Institute
of Georgetown University
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By

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Abstract. In this paper, I analyze the effect of receiving remittances on the decision to work in the formal sector. The hypothesis is this variable increase the income of individuals, allowing to them to work in the formal sector and receiving the benefits of social security. In order to measure such effect, I use a panel database of Mexican individuals with observations in 2002 and 2006. I run a cross-sectional probit model which includes a dummy variable for receiving remittances in order to estimate the probability to work in the formal sector in 2006 conditional to individuals who worked in the i) informal sector and those in the ii) formal sector, both in 2002. After controlling for other variables, I found that that receiving remittances has a positive effect on the decision to switch to the formal sector, and it is significative for individuals who worked in the formal sector in 2002.
I would like to thank my advisor, Tobias Pfutze, for his advice and insight, and would like to thank all others who assisted me in this project.
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Chapter 1. Introduction

Latin American countries have been exposed to trade openness and economic crisis due to both external and internal factors over the last two decades. Among the results of such phenomenon, there are the increase of the informal sector in these countries and the migration to America.

In Mexico, there has been a growth in remittances during the last decade, especially since 1994, when one of the economic crises pushed poor individuals to migrate to America. After that period, remittances constituted an important change in the local economies of Mexican towns, and more important, remittances have increased the number of goods and services that families can afford.

Additionally, individuals in the Mexican labor market switched between formal to informal sectors or even to unemployment. Even, there is the case in which workers decided to move permanently to the informal sector, where they found additional benefits and more flexibility than in the formal one. However, the lack of social security (health care services and pension) was not among those benefits.

The Mexican government has introduced social programs aimed to alleviate poverty, increase the human capital, and developing a micro-firms sector to create jobs in the country. However, these programs create incentives among informal workers to stay in that sector because they can receive benefits comparable to those in the formal sector. For example, Oportunidades aimed to developing the human capital of poorest families, providing education, health and nutritional services, and in-cash transfer to the poorest families in Mexico. Also, the Popular Health Care system, or Seguro Popular de Salud,
provides health care services to the population not covered through mandatory social security.

Most of the previous literature on migration and remittances has focused on the positive effect on household welfare (education, child and female labor, consumption, health), as well as other benefits in local economies. In this paper, I try to address the effect of migration and receiving remittances in the decision to work in the formal sector in Mexico between 2002 and 2006 but the main purpose of this document is to measure the effect of receiving remittances. The hypothesis is that receiving remittances has a positive effect on the decision to switch to the formal sector. The results are conclusive: for those who previously worked in the formal sector workers receiving remittances has a positive and significative effect.

This document is structured as follows: the next part includes the background section and importance of remittances, migration and informal sector in Mexico. Then, Section 3 presents the literature review. In Section 4 describes the model, hypothesis, data and methodology. Afterward, Section 5 shows the results of the econometrical analysis. The last section accounts for conclusions.
Chapter 2. Background

Immigration is one the effects of the geographical position of Mexico with respect to America. Since the beginning of the last century, illegal and legal immigration flowed to America. Families in Mexico get the benefits of receiving remittances from relatives abroad, this additional income is basically spent on regular consumption, saving and/or investment in durable goods.

In 1990, the remittances became an important component not only for household income but for the Mexican economy. However, it is plausible to assume that remittances have been part of the Mexican economy over the past century. Studies document the amount of remittances in the beginning of the last century (Conapo, 1999). Lozano (1992) estimates remittances of about $4.9 million between 1920 and 1928. Durand and Arias (1997) calculate it as $63, $120, $163 and $275 million for 1942-1945, 1956, 1959, and 1961, respectively. For 1975, the most conservative study (Diez-Canedo, 1984) suggests an amount of $317.6 million, whereas the most conservative $2 billion for the same year. The estimate of Durand and Arias (1997) is $1.5 billion for 1976. For the 1980s, the estimates are $1.5 billion in 1984 (García and Giner 1985), and $2.3 billion in both 1985 and 1989 (Cornelius, 1978, Durand et al., 1996). For the decade of 1990 and onwards, the Mexican Central Bank (Banxico) publishes reliable information based on its own methodology.
As can be seen in the graph above, the remittances started to increase considerably in 1995. In fact, the Conapo, Mexican Institute for Population, (1999), mentions it is in 1996 when Mexico was the world's leading receiver of remittances. Later, by 1994, the remittances represented 35% of the Foreign Direct Investment in Mexico, and this share increased abruptly to 96% in 2007.

Remittances have become a motor for state economies because they increase the consumption of goods and services that families can afford. In fact, the remittances constitute a significant share in the state's GDP. Table 2.1 shows the remittances per state as percentage of GDP. For example, Michoacan is the leading state receiver, and remittances constituted 9% of the GDP in 1995, and around 15% between 2003 and 2006. Also in 1995, remittances for Zacatecas and Guerrero account for 4.78% and 4.46% of the states' GDP, respectively. For other states like Michoacán, Zacatecas, Guerrero and
Oaxaca remittances represent more than 10% in 2006. Of course, it is not surprising that the poorest states lead among the states receiving remittances, reflecting the fact they are also the states with higher emigration rates.

Table 2.1
Remittances as a Percentage of GPD, by State and Year

<table>
<thead>
<tr>
<th>State</th>
<th>1995</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aguascalientes</td>
<td>3.69</td>
<td>3.38</td>
<td>3.94</td>
<td>3.66</td>
<td>3.76</td>
</tr>
<tr>
<td>Baja California</td>
<td>0.35</td>
<td>0.70</td>
<td>0.74</td>
<td>1.07</td>
<td>1.14</td>
</tr>
<tr>
<td>Baja California Sur</td>
<td>0.29</td>
<td>0.53</td>
<td>0.46</td>
<td>0.59</td>
<td>0.62</td>
</tr>
<tr>
<td>Campeche</td>
<td>0.09</td>
<td>0.52</td>
<td>0.49</td>
<td>0.60</td>
<td>0.71</td>
</tr>
<tr>
<td>Chiapas</td>
<td>0.39</td>
<td>3.73</td>
<td>4.74</td>
<td>6.03</td>
<td>6.76</td>
</tr>
<tr>
<td>Chihuahua</td>
<td>0.55</td>
<td>0.78</td>
<td>0.87</td>
<td>1.17</td>
<td>1.29</td>
</tr>
<tr>
<td>Coahuila</td>
<td>0.72</td>
<td>0.68</td>
<td>0.82</td>
<td>1.07</td>
<td>1.10</td>
</tr>
<tr>
<td>Colima</td>
<td>1.49</td>
<td>3.43</td>
<td>4.17</td>
<td>4.49</td>
<td>4.44</td>
</tr>
<tr>
<td>Distrito Federal</td>
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<td>0.62</td>
<td>0.69</td>
<td>0.91</td>
<td>0.96</td>
</tr>
<tr>
<td>Durango</td>
<td>2.08</td>
<td>2.96</td>
<td>3.54</td>
<td>3.93</td>
<td>3.95</td>
</tr>
<tr>
<td>Estado de México</td>
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<td>1.87</td>
<td>2.33</td>
<td>2.58</td>
<td>2.73</td>
</tr>
<tr>
<td>Guanajuato</td>
<td>3.97</td>
<td>6.02</td>
<td>6.98</td>
<td>7.41</td>
<td>8.06</td>
</tr>
<tr>
<td>Guerrero</td>
<td>4.46</td>
<td>7.06</td>
<td>7.92</td>
<td>8.70</td>
<td>10.06</td>
</tr>
<tr>
<td>Hidalgo</td>
<td>1.90</td>
<td>6.72</td>
<td>7.45</td>
<td>7.71</td>
<td>8.58</td>
</tr>
<tr>
<td>Jalisco</td>
<td>2.64</td>
<td>3.71</td>
<td>3.78</td>
<td>3.92</td>
<td>4.20</td>
</tr>
<tr>
<td>Michoacán</td>
<td>9.00</td>
<td>13.75</td>
<td>16.44</td>
<td>16.59</td>
<td>15.12</td>
</tr>
<tr>
<td>Morelos</td>
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<td>4.13</td>
<td>4.62</td>
<td>4.99</td>
<td>5.53</td>
</tr>
<tr>
<td>Nayarit</td>
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<td>6.62</td>
<td>7.28</td>
<td>7.84</td>
<td>7.89</td>
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<tr>
<td>Nuevo León</td>
<td>0.20</td>
<td>0.43</td>
<td>0.64</td>
<td>0.55</td>
<td>0.61</td>
</tr>
<tr>
<td>Oaxaca</td>
<td>3.49</td>
<td>7.28</td>
<td>8.44</td>
<td>8.98</td>
<td>10.31</td>
</tr>
<tr>
<td>Puebla</td>
<td>1.89</td>
<td>3.56</td>
<td>4.17</td>
<td>4.37</td>
<td>4.97</td>
</tr>
<tr>
<td>Querétaro</td>
<td>1.56</td>
<td>2.65</td>
<td>3.11</td>
<td>3.17</td>
<td>3.33</td>
</tr>
<tr>
<td>Quintana Roo</td>
<td>0.09</td>
<td>0.55</td>
<td>0.65</td>
<td>0.76</td>
<td>0.83</td>
</tr>
<tr>
<td>San Luis Potosí</td>
<td>2.36</td>
<td>3.41</td>
<td>3.56</td>
<td>3.91</td>
<td>4.36</td>
</tr>
<tr>
<td>Sinaloa</td>
<td>1.88</td>
<td>2.65</td>
<td>2.86</td>
<td>3.32</td>
<td>3.43</td>
</tr>
<tr>
<td>Sonora</td>
<td>0.34</td>
<td>0.81</td>
<td>1.00</td>
<td>1.61</td>
<td>1.56</td>
</tr>
<tr>
<td>Tabasco</td>
<td>0.13</td>
<td>1.05</td>
<td>1.22</td>
<td>1.69</td>
<td>1.82</td>
</tr>
<tr>
<td>Tamaulipas</td>
<td>0.55</td>
<td>1.10</td>
<td>1.24</td>
<td>1.78</td>
<td>1.96</td>
</tr>
<tr>
<td>Tlaxcala</td>
<td>1.91</td>
<td>4.33</td>
<td>4.91</td>
<td>5.77</td>
<td>6.55</td>
</tr>
<tr>
<td>Veracruz</td>
<td>0.56</td>
<td>3.43</td>
<td>3.73</td>
<td>4.07</td>
<td>4.49</td>
</tr>
<tr>
<td>Yucatán</td>
<td>0.33</td>
<td>0.66</td>
<td>0.77</td>
<td>0.86</td>
<td>1.07</td>
</tr>
<tr>
<td>Zacatecas</td>
<td>4.78</td>
<td>8.12</td>
<td>9.08</td>
<td>9.63</td>
<td>10.48</td>
</tr>
</tbody>
</table>

Source: Banco de Mexico, Indicadores Economicos – Balanza de Pagos, Conapo 2008 and INEGI, Banco de Informacion Economica.

Talking about the informal sector, there is not a common definition. However, informality has been seen as a bad outcome of the labor markets: “unprotected workers, excessive regulation, low productivity, unfair competition, evasion of the rule of law, underpayment or nonpayment of taxes, and work underground or in the shadows” (World
Bank, 2007). In this study, informality denotes the lack of mandatory social security through a job. For the purposes of this research, the definition of informality is those who don’t have access to health care through mandatory social security, i.e., through social security provided through their jobs.

General speaking, between 1980 and 2000, the informal sector in Latin American and Caribbean countries expanded. This expansion is not only observed in the Americas but also in other developing countries (World Bank, 2007). In Mexico, its growth has likely been the result of labor market rigidities, trade openness, and several periods of economic crisis, among others (Heckman and Pages, 2004).

The growth of the informal sector merits an investigation not only because of its effects on labor outcomes markets, but more important because of the negative effects on social well-being, access to health care and pensions. Universal health coverage is not the main characteristic in Latin America and the Caribbean (with the exception of Cuba) and these countries are facing an aging process, i.e., a higher percentage of their population will be in retirement age.

In Mexico regular health coverage is associated with employment in the formal sector, where employees and employers are subject to payroll taxes. The government has been challenged by existence of an informal sector where individuals may establish labor relations without provision of health care. As a consequence, social programs were created to provide health services to the population out of the formal labor force. For example, the Popular Health System or Seguro Popular de Salud was established to provide health care services to those who don’t have access through mandatory social security.
The estimations of the size of the informal sector vary across authors and years for Mexico, although the sector has been increasing over the years. For example, in 2002, the numbers vary between 41.8 and 47.8% (Gasparini and Tornarolli, 2006; ILO, 2006). The World Bank (2007) (based on several authors) estimates the informality as 29%, 57%, 50%, 30%, 73%, and 30%, as a percentage of sales not reported, (illegal) labor force, informal labor force based on productivity, self-employed, lack of pensions and shadow economy, respectively.

Table 2.2
Total Population Covered Mandatory Social Security (Percentage)

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>55.83</td>
</tr>
<tr>
<td>1995</td>
<td>47.50</td>
</tr>
<tr>
<td>2000</td>
<td>55.31</td>
</tr>
<tr>
<td>2001</td>
<td>54.41</td>
</tr>
<tr>
<td>2002</td>
<td>54.43</td>
</tr>
<tr>
<td>2003</td>
<td>52.16</td>
</tr>
<tr>
<td>2004</td>
<td>53.26</td>
</tr>
<tr>
<td>2005</td>
<td>54.43</td>
</tr>
<tr>
<td>2006</td>
<td>56.21</td>
</tr>
<tr>
<td>2007</td>
<td>57.85</td>
</tr>
<tr>
<td>2008</td>
<td>58.06</td>
</tr>
</tbody>
</table>

Source: INEGI, own calculations.

Table 2.2 presents the population covered by mandatory social security as a percentage of the total population. As can be inferred from the table, since 1990, around 45% of the population lacks social security. Even worse, in 1995, more than half of the population lacked social security, reflecting the economic crisis suffered in Mexico between 1995 and 1997.

Half of the Mexican population lacked of mandatory social security since the last 12 years old. That was the main reason to establish the Seguro Popular de Salud (Frenk, 2004, Torres 2002): to provide health care service to that half who didn’t access to such services, mainly targeted to those self-employees, informal workers, and those out of the labor force.
Policy markers should concern about the incentives a program like that can create on workers of the informal sector, and not on the lack of health services. If they already have access to the benefits they may get in the formal sector, there is not reason why they should switch to a sector where they would face more constraints and taxes.
Chapter 3. Literature Review

In the first part of this document, the importance of remittances in household incomes and local economies was briefly introduced, as was the informal sector in Mexico. This paper tries to establish the link between remittances to the rise of informal work among those members receiving support from their families abroad or who migrated to America during the period of study.

Informality can be defined as the sector of the economy of “unprotected workers, excessive regulation, low productivity, unfair competition, evasion of the rule of law, underpayment or nonpayment of taxes, and work underground or in the shadows” (World Bank, 2007).

Usually, the informal sector has been analyzed within a framework of labor market segmentation (Harris and Todaro, 1970), a mean to escape from regulations (Heckman and Pages, 2004) or an alternative way of doing business (Soto, 2000). In the first case, workers decide to stay in the formal sector due to the benefits they receive; in the second, there are no barriers to mobility within sectors, but informality is seen as way to escape from regulations and avoiding costs; in the last example, obsolete regulations constitute a barrier to small firms and prevent them from crossing the line between the informal and formal sectors.

How do people choose an informal or formal job? Individuals make a cost-benefit analysis of the outcomes associated with formality and the governmental enforcement to push them into the formal sector. For example, given a set of rigid regulations and high-cost transactions, a small firm without any chance to grow would stay in the informal sector. Unskilled, lower wage workers can have access to social protection through social
(governmental), non-contributory programs or private means that allow them to get benefits while enjoying the flexibility offered in the informal sector. In other words, individuals can get health services through social protection programs without paying taxes to get the regular security benefits in the formal sector.

The view of labor market segmentation doesn’t apply to Mexico: informal workers are not waiting or queuing to get a formal job (World Bank, 2007). This means that people opt out of the formal sector; the informality is not the result of exclusion but the outcome of cost-benefit analysis. In other words, this implies individuals are rational, given the set of endowments (education, experience and skills) they prefer the benefits associated with the informal sector over those they would receive in the formal sector.

Levy (2008) proposes exactly that hypothesis: workers decide in which sector to work on the basis of the benefits they receive in either sector. Additionally, the existence of governmental programs has an effect on the labor market and on the decision to enroll in a formal job. In deed, such effect may be negative.

Reviewing the studies that focus in the impact of remittances on poverty, inequality and welfare, there is not one related to labor market decision, except those in reduction of labor hours for female and (higher school enrollment) children (Acosta, 2006, and Chami, 2008).

On the one hand, the evidence suggesting a positive effect in reducing income inequality in net sender countries is mixed. Koechli and Leon (2006, 2007) found evidence suggesting a negative effect of remittances on income inequality in countries receiving remittances. This effect occurs in part because migrants are not necessarily the poorest people in town. Then, because they are sending money, received remittances
increase the inequality between their families and the poorest members of the community. However, Acosta (2007) found a reduction in income inequality due to the effect of remittances. And the World Bank (2006) also recognizes that remittances have a modest effect on income inequality reduction.

Considering other indicators such as poverty reduction, improvements health indicators and school attendance, the evidence suggests a positive effect. For Mexico, evidence confirms a reduction in poverty and better indicators in schooling and health (Lopez, 2004).

Remittances may have a positive effect in the development of local economies. For example, “Hometown Associations” have been established in some Latin American countries in order to coordinate efforts among sender and receiver members of the community and subsequently support their community. Orozco (2002) mentions the use of remittances on charity, infrastructure, human development, investment and others activities to improve the quality of live in origin communities, as well as in the new communities.

Brambila (2008) developed a model in which remittances coexist in a mixed informal and formal economy like Mexico's. His model shows that even when remittances drain the aggregate labor force, especially in the informal sector, the overall remittances effect on economic growth in Mexico is positive. But he doesn’t discuss the final effect on the labor markets and especially doesn’t mention whether the informal sector will reduce with the presence of remittances.

*What is the effect of receiving remittances on the decision to work in the informal or formal sector?* First, individuals who migrated to America and came back to Mexico
have greater skills than those who didn’t. This assumptions sounds reasonable because migrants are not necessarily the individuals with the lowest skills neither the less educated. Moreover, those who migrated to America to get a job (illegal or legal) also got on-the-job training and/or increased the skills they already had. Second, individuals have the option to send remittances to their families in Mexico, and families can increase in the number of good they can afford.

Formally speaking, individuals who receive remittances have greater endowments than their matches who do not receive any of them. In the informal sector workers can find flexibility (like independency, and free schedule) that would allow them to move across industry sector, migrate to other region of Mexico, or –inclusive- migrate one more time to America. I consider remittances may have positive effect on the decision to work in the formal sector because individuals take the decision in the basis of benefits associated with each sector. In the formal sector they have access to the social security benefits while in the informal one access to social program benefits. One can assume the benefits from the formal sector are greater than those in the informal, but this may not be necessarily true for all cases.

Levy (2008) points out individuals can not take into account all the benefits in the formal sector, like pension benefits not available in the informal sector. Also, if individuals don not have access to formal sector benefits they do not consider such benefits more valuable than informal sector benefits. So, it turns to be the case in which either benefits or wage in the informal sector benefits are greater than those in the formal one. In this case remittances compensate the benefits they would get under the informal sector with the services they can afford with the additional income.
Chapter 4. Model, Data and Methods

4.1 Model

In this section, I employ the framework developed by Levy (2008) but modified in order to include the effect of remittances. In his book “Good intentions, bad outcomes,” he develops a Labor Market equilibrium in which formal and informal workers co-exist with the presence of social security (for those in the formal sector) benefits and with social protection (for those in the informal sector) programs.

Levy constructs a framework for both labor market with informal-formal sector in the presence of: i) without social programs, and ii) with social programs with both full valuation of these benefits and with incomplete valuation of them. This document will only focus in the case of labor market with social programs with incomplete valuation of social benefits.

Individuals are rational and maximize utility derived from receiving social security benefits in the formal sector or the social protection benefits from the informal one. Workers in both groups make a decision on the basis of preferences and constraints, including human capital (education, experience and migration) they have. Later, they maximize utility, which is function of wages plus the value of the social benefits associated with each sector. Additionally, they also take into account receiving other sources of income, like family income (remittances) or social protection from a family member support and receiving a cash transfer or in-kind benefits from social programs.

Second, the firms also maximize profits by choosing the level of output and employment according to their goals. It is assumed the capital stocks are given, and at
least in the formal sector, by obvious reasons, both firms and workers comply with labor regulations.

Finally, jointly firms and workers decide to engage in a labor relationship such that the level of outcome and employees in each sector is determined: How many people are going to be employed in the formal sector and how many will go to the informal one. As a consequence, the distribution of the labor force described above reflects how many people will be covered by social security and the rest by social protection programs.

The hypothesis I am interesting to address is: remittances have a positive effect on the decision to switch to the formal sector. Workers maximize a utility function on the basis of their preferences and constraint, the benefits associated to each sector and additional income transfers as remittances. The additional income of remittances can be used to close the gap between the formal - informal wage. First, individuals may value informal sector benefits over formals sector benefits, receiving remittances helps to reduce between the total benefits (wages + social benefits) they may receive in either sector. Second, if the labor income in the informal sector is greater than the received in the formal sector, also remittances may reduce the difference in wages. Thus, as long as remittances compensate the difference in utility individuals receive in either sector, it is expected those in the informal sector will move the formal one; especially because social security benefits are greater than social program ones.

In the model of Levy (2008), originally the allocation of formal and informal workers is efficient. This is a result of workers moving across sectors until wages are equalized, and there are not more incentives to moving to the other sector. However,
when social security and social programs are introduced individuals evaluate the benefits associated with each sector, i.e., the utility derived from wages, remittances and benefits.

Workers face scenarios and make decisions. In the formal sector, they receive benefits equal to a wage plus benefits from social security or social programs according to sector they work. It is also important to having in mind that wage, among other variables, is a function of education and experience, and it is there where migration and remittances show up. And remittances constitute an additional source of non-labor income for individuals. In the formal sector they receive $W_f(\text{migration}) + \text{Remittances} + B_fT_f$, where $B$ is the valuation the workers have to the benefits and $T$ is the benefit transfers they receive. While in the informal sector, they can receive $W_I(\text{migration}) + \text{Remittances} + B_IT_I$. The subscript denotes the formal or informal sector. Then, individuals take that into the utility function and decide where they fit best given their preferences and constraints. Basically, individuals compare:

$$U(W_f(\text{migration}) + \text{Remittances}) + B_fT_f \text{ vs. } U(W_I(\text{migration}) + \text{Remittances}) + B_IT_I$$

Assuming individuals perceive $B_fT_f < B_IT_I$, they will prefer the formal sector as long as the income from remittances compensate the difference in wage they would receive in the formal sector. In other words, remittances income has to be enough to close the difference between those two utility. If we consider $B_fT_f \geq B_IT_I$ and $W_f \leq W_I$, as it is the case in this document (See section 5.1), the remittances not only compensate for difference in social benefits but the difference in utilities derived from wages in both sectors.

It is worth to comment there are regions in Mexico where the social security benefits (in the formal sector) are perceived as zero by workers because they don’t have
access to them. Thus, in these regions social protection programs play an important role in the welfare of the community, and it is reasonable these individuals value more the social program benefits over the social security ones, i.e., $B_{T_s} < B_{T_I}$.

### 4.2 Data

The data used in this study correspond to a household panel database from Mexico, which includes two periods: 2002 and 2006. The Mexican Family Life Survey (MxFLS)\(^1\) has the advantage of being the first Mexican survey with national representation considering a longitudinal design. More important, the fact that it is a panel database allows observation of household members regardless of immigration decision. It also includes expenditure and household income decisions, as well as other indicators of education, health and other household decisions.

In the MxFLS, the households are the main unit but information is also collected at the individual level. For 2002, the database includes 8,440 households in 150 communities in Mexico; around 35,000 individual interviews were conducted. The selection of the households derives from a national, urban-rural and regional criterion according to the National Development Plan 2000-2006 in order to have a representative survey. The second phase of the panel was carried out during 2005 and 2006, and according to the official information, 90% of the households interviewed in 2002 were re-interviewed in the second phase. For convenience, the second phase will be referred to as 2006 only.

The longitudinal approach of the survey has three important advantages: i) it allows following each individual regardless their place of living, ii) it follows the

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\(^{1}\) For further information and database downloadable online, visit [http://www.ennvih-mxfls.org/](http://www.ennvih-mxfls.org/)
movement and aging process of the persons, and iii) it captures the effect of social programs benefits received by households.

According to the manual, each household member is interviewed, and for those not presented at the moment of the interview (either because they are busy or not living there), other members of the family answer the questions for that person. This is an important feature because we can later observe if that member was interviewed in 2006. Besides, we can observe the profile of such member.

One limitation of the database is related to the structure of the questions used in this study. This study uses three set of questions to determine whether the individual receives remittances: i) he receives money from his parents and they live in America; ii) he receives money from a family member who doesn’t live at home; iii) he has a family member who lives in America. The first constitutes clear evidence that the individual receives remittances, whereas two and three constitute a proxy whether he receives remittances from a family member who lives in America.

1. Target population

- People in the two rounds of the survey
- People aged 15 years and above
- People reported as working at the moment of the interview, non-agricultural/agricultural worker or employee

2. Excludes

- Farmer on your own plot
- Family worker in a household-owned business, without remuneration
- Boss, employer, or business proprietor
• Self-employed worker (with or without non-remunerated worker)
• Employee without remuneration from a business or company that is not owned by the household

3. Variables

3.1 Dummy variables
• Formal, working in the formal sector
• Migration to America to get a job between 2002 and 2006, or if the individual migrated before 2002
• Remittances, receiving remittances
• Social programs, receiving cash transfers from any social program
• It includes whether an individual receives income transfer from oportunidades, alianza para el campo or procamo, Fondo PYMEX, coinversion social, fonaes.
• Marital Status, if the individual is married
• Female, if the individual is a woman
• Female Head of household, if the individual is female and household head, 0 otherwise

3.2 Discrete variables
• Education, years of schooling
• Education2, square of education
• Age, number of years
• Age2, square of age as defined above
• Monthly family income of household members, expressed in constant pesos
• Amount of remittances received during the previous year monthly income, received individual, expressed in constant pesos

• Change in remittances, change in the monthly amount of remittances received in 2006 compared to 2002, expressed in constant pesos

4.3 Analysis Plan

First, it is important to remark on the objective of this study: to measure the impact of receiving remittances on the decision to work in the formal sector for individuals who reported living and working in Mexico during both 2002 and 2006, migrated to America, and between 15 and 65 years old, who work as an employee or non-agricultural worker. Then, we will focus in the mobility between the formal and informal sectors in Mexico due to the presence of remittances, receiving cash transfers through social programs, and emigration to the United States. The first two variables affect the decision of what sector to work in because it increases the income of individual, as well as providing some benefits associated to the regular formal sector. For example, receiving health care services. The second—immigration—variable is viewed as an increment in the human capital and labor experience for individuals.

There are two cases we are interested in. First, there are households receiving money from a family remember who lives abroad, specifically in America. Second, there is another group of people who worked in America but came back before the moment they were interviewed: They migrated to America between 2002 and 2006 or migrated before 2002. In this second group, one could expected that those migrants possess more assets than their peers in Mexico in terms of human capital (they have more experience and greater skill after migration to America) or personal savings (they saved money while
working in America and came back with those savings). At this moment, a unilateral movement cannot be suggested neither from the informal to formal sectors nor the opposite.

The econometrical analysis will be carried out through a probit model. The *cross-section probit model* will be used with observations of 2006 individuals who worked in the informal sector in 2002, controlling for observable variables in 2006. Torres (2002) and Torres and Knaul (2003) analyze the determinants that affect the decision to incur catastrophic medical expenditures (Murray *et al.*, 2000), estimating a probit model controlling for the socioeconomic characteristics: It is not surprising that they find that households with higher responsibilities (older people and/or children in the household) spend more money. In contrast, households in which family members have access to mandatory social security are less likely to incur catastrophic expenditures. Similarly, in this analysis, I look for the factors that make individuals more likely to remain in the formal sector and receive the benefits of mandatory social security.

*Why not carry out a panel estimation?* There are two options: a panel probit model with fixed effect or random effects, but these do not apply in this case. More important, the methodology for the fixed effect model is still under development. Greene (2008) shows that the estimators under the fixed effect panel probit model are not consistent; neither is the model that corresponds to the constant term, nor any others. The smaller the sample is, the bigger the bias in the estimators is (Hsiao, 1986, Heckman and MaCurdy, 1980). Also, Greene (2002) finds that average effect estimates do not account for unobserved heterogeneity but are consistent, as long as the omitted heterogeneity is normally distributed and independent of the included regressors. Fernandez-Val (2007)
develops a fixed effect model that accounts for heterogeneity; however, his result shows that there is no bias as long as there is no heterogeneity in the individual fixed effect term, which is not an assumption for this study.

The panel probit with random effects has been applied to multinomial models. For example, Gong, Soest and Villagomez (2000) study the mobility in the urban labor market using panel data for Mexico. Such a study considers a multinomial panel probit model for switching with formal sectors, informal sectors and unemployment. In most cases, a random effect probit model is used for multinomial cases (Greene, 2002). In addition to these two options there is the pane logit model with fixed effect, but this methodology limits the number of observations to those individual who switch between sectors, i.e., it reduces the sample size. This would reduce the explanatory power of the results due to a fewer number of observations used in the regression.

**4.3.1 Probit Model: Cross-section estimation**

Based on his preference, the individual decides to work in the formal sector and receives a utility $F_i^*$. However, this variable is not observable. For instance, we observe a dummy variable $F_i$, which denotes his participation in the labor force and it is defined as follows:

$$
F_i = \begin{cases} 
1, & \text{if } F_i^* > 0 \\
0, & \text{otherwise}
\end{cases}
$$

It follows that

$$
F_i = 1(F_i^* > 0) = a_i + X_i + M_i + RE_i + SP_i + \varepsilon_i
$$
Where

- $F_i$ indicates whether he works in the formal (1) or informal (0) in 2006, subject to work in the informal sector in 2002.
- $a_i$ is a scalar unobserved individual effect
- $X_i$ is individual’s characteristics
- $M_i$ indicates that individual migrated to get a job in America either between 2002 and 2006 or before 2002 (1 yes, 0 no)
- $R_{Ei}$ dummy variable of receiving remittances (1 yes, 0 no)
- $SP_i$ indicates whether he receives cash transfers from any social program (1 yes, 0 no)

It includes if the individual receives income transfer from the following:

- *oportunidades*, mother receives money in order to support the education of children up to 12 years old,
- *alianza para el campo* or procamo, money for small agricultural producers,
- *Fondo PYMEX* or *credito a la palabra*, for those who want to begin a small business,
- *coinversion social*, for those who want to begin a small business that has social benefits or social spillovers in their communities,
- *fonaes*, for those who want to begin a small business related to arts and traditional culture.

- $E_i$ is an error term or the regression, $N \sim (0, \sigma^2)$, and are assumed to be uncorrelated with $X_i$ and $a_i$. 
The $X_i$ variables include the following:

- Marital Status, 1 if individuals are married in 2006, 0 otherwise
- Head of household, 1 if the individuals are the head of household in 2006, 0 otherwise
- Female, 1 if the person is a woman, 0 otherwise
- Monthly family income, captures the monthly income of all household members
- Change in the monthly amount of remittances received in 2006 vs. 2002

It is important to comment that bias due to self-selection is eliminated once we subject our study to a unique group of individual, i.e., those who worked in the informal section during 2002. In other words, we are comparing the same individuals in both periods and the estimates are consistent, and I assume these individuals have on average the same unobservable characteristics.
Chapter 5. Results

In this section, the descriptive statistics of the group of study is presented, as well as the preliminary results from the cross-sectional probit model.

5.1 Descriptive statistics

As can be seen from Table 5.1, there is less than one year of difference in education between formal and informal workers. However, this difference can be translated to a higher income, which is also seen in the data.

The individuals who work in the formal sector receive a higher monthly income than those in the informal sector. On average, the annual income for formal workers is 56% greater than informal workers. When we look at the maximum amount of annual earnings, the difference is even higher: Formal workers can earn up to five times the annual income of informal worker.

The monthly amount of remittances received by informal workers is higher than formal workers. Also, the percentage of individuals who received remittances is higher in the informal sector than in the formal one—this number is 60% higher. From the universe of 3420 observations, only 232 individuals received remittances in 2006, among them 141 and 91 from the formal and informal sector, respectively.

The percentages of individuals who are women, married and the head of the household is about the same in both sectors, although there are more individuals who are married and/or household head in the formal sector.
Table 5.1

Descriptive Statistics for those Informal in 2002 that became Formal in 2006

(Weighted estimation)

A. Informal workers in 2002

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations: 1990</th>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual family income</td>
<td>797.73</td>
<td>Annual family income</td>
<td>1244.80</td>
<td>2860.722</td>
<td>0</td>
<td>1081979</td>
</tr>
<tr>
<td>Annual individual income</td>
<td>514.69</td>
<td>Annual individual income</td>
<td>991.45</td>
<td>2860.711</td>
<td>0</td>
<td>1081979</td>
</tr>
<tr>
<td>Age</td>
<td>38.57</td>
<td>Age</td>
<td>36.40</td>
<td>13.11</td>
<td>17</td>
<td>88</td>
</tr>
<tr>
<td>Years of education</td>
<td>6.12</td>
<td>Years of education</td>
<td>5.69</td>
<td>3.81</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Monthly $ remittances received in 2002</td>
<td>2.41</td>
<td>Monthly $ remittances received in 2002</td>
<td>2.41</td>
<td>15.26</td>
<td>0</td>
<td>614</td>
</tr>
<tr>
<td>Monthly $ remittances received in 2006</td>
<td>4.43</td>
<td>Monthly $ remittances received in 2006</td>
<td>4.43</td>
<td>37.11</td>
<td>0</td>
<td>1267</td>
</tr>
</tbody>
</table>

Percentages of individuals

- Female: 30.68%
- Household head: 50.02%
- Married: 48.70%
- Family support: 5.69%
- Social Programs: 2.12%
- Migration: 1.05%
- Received remittances: 4.48%

B. Formal workers in 2002

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observations: 1430</th>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual family income</td>
<td>1244.80</td>
<td>Annual family income</td>
<td>1244.80</td>
<td>2860.722</td>
<td>0</td>
<td>1081979</td>
</tr>
<tr>
<td>Annual individual income</td>
<td>991.45</td>
<td>Annual individual income</td>
<td>991.45</td>
<td>2860.711</td>
<td>0</td>
<td>1081979</td>
</tr>
<tr>
<td>Age</td>
<td>36.40</td>
<td>Age</td>
<td>36.40</td>
<td>13.11</td>
<td>17</td>
<td>88</td>
</tr>
<tr>
<td>Years of education</td>
<td>5.69</td>
<td>Years of education</td>
<td>5.69</td>
<td>3.81</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Monthly $ remittances received in 2002</td>
<td>2.41</td>
<td>Monthly $ remittances received in 2002</td>
<td>2.41</td>
<td>15.26</td>
<td>0</td>
<td>614</td>
</tr>
<tr>
<td>Monthly $ remittances received in 2006</td>
<td>3.84</td>
<td>Monthly $ remittances received in 2006</td>
<td>3.84</td>
<td>22.71</td>
<td>0</td>
<td>402</td>
</tr>
</tbody>
</table>

Percentages of individuals

- Female: 34.40%
- Household head: 58.80%
- Married: 60.64%
- Family support: 3.40%
- Social Programs: 1.70%
- Migration: 1.57%
- Received remittances: 6.10%

Source: own calculations based on MXFLS, 2002 and 2006.

Note: income and remittances are expressed in pesos of 2002.
The number of persons who have access to social security through a family remember is higher in the informal sector—in fact, it is almost twice the number for formal workers. More informal workers receive a social program than formal workers.

Table 5.2 shows that for this case, individual who do not receive social security benefits through a job (informal sector) receive a greater labor income than those who do not have access to them. Additionally, individuals who worked as informals in 2002 and still informals in 2006 have a greater wage than who were formals both in 2002 and 2006.

<table>
<thead>
<tr>
<th>Table 5.2</th>
<th>Monthly labor income by Formal sector and Year</th>
<th>(Pesos of 2002)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal sector 2002</td>
<td>Yes</td>
<td>4,750.99</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>19,032.94</td>
</tr>
<tr>
<td>Formal sector 2006</td>
<td>Yes</td>
<td>Formal sector 2002</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>3333.005</td>
</tr>
<tr>
<td>No</td>
<td>Formal sector 2002</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>24745.12</td>
</tr>
</tbody>
</table>

Source: own calculations based on MXFLS, 2002 and 2006.

How many people who were working in the informal sector switched to the informal? According to the calculations in Table 5.3, 26.6% (381) of informal workers in 2002 moved to the formal sector in 2006. But also, 17% (348) of formal workers in 2002 switched to the informal sector in 2006.
5.2. Results from the Cross-Sectional Probit Model

The results of the cross-sectional probit model are presented in Table 5.3. There are two sections of the table; at the top, the probit model for those who worked in the informal sector in 2002, and at the bottom, those in the formal sector. The variables with explanatory power in the regression are highlighted.

Table 5.3
Cross-Sectional Probit Model Results for 2006

A. Worked in the informal sector in 2002

|                     | Coef. | P>|z| |
|---------------------|-------|-----|
| Age                 | 0.010934 | 0.6520 |
| Age Square          | -0.000182 | 0.5150 |
| Education           | -0.205359 | 0.0000 |
| Education Square    | 0.020802 | 0.0000 |
| Female              | 0.105582 | 0.4150 |
| Household Head      | 0.004946 | 0.9710 |
| Married             | 0.074971 | 0.5090 |
| Average monthly family income | -0.000002 | 0.0000 |
| Family support      | -0.725444 | 0.0090 |
| Social programs     | -0.185655 | 0.5370 |
| Migration           | -0.637233 | 0.0410 |
| Receiving remittances | 0.029137 | 0.8820 |
| Changes in amount of remittances | 0.001880 | 0.4370 |
| Constant            | -0.577412 | 0.2000 |

Note: weighted estimation
Table 5.3
Cross-Sectional Probit Model Results for 2006
(Cont.)

B. Worked in the formal sector in 2002

|                      | Coef.  | P>|z| |
|----------------------|--------|-----|
| Number of obs = 1976 |        |     |
| Wald chi2(13) = 56.02|        |     |
| Prob > chi2 = 0.000  |        |     |
| Pseudo R^2 = 0.0467  |        |     |
| Log pseudolikelihood = -851.33126 | |     |

|                      | Coef.  | P>|z| |
|----------------------|--------|-----|
| Age                  | 0.013547 | 0.6340 |
| Age Square           | -0.000075 | 0.8210 |
| Education            | -0.105312 | 0.0110 |
| Education Square     | 0.009455 | 0.0100 |
| Female               | 0.319016 | 0.0170 |
| Household Head       | 0.074624 | 0.5840 |
| Married              | 0.098450 | 0.3690 |
| Average monthly family income | 0.000054 | 0.5240 |
| Family support       | -0.980053 | 0.0000 |
| Social programs      | -0.363489 | 0.2180 |
| Migration            | 0.286601 | 0.3590 |
| Receiving remittances| 0.741527 | 0.0000 |
| Changes in amount of remittances | 0.000494 | 0.5970 |
| Constant             | 0.459322 | 0.4180 |

Note: weighted estimation

In both regressions, Age has a positive sign, whereas Age Square has a negative, but they are not significative. It shows that the more educated you are, the more likely you are to be in the formal sector regardless of whether you worked in the informal sector before. This effect decreases as you become older, hence the negative sign of Age Square.

Education is significative and with a negative sign in both regressions. More education reduces the probability of an individual working in the formal sector. On the other hand, Education Square is significative and positive, which means this effect decreases with the education. There may be a point in which having a certain level of education makes you more likely stay in the informal sector, but the more-highly
educated people still work in the formal sector. At first glance, one could think this an unexpected effect. However, the World Bank 2007 says that “larger firms or skilled professionals may decide to underreport their operations and incomes, balancing private gains from tax evasion with low detection risks resulting from poor enforcement,” which could be the case for these people.

The variables Household Head and Married have a positive sign, but none have explanatory power in the regressions. However, the positive sign means it increases the probability of the individual to work in the formal sector, regardless of previous history. This could reflect that those individuals who have more responsibilities prefer receiving the benefits of social services of the formal sector and not living in world with uncertainty. However, Female is positive in both regression and only significative for those who worked in the formal sector in 2002. Torres (2002) founds similar results on the gender variable: it may reflect the women value more receiving the social security benefits than males.

The variable Family support has a negative sign and is significative. This variable is constructed to show whether the individual receives health coverage through a family member. It is not surprising to see the sign of this variable. If an individual is already receiving health coverage, it doesn’t make any sense for him to move to the formal sector.

The variable Social Programs has a negative sign in both sections and it is not significative in either case. The negative sign in these variables has the same meaning as in Family Support. In other words, receiving cash transfers from social programs like “Oportunidades” or in-kind like the “seguro popular de salud” reduces the likeliness to
switch to the formal sector, because it may be the case these group of workers the utility associate with wage in this sector and social programs is more valuated than the labor income and social benefits in the formal sector.

Migration is only significative and negative for workers in the informal sector 2002. Thus, workers are less likely to switch to the formal sector in 2006. This may be explained because the formal sector is associated with more entry flexibility and this groups of individuals are looking to change of occupation, change their residence or – inclusive- migrate once again to America.

Contrasting the results with the hypothesis I can say that results validate the supposition that remittances have positive effect, but it is only significative for those who worked in the formal sector in 2002. To begin with, the structure of the data shows 61% of the individuals who receive remittances are working in the formal sector in 2005. Also, in average, the share of remittances to income represents 3.3% and 1.3% of individuals in the formal and informal sector, respectively. Follows that remittances increase the income of families and individuals and the number of goods and services they can afford. Additionally, it is worth to comment I found only 225 of 3,420 observations which contain the amount of remittances, and other 7 observations with recognized they received remittances but they don’t specify the amount.
Chapter 6. Conclusions

I investigated the labor market in Mexico in 2006 focusing in mobility between formal and informal sector due to the presence of remittances. Basically, the original hypothesis was that remittances have a positive effect on the decision to work in the formal sector. In order to test that hypothesis two cross sectional probit models were estimated using Mexican database which also include a dummy variable for receiving remittances: the first for individuals who worked in the informal sector in 2002, and the second for those in the formal sector for the same year.

The results validate that hypothesis that receiving remittances has a positive effect on the decision to work in the formal sector. Individuals who received an income transfer through remittances experience an increase the consumption bundle and this effect may narrow the gap between formal and informal utilities each individual observes. Even when remittances had the expected -positive- sign in both regressions, it was only significative for those who worked in the formal sector in 2002.

I also include a dummy for individual who migrated to America for a job and other for those who received social programs. In the informal sector workers can find the flexibility (like independency, and free schedule) that would allow them to move across industry sectors, migrate to other regions of Mexico, or -inclusive- migrate one more time to America. The results validate such hypothesis: those who worked in the informal sector and migrated are less likely to switch to the formal sector. The data shows that one-eight of the people who want to migrate want to do it to America.
Additionally, I found that if an individual has access to health care services through a family member who works in the formal sector, is less likely he switches to the formal sector. Surprisingly, even when workers in the formal sector are more educated the structure of the data shows the more educated you are the less likely you are to switch to the other sector. In other words, individuals don’t with higher level of education don’t find attractive the benefits of the other sector and prefer to status quo. For some individuals with higher education the informal sector is attractive because it is a way to evade taxes, meanwhile for those in the formal sector they prefer the stability associated with their current jobs.

Some limitation of this approach and directions for future research seem worth mentioning. The first is the analysis is based on a cross-section estimation instead of using a panel estimation, however the ideally panel probit model with fixed effects stills under review and not even econometrical software accounts for that. Second, the effect of social programs on the decision to choose between formal or informal sector shouldn’t be underestimated. The results show they have a negative but not significative effect on the worker’s decision. Receiving social benefits it is especially important in regions where social security benefits are not accessible like rural area, but even in urban area social program benefits help to close the gap between formal-informal wages. As a consequence, workers compare the benefits associated with each sector considering both social security and social program benefits. In that case, social programs may induce people to prefer the informal sector.
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