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Mexican Employment Dynamics:

Evidence from Matched Firm-Worker Data

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Abstract

Using a census of all workers in private establishments in the formal sector in Mexico to track workers and establishments over time, this paper presents the first Mexican worker and job flow statistics. The data allow for comparing these flows across time, space, and worker characteristics. Although many patterns are similar to those documented in developing countries, the analysis

uncovers patterns that have potentially important policy implications. The authors compare the results to the literature, illustrate how the statistics change during times of reform and crisis, and present novel findings that contribute to the broader literature on worker reallocations.

Mexican Employment Dynamics:
Evidence from Matched Firm-Worker Data

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1. Introduction

The purpose of this paper is to examine Mexican employment dynamics at the micro level. An important and growing body of literature suggests employment expansions and contractions at the establishment level ("job flows") hide a considerable amount of employee-level turnover ("worker flows").[1] Prior to the IDB project "Market Institutions, Labor Market Dynamics, Growth and Productivity: An Analysis of Latin America and the Caribbean," of which this paper is a part, nearly all[2] of the literature on worker flows or job flows had focused on developed countries. Understanding these gross worker and job flows, however, is especially critical in developing countries that seem to consistently experience larger shocks or are experiencing substantial reform.

For our analysis, we use established techniques on a novel data set. We match workers and firms over time using Mexican social security records. This matching capability, which is rare, allows us to calculate within-establishment employee turnover as well as labor reallocations across establishments that differ across time period, firm size, geographic location, and worker characteristics (gender and age).

Our analysis produces many new results. First, although Mexico differs from the United States in several important ways,[3] Mexico's basic patterns are similar to the patterns in the U.S. and in other developed countries. Perhaps most importantly, we show that aggregate statistics hide a great deal of labor market churning. Constant creation and destruction implies that job destruction is a consistent characteristic of Mexican labor markets (even in economic expansions).

Although many Mexican patterns are similar to those in developed countries, we find that worker flows - but not job flows - increased during the late 1980s, which was a period of significant policy reform. Small firms suffered disproportionate employment declines during the December 1994 peso crisis, during which the credit market essentially shut down. Worker and job flows increased between 1997 and 2001, as the economy recovered from the peso crisis and additional reforms were implemented. Unlike during the peso crisis, the data suggest that the 2001 recession hit large manufacturing establishments along the U.S. border especially hard.

We also find differences between workers with different demographic characteristics. Workers between the ages of 60 and 65 are hired at rates that are only slightly lower than those for younger workers. Although these older workers separate from their firms at substantially higher rates, many of these people attempt to find new employment. Furthermore, while worker and job flow statistics are quite similar for men and women, establishments are born mainly with men. Establishments quickly move to hire women in their early years.

Our results reveal a wide variety of opportunities for policy makers that go beyond established reasons why understanding worker and job flows are important.[4] Continuous turnover imposes substantial risk on workers and may justify an expansion of unemployment insurance. Adjustment may be less costly than in developed countries, but adjustment costs are still significant for workers and firms.[5] Changes in these flows may be linked to policy reforms, which would provide a way to evaluate the impacts of these reforms. Secondly, understanding these flows can be used to enhance the efficiency of policies designed to aid dislocated workers. Mexico's training program PROBECAT (*Programa de Becas de Capacitactión para Trabajadores*), for example, uses a nonlinear selection mechanism to determine eligibility [see Revenga, Riboud, and Tan (1994) for more details], which could be tailored to reflect

demographic and geographic groups most in need of help to find employment.

Third, understanding worker and job flows can help policymakers determine the kinds of policies that might best foster employment growth. Unlike in developed countries, younger Mexican firms in all periods tend to have lower percentage employment growth than older firms. To the extent that smaller firms and younger firms are more susceptible to poorly functioning credit markets,[6] these results provide microeconomic evidence consistent with Tornell, Westerman, and Martínez (2004) who suggest that Mexico's relatively slow growth is related to a lack of credit. The finding that women participate less in firm births may be an indication that women have less access to credit than men. Since a large majority of workers are employed in small firms, policies that ease credit during credit-driven recessions may help smooth job creation and destruction along the business cycle.

The format of the rest of the paper is as follows. In the next section, we describe how we created our worker- and job-flows data set from social-security records in Mexico. In section 3, we describe the methodology we use to calculate worker- and job-flows statistics. In section 4, we present the statistics. We include results separated by establishment age, establishment size, gender, and employee age. In section 5 we add some final concluding remarks.

2. Creation of a Job- and Worker-Flows Data Set for Mexico

The raw data come from the Mexican Social Security Institute (*Instituto Mexicano del Seguro Social,* or *IMSS*), which is the agency that manages the social-security accounts for all private-sector tax-registered workers in Mexico. Since filing with the IMSS has been used as a criterion for formal sector participation,[7] the data can be thought of as a census of formal-sector establishments in the private sector. The IMSS uses its own 4-digit industry classification system

consisting of 271 separate industries that span all economic activity in the formal sector. Unfortunately, if an employee leaves the formal (tax-registered) sector, we are unable to observe if the employee becomes unemployed or finds a job in the informal sector.

Individual records in the raw data contain an identifying number for the person, an identifying code for the establishment, the daily wage, the date when the information of this record became valid, and the date when the information stopped being valid. If the worker leaves the establishment, the old record is closed. If the worker's salary changes, the old record is closed and a new record is opened with the updated wage information but with the same identifier for the establishment. Importantly, we have both an establishment identifier and a person identifier that are consistently coded over time. Our first step was to convert this information into annual information. We chose December 31 as the date for which we would extract the relevant information each year from 1985 to 2001.[8]

For each December 31 of the 17 years for which we have data, we selected the records that were applicable to the particular date. If a person had two apparently applicable records from the same establishment, we chose the record with the later start date. If a person had two applicable records from different establishments, we assumed the person really was working in both establishments. We only selected workers with strictly positive wages. This restriction mainly excludes students from the database, many of whom are insured by the IMSS although they are not really employees.

The files mentioned above include wage and employment histories of all workers registered with the IMSS. The files also contain the age and gender for nearly all workers. We also merged in industry and location information of the establishment using separate files provided by the IMSS. The match rate was nearly 100%.

Since we are using a new data set, we believe it is useful to look at some simple statistics and compare them to official statistics of the IMSS. We do this comparison in table 1, although it should be noted that we made no attempt to replicate the precise methodology used in the generation of these official statistics. In fact, we do not know the precise methodology used by the IMSS although we are using the same raw data.

The first employment figures in table 1 are official IMSS statistics on *cotizantes* on December 31 of each year.[9] *Cotizantes* are employees who pay social-security taxes or for whom social-security taxes are paid. Of the official statistics we have found, we suspect that these statistics use the definition that most closely matches our definition of all individuals who receive positive salaries. Unfortunately, however, we could not find statistics on *cotizantes* before 1992.

(Table 1 here)

The second set of employment observations presents our calculations of employment on December 31 of each year. The figures match up fairly well, although the net-growth percentages in our data tend to be slightly smaller than in the official statistics. The third set of statistics gives our counts of "jobs" which will correspond to our worker- and job-flows statistics. The difference between the statistics on jobs and employment is that one employee may have more than one job.

Our data represent all sectors of the Mexican economy, but, as an additional check, we also compared our 1993 average employment in manufacturing with the 1993 average total employment in the 1993 Mexican Industrial Census. One would expect the majority of employees in manufacturing to be formally registered, implying that manufacturing employment registered with the IMSS should be similar to manufacturing employment recorded in a

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manufacturing census. Our 1993 manufacturing employment is 2,836,277 and the 1993 Census

manufacturing employment is 3,246,039, suggesting that our data cover about 87.4% of total

manufacturing employment. Based on these comparisons, we believe that our data are reliable.

3. Methodology

We now turn to our methodology for studying job and worker flows. To facilitate

comparison with the developed countries that dominate the existing literature, we use established

definitions of both job flows and worker flows (e.g. Davis and Haltiwanger 1992). We begin

with the methodology for our worker-flows statistics. When an establishment hires a new

employee, we refer to this event as an accession. For a given year, we define the accession

percentage according to the following formula

$$accper_t = 200 * \left(\frac{\sum_j acc_{j,t}}{\sum_j empl_{j,t} + \sum_j empl_{j,t-1}} \right)$$

where $acc_{j,t}$ is the number of employees in establishment j in year t who were not working in

establishment j in year $t-1$, $empl_{j,t}$ is the number of employees of establishment j in year t,

and $empl_{j,t-1}$ is the number of employees of establishment j in year $t-1$. Similarly we define

the separation percentage as

$$sepper_t = 200 * \left(\frac{\sum_j sep_{j,t}}{\sum_j empl_{j,t} + \sum_j empl_{j,t-1}} \right),$$

where $sep_{j,t}$ is the number of employees in establishment j in year $t-1$ who were not working

in establishment j in year t. It is now natural to define the net-growth percentage in

employment, which is simply

$$netper_t = accper_t - sepper_t .$$

Our two statistics on worker flows, $accper_t$ and $sepper_t$ give us information of reallocations of people within and across establishments. As we mentioned in the introduction, however, it is also common to examine reallocations of jobs across establishments.[10] Job flows statistics give us information about establishment-level changes in employment without taking into consideration the identities of the employees. For example, consider an establishment in which five employees have left since the last year and were replaced by five new employees. We would say that this establishment experienced worker flows in the form of five accessions and five separations. Since total employment has not changed, however, we would say that the establishment neither created nor destroyed jobs.

More precisely, define net employment growth in establishment j and period t as

$$net_{j,t} = empl_{j,t} - empl_{j,t-1} .$$

Now denote job creation in establishment j and period t as

$$pos_{j,t} = \max(0, net_{j,t})$$

and denote job destruction in establishment j and period t as

$$neg_{j,t} = \max(0, -net_{j,t}).$$

We can now define the job-creation percentage and job-destruction percentage in period t as

$$posper_t = 200 * \left(\frac{\sum_j pos_{j,t}}{\sum_j empl_{j,t} + \sum_j empl_{j,t-1}} \right) \text{ and } negper_t = 200 * \left(\frac{\sum_j neg_{j,t}}{\sum_j empl_{j,t} + \sum_j empl_{j,t-1}} \right)$$

respectively.

It should be clear that statistics on job flows and statistics on worker flows are related. If an establishment increases its total employment by one, at least one current employee must be new. If an establishment reduces its total employment by one, at least one employee must have left. In this sense, statistics of job flows give us a lower bound on our worker-flows statistics.

Along these lines, we will now explain our decomposition of worker flows into two components: the component explained by job flows and the "excess" component. First, we will define the sum of worker flows

$$sumwf_t = accper_t + sepper_t$$

as our summary measure of worker flows. Similarly, we will define our summary measure of job flows as

$$sumjf_t = posper_t + negper_t.$$

As we mentioned earlier, the sum of job flows ($sumjf_t$) can be thought of as a component of worker flows ($sumwf_t$). Our definition of "excess" worker flows will simply be

$$excwf_t = sumwf_t - sumjf_t.$$

In words, excess worker flows are the worker flows not accounted for by job flows.

One common practice in the literature on job flows is to separate jobs created by births (establishments that had zero employment in the previous year) from jobs created by expansions (establishments that had positive employment in the previous year and expanded). Similarly, it is common to distinguish jobs destroyed by deaths (establishments whose employment fell to zero) from jobs destroyed by contractions (establishments that reduced employment but continue to employ at least one employee). Our data are particularly well suited for studying births and deaths because we observe all establishments, no matter how small they are. We do not, for

example, only observe establishments only when they cross some employment-size threshold.

It is also common to decompose the sum of job creation and destruction ($sumjf_t$) into an aggregate component, an industry component, and an idiosyncratic component. In our data, however, we find that the industry-level changes in employment at any level of aggregation explain a small fraction of gross employment flows. Therefore, we do not present these results here. Instead, they are available from the authors upon request.

4. Job and Worker Flow Results

4.1 A Brief Overview of Macroeconomic Conditions

Since our data cover a period of changing policy, crisis, and recovery, a brief overview of Mexican macroeconomic conditions may help the reader put some of the subsequent statistics into context. We summarize Mexican macroeconomic conditions with four key variables: the unemployment rate (the open unemployment rate calculated by INEGI), inflation (measured as the annual average of year-on-year changes in the consumer price index), real GDP growth (calculated by INEGI using 1993 as the base year), and the nominal exchange rate (expressed in pesos per dollar). Figure 1 contains the movements of these four variables over the 1987-2002 period.

While these four variables describe slightly different aspects of the Mexican economy, they clearly tell similar stories. The most immediately obvious is the severe recession that occurred with the December 1994 peso crisis. Prior to the crisis, growth was relatively robust and inflation, reaching well over 100 per cent in 1988, was coming under control. With the contraction of GDP came a sharp devaluation of the peso (shown as an increase in the peso/dollar exchange rate), a rise in unemployment, and an increase in inflation. The economy

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recovered until the turn of the century, when another economic slowdown becomes apparent.

4.2 Magnitude of Job and Worker Flows in Mexico

Table 2 presents all of the statistics on worker flows and job flows discussed in the

methodology section for each year 1986-2001. Table 2 is the central table of our paper and we

will discuss its implications quite thoroughly. Table 2 contains twelve columns that are grouped

and numbered. Several of the columns are algebraically related. Column 1, net employment

growth, is equal to the sum of columns 2 and 3. Column 1 is the difference between jobs created

(column 7) and jobs destroyed (column 10). Furthermore, the sum of accessions and separations

(column 4) can be decomposed as the sum of job creation and destruction (column 11) and

excess worker flows (column 12). To further illustrate the main trends, figure 2 graphs columns

4, 11, and 12.

(Table 2 here)

Job flows in Mexico on average appear to be not very different from job flows in the

U.S., although both job creation and job destruction are somewhat higher in Mexico. For

example, using data from West Virginia, Spletzer (2000), finds an annual job-creation

percentage of 15.8%, which is lower than the 19.0% we observe on average in our data (column

7). Spletzer reports an annual job-destruction percentage of 14.4%, which is slightly lower than

our figure of 14.8%.

Davis and Haltiwanger (1992) cover the period 1972-1986. If we compare their results to

our Mexican results, we again find that both job creation and job destruction are higher in

Mexico. If we restrict the sample to manufacturing establishments, we get an average job-

creation percentage of 16.4%, substantially higher than the figure of 9.2% from Davis and

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Haltiwanger. The average figure for job destruction in Mexico is 12.8%, marginally higher than the 11.3% from Davis and Haltiwanger. Tables analogous to table 2 calculated separately for the manufacturing and non-manufacturing sectors are available upon request.

As in Hamermesh et al. (1996) and Abowd et al. (1999), we find that a substantial share of worker flows cannot be accounted for by job flows. As described in the previous section, we can summarize worker flows by using the sum of the accession percentage and the separation percentage. The average of this statistic in our data is 71.3% (column 4). We can similarly summarize job flows by using the sum of the percent of jobs created and the percent of jobs destroyed. The average of this statistic in our data is 33.8% (column 11). Job flows therefore account for slightly less than half of total worker flows.

4.3 Changes over Time: Recession, Recovery, and Reform

The period we study encompasses several important reforms, policies, and economic events in Mexico. Mexico joined the General Agreement on Tariffs and Trade on January 1, 1986 and implemented deep tariff cuts. A peso devaluation in 1987 was followed by an economic "Solidarity Pact" that effectively reduced inflation from over 100% per year. Foreign investment laws were liberalized in 1988, 1989, and 1990 and the new laws induced a rapid inflow of foreign capital. In 1990, Mexico announced it was pursuing a free trade agreement with the United States (with Canada to join the negotiations soon thereafter). The North American Free Trade Agreement was signed in 1992 and went into effect in January 1994. The peso crashed in December 1994 and was followed by a very deep, but relatively brief, recession that was followed by a four-year recovery. We consider our results in the context of these changes.

It is interesting to note that the pace of job flows and worker flows has been increasing

over time, although not in a linear fashion. From roughly 1986-1990, the pace of worker flows was accelerating. In fact, both the accession percentage and the separation percentage increased from 1988 to 1989, and again from 1989 to 1990. The pace of job flows was fairly flat over this period, which highlights the importance of observing worker flows, which are a more complete measure of reallocations than job flows.[11] The timing of these accelerations in worker flows is consistent with the hypothesis that inflows of foreign capital and the implementation of GATT led to an increase in worker turnover.

The economic crisis of 1995 looks like a fairly calm period in terms of worker flows. Although the net growth was –4.6% in 1995 compared with 2.0% in 1994, the separation percentage barely changed. Almost all of the change in the net-growth percentage came from a reduction in the accession percentage. Once again the results using job flows are not as stark as the results using worker flows, although the job-creation percentage did fall more than the job destruction rose from 1994 to 1995.

The period of 1997-2001 is the most active period in terms of job flows and worker flows. One way to see this is by a series of comparisons. When one compares two years with similar net percent changes in employment, one finds that both the accession rate and the separation rate are higher in the more recent year. One finds similar results for the percent of jobs created and the percent of jobs destroyed when making these comparisons.

To illustrate this point, note that the net percent change in employment of –4.4% in 2001 is similar to the net percent change in employment of –4.6% in 1995. The accession percentage and the separation percentage, however, were 9.6 and 9.5 percentage points higher respectively in 2001 compared with 1995. The analogous figures for the percent of jobs created and destroyed are 3.7 and 3.6 percentage points respectively.

One might think that using the year 1995 is a strange choice due to the economic crisis, so we should do at least one more comparison. The net percent change in employment of –1.4% in 2000 is almost identical to the net percent change in employment in 1993. Note, however, that in 2000, both the accession percentage and the separation percentage were both 5.5 percentage points higher than in 1993. The analogous figure for the percent of jobs created and destroyed is 1.9 percentage points. One obtains similar results comparing either the year 1998 or the year 1999 to the year 1991, and by comparing the year 1997 to the year 1987.

We also note that the accession percentage, the separation percentage, the percent of jobs created, and the percent of jobs destroyed were all higher in 1997 compared to the year 1996. We observe this same increase in all of our measures of reallocation from the year 2000 to 2001. Finally we note that the sum of the accession percentage and the separation percentage attained its two highest values in the last two years of our data (2000 and 2001). The same is true for the sum of the percent of jobs created and the percent of jobs destroyed. It seems quite clear that labor reallocations have been accelerating in recent years.

Why have labor reallocations been so high in recent years? There are at least two possible explanations. The first is that NAFTA has a bigger and bigger impact each year and that the economy is adjusting to the more open trade environment. Another hypothesis worth considering is that the 1997 pension reform (reform of the IMSS) reduced labor-market rigidities. The 1997 reform reduced the quotas that firms and workers had to pay to become registered with the IMSS. This change was designed to encourage the formalization of the Mexican workforce by lowering the costs of formalization. While a formal analysis of these effects is beyond the scope of this paper, it is worth noting that the acceleration in worker flows apparently began in 1997, just as the reform was implemented.

The result that both worker flows and job flows have been accelerating in recent years is complemented by other work as well. Castellanos, García-Verdú, and Kaplan (2004) show that the percent of workers with nominal-wage freezes has been declining dramatically in recent years, while both nominal-wage increases and nominal-wage decreases have been increasing. Budar-Mejía and García-Verdú (2003) estimate the probabilities that a worker moves from the formal sector to the informal sector and vice versa. They find that both probabilities have been increasing over time, that is, that transitions from the formal sector to the informal sector are becoming more common as are transitions from the informal sector to the formal sector. The results from the two papers above, combined with the results on worker flows and job flows in the present paper, paint a clear picture. The labor market in Mexico has become more dynamic in recent years.

Table 2 also presents the two decompositions of job creation and destruction mentioned in the methodology section. Job creation is separated into the component due to establishment births and the component due to establishment expansions. Analogously, job destruction is separated into the component due to establishment deaths and the component due to establishment contractions.

4.4 Flows by Age and Size of the Firm

Before turning to some of the more novel results of our paper, we first show that some of the other stylized facts of job and worker flows also appear to be true in Mexico. Table 3 presents averages of worker- and job-flows statistics for the period 1996-2001 for several establishment-age categories beginning with establishments that are at least one year old but less than two years old. Each successive age category is one year older than the previous category, until we reach the maximum category of 11 years old or more. Since our data begin in 1985 we

have to wait until the year 1996 before we can observe whether an establishment first appeared in the data 11 or more years earlier.[12]

(Table 3 here)

Table 3 also shows many of the results one would expect. The accession percentage, separation percentage, job-creation percentage, and the job-destruction percentage all decrease with establishment age. Excess worker flows show this same general trend with the exception of the youngest age category. Table 3, however, does yield two results that may be surprising. First, net employment growth for firms 1-11 years old is negative. The overall positive growth (4.3%) comes from births (firms 0 years old).[13] We also observe that net-growth percentages are lowest for the youngest establishments, which contrasts with the results in Davis and Haltiwanger (1992). This result may point to the importance of credit-market failures that may impede younger firms from expanding.

Table 3 also shows the average of worker- and job-flows statistics for the period 1986-2001 separated by size category of the establishment. We define five categories based on the average of current- and previous-year employment of the establishment. The categories are: less than 50 employees, at least 50 employees but less than 100, at least 100 employees but less than 250, at least 250 employees but less than 1000, and at least 1000 employees. We see here that the accession percentage, separation percentage, job-creation percentage, and job-destruction percentage all decline with establishment size. That is, small establishments exhibit higher rates of both job and worker flows. This is consistent with the stylized facts of the literature.

We now turn to some of the more novel results of our study. Perhaps the most important economic event in Mexico over the period studied was the economic crisis of 1995. Indeed, the net-growth percentage of –4.6% in 1995 is the lowest net-growth percentage we observe. Earlier

in the paper we established that gross flows indicate a great deal of churning in the labor market. In terms of identifying the characteristics of firms hurt most by the crisis, which policymakers are rightly concerned about, we focus the next stage of the analysis on net flows.

Since problems in the credit markets were an important component of the economic crisis, smaller establishments may have been particularly hard hit by the crisis. The crisis also had a significant trade component, and, since large and small firms may differ in their propensity to export, different export responses may also generate different results across size categories. Table 4 shows net-growth percentages from 1986-2001 separated by the same establishment-size categories used in table 3. These results are presented for the formal sector overall and separately for the manufacturing and non-manufacturing sectors. Table 4 indeed shows that small establishments suffered the most during the economic crisis. Over the whole period, we observe that establishments with average employment greater than 1000 grew at a slower rate than did establishments in the other size categories. In 1995, however, the pattern was quite different.

(Table 4 here)

Table 4 shows that net-growth percentages rose monotonically with establishment size in 1995. For example, the net-growth percentage in establishments with average employment of at least 1000 employees was 0.8%. The same figure for establishments with less than 50 employees is –8.7%. Beginning in 1996, as the economy began to recover its losses, smaller establishments outperformed their larger counterparts. This general pattern was true both inside and outside of manufacturing.

We also see from table 4, however, that 2001 was a terrible year for large manufacturing establishments, but not for large establishments outside of manufacturing. Noting that large manufacturing establishments are likely to be exporters,[14] we believe the likely cause for these

employment declines to be a weakening export market caused by a weakening U.S. economy and by increased competition from other countries. To follow up on this point, table 5 presents net-growth percentages separately for establishments near the U.S. border and for establishments in the rest of the country.[15] We present net-growth percentages for all industries combined as well as separately for manufacturing and non-manufacturing.

(Table 5 here)

Recall that the North American Free Trade Agreement came into effect in 1994. From 1994-2000, employment grew faster in percentage terms in the border region than in the rest of Mexico, with the small exception of 1997 when the difference was minimal. In 2001, however, the region that borders the U.S. experienced a huge decline in employment of 11.8%. This represents the only employment contraction in the border region during the period we study. This fact lends even further weight to the argument that the results from earlier tables for the year 2001 are picking up Mexico's recent problems for establishments that export to the U.S.

Let us now focus on manufacturing versus non-manufacturing. Although it is true that the non-manufacturing sector experienced larger net percent employment declines on the border compared with the rest of the country (-2.5% compared with –0.2%), the big difference between the border and the rest of Mexico occurred in manufacturing. The manufacturing sector contracted a staggering 17.9% at the border compared to a contraction of 10.9% in the rest of the country. Once again we find that in 2001 those establishments that are most likely to export, in this case those located at the border with the U.S., experienced the largest percent employment declines.

Summarizing the evidence for the year 2001, a fairly convincing case can be made that a large fraction of the reduction in employment was due to the weakening of U.S. manufacturing.

Although the manufacturing sector in Mexico apparently had benefited from NAFTA for many years, things changed dramatically in the year 2001. This experience lends credence to the argument that Mexico has exposed itself to more economic volatility by linking its fortunes so tightly to the U.S. economy.

4.5 Gender Differences

One attractive feature of our data is that we observe the gender of the vast majority of workers in our data. This allows us to calculate the job- and worker-flows statistics presented in table 2 separately for men and women. One might wonder to what extent women might tend to hold less stable jobs, which might translate into higher accession rates and separation rates. Perhaps surprisingly, statistics on worker flows and job flows are quite similar for men and women. These tables are available upon request.

When we interact gender with establishment age, however, we see an interesting result on the life cycle of establishments. In table 6, we divide establishments into six establishment-age categories. The difference between the establishment-age categories in table 6 and those in table 4 is that the oldest age category aggregates all establishments that are five years old or older. We present average net-growth percentages separately for men and women along with the average percentage of male and female employment in each establishment-age category. The averages are taken from the period 1990-2001.

(Table 6 here)

We find the percent of men working in the youngest establishments (as a percentage of the male labor force) is larger than the analogous statistic for women. That is, men are more likely to work in establishments that are less than one year old (new establishments). Establishments one to two years old, however, show an average net-growth percentage for men

of –7.9 percent while the analogous statistic for women is 6.9%. In other words, establishments are born mainly with men, but then quickly move to hire women in their early years. These differences disappear for the older establishments. This result raises the possibility that differences in risk aversion may explain participation decisions in young establishments.[16] Another explanation is that when new establishments start up, they mainly employ managers, who tend to be disproportionately male. Then as things get up and running, they expand their blue collar workforce, which has a larger proportion of females.[17]

Another attractive feature of our data is that we observe the age of the workers. Table 7, for example, shows averages of job and worker-flows statistics separately for several age-of-worker categories over the period 1986-2001. The first category is at least 15 years old but less than 20 years old. We use categories of five-year increments until the oldest category of at least 60 years old but less than 65 years old.[18] Net-growth percentages decline as the age of the workers increases.

(Table 7 here)

At the extreme ends of the table we see some extreme results. For example, net employment growth for workers 15-20 years old is 49.0% while net growth is 7.9% for workers 20-25 years old. To what is this difference due? The accession percentage for the younger group is 41.1 percentage points higher while the separation percentage is identical. That is, all of the difference is due to differences in accession percentages, which is probably explained by the younger workers entering the workforce. Turning to job creation and destruction, we see that the job-creation percentage for the younger group is 37.2 percentage points higher. The job-destruction percentage for the younger group is only 3.9 percentage points lower.

As workers approach retirement, we again see dramatic results. The net-growth

percentage for workers 50-55 years old is –3.2% while net growth is –16.3% for workers 55-60 years old. The difference in accession percentages is minimal; the younger group has an accession percentage that is 0.7 percentage points higher. The difference in separation percentages, however, is dramatic. The separation percentage for workers 55-60 years old is 23.8% while the separation percentage for workers 60-65 years old is 36.3%. That is, almost all of the difference between these two groups comes from the separation percentage, which is probably explained by workers in the older group entering retirement.

As we mentioned in the introduction, these results imply that people in the 60-65 years of age category are being hired at what might be considered a surprisingly high rate. Given the apparently high demand for these people to find new employment, and given the demographic trends that indicate that the population is aging, programs aimed at aiding dislocated employees like PROBECAT might consider targeting this group for additional support.

Turning to the age groups between 20 and 55 years old, the pattern is clear. As we move from a younger age category to an older one, both the accession percentage and the separation percentage fall. The drop in the accession percentage, however, is always more pronounced. The patterns for job creation and destruction are less clear.

5. Conclusions

During times of economic reform, understanding gross worker and job flows is critical for forming efficient policy. Significant data requirements, however, have kept the focus of these studies away from developing countries. In this paper, we present the first results on worker and job flows from Mexico. Some results found in other countries are also true in Mexico. In particular, older establishments and larger establishments exhibit lower rates of job

and worker turnover and the majority of job reallocations occur within industries. One key difference from the existing literature, however, is that younger establishments in Mexico have lower net-growth percentages than older establishments.

In addition to examining whether our results fit previously established patterns from other countries, we generate some new results as well. We find, for example, that large establishments dramatically outperformed smaller establishments during the economic crisis. In 2001, however, large manufacturing establishments and manufacturing establishments near the U.S. border exhibited dramatic declines in employment, which suggests that difficulties in the export market are having serious ramifications on the labor market.

We further found that younger establishments (in the first two years after appearing in the data) exhibit much higher net-growth percentages for women than for men. Men, however, disproportionately tend to work in establishments that are just entering the market. Looking at age of workers, we found that net-growth percentages decline with worker age. The general pattern is that accession percentages and separation percentages both decline with worker age, but accession percentages decline faster.

Our results have several implications for policy. The contrasting effects of the 1995 and 2001 recessions suggest that policy must retain some flexibility to remain effective. In particular, the crisis of 1995, which was probably linked to domestic credit problems, adversely affected small firms. The recession of 2001, however, was probably linked to the decline in U.S. manufacturing, adversely affected large manufacturing firms and manufacturing firms located at the U.S. border.

We also found evidence that reducing barriers to trade can have the effect of increasing reallocations of labor. During the late 1980s, worker flows accelerated at the same time when

GATT was being implemented and restrictions against foreign investment were being relaxed. The period of 1997-2001, that last five years in our data, was the most active period for both worker flows and job flows. Again the relaxation of trade barriers, this time due to NAFTA, is a possible source of this acceleration.

Administrators of training programs, such as Mexico's PROBECAT, may find some of our geographic and demographic results helpful. In particular, the recession of 2001 induced larger contractions in the border, which suggests that, for foreign-induced recessions, resources for training may be more effective in the border region. Furthermore, we found that older workers, although exhibiting predictably high rates of separations from firms, exhibit surprisingly high accession rates. Training programs might therefore consider targeting this group as one with high demand for re-employment.

Endnotes

[1] Key contributions include Davis and Haltiwanger (1990, 1992, 1999) and Hamermesh et al. (1996).

[2] The only exception that our search of the literature revealed is Roberts (1996).

[3] Robertson and Dutkowsky (2002) find, for example, that worker adjustment costs in Mexico are an order of magnitude smaller than in the United States.

[4] Davis and Haltiwanger (1998) offer twelve additional reasons why it is important to understand gross worker and job flows.

[5] For more detail about how adjustment costs may matter for Mexican firms and workers, see Kaplan et al. (2005).

[6] Although debated, a positive link between firm size and access to credit seems to pervade the literature. See Gertler and Gilchrist (1994) for an example.

[7] For example, see Roberts (1991) or Marcouiller, Ruiz de Castilla, and Woodruff (1997).

[8] We chose December 31 because it often is used to represent annual statistics and because data from other countries participating in the same IDB project used this date.

[9] The official statistics were obtained from Instituto Mexicano del Seguro Social (2001).

[10] Most of the work in the literature focuses on job flows due to data constraints.

[11] It is worth noting that both the job-creation percentage and the job-destruction percentage rose from 1989 to 1990.

[12] A concern about Table 6 is the endogenous movement of establishments into different size categories over time. This concern is related to other regression-to-the-mean criticisms discussed in Davis et al. (1996) and Davis and Haltiwanger (1999, pp. 2743-2744). If we assign firms on the basis of base year size, then our analysis is accurate. Nevertheless, the results seem robust to the way of allocating firms into size categories. To address this problem, however, we use the average of the two employment measurements to allocate firms.

[13] Recall that the denominator for all percent-change formulae is the sum of current and previous-year's employment. Since previous-year's employment is zero by definition for all births, the formula reduces to 200 times current employment divided by current employment or simply 200.

[14] See Alvarez and Robertson (2004).

[15] We define the border region to consist of the following cities: Mexicali, Tecate, San Luis Río Colorado, Tijuana, Ciudad Acuña, Piedras Negras, Ciudad Juárez, Nogales, and Agua Prieta.

[16] Gender differences in risk aversion have been the subject of growing academic debate. See Schubert et al (1999) for a review of an aspect of this debate.

[17] We thank a referee for this possibility.

[18] An employee is placed in an age category based on his or her age on December 31 of the year listed in the table. For example, if an employee who is 59 on December 31, 1999 is no longer with the establishment on December 31, 2000, we treat this as a separation for the age category 60-65 in the year 2000.

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Table 1: Comparisons with Official Statistics

	Official Stats on Cotizantes		Employment in our Data		Jobs in our Data	
year	empl	percent change	empl	percent change	empl	percent change
1992	8,635,503	--	8,912,347	--	9,018,442	--
1993	8,514,279	-1.41	8,812,949	-1.12	8,890,717	-1.43
1994	8,795,812	3.25	8,995,896	2.05	9,073,308	2.03
1995	8,283,045	-6.00	8,607,030	-4.42	8,669,204	-4.56
1996	8,993,670	8.23	9,294,005	7.68	9,364,274	7.71
1997	10,154,944	12.13	10,546,623	12.63	10,663,211	12.97
1998	11,050,796	8.45	11,140,041	5.47	11,243,559	5.30
1999	11,807,827	6.62	11,770,662	5.51	11,905,464	5.72
2000	12,406,565	4.95	11,635,666	-1.15	11,735,977	-1.43
2001	11,914,225	-4.05	11,137,487	-4.38	11,226,124	-4.44
Means		3.57		2.47		2.43
Std Devs		6.17		5.80		5.96

Notes: Official Statistics come from http://www.imss.gob.mx/ventunica/memoria_2001/2/024000.htm, which is a web site of the Instituto Mexicano del Seguro Social (IMSS). The other statistics from our calculations from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). Employment is defined as the number of people working. Each job is a worker-establishment pair. The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. See text for details.

Table 2: Annual Worker Flows and Job Flows from Mexico from 1986 – 2001

year	(1) net growth perc	(2) access perc	(3) separ perc	(4) sum of access and separ	(5) births	(6) expans	(7) job creat perc	(8) deaths	(9) contrs	(10) job destr perc	(11) sum of creat and destr	(12) excess worker flows
1986	1.2	29.1	27.9	57.0	5.7	9.4	15.1	3.9	10.0	13.8	28.9	28.1
1987	12.8	38.5	25.8	64.3	6.2	17.5	23.7	4.6	6.3	10.9	34.6	29.7
1988	8.9	35.8	26.9	62.7	5.9	12.8	18.7	3.1	6.7	9.8	28.5	34.2
1989	6.3	38.3	31.9	70.2	6.6	11.3	17.8	3.4	8.2	11.5	29.4	40.8
1990	9.5	42.6	33.0	75.6	8.8	13.3	22.1	4.6	8.0	12.6	34.7	40.9
1991	5.7	39.1	33.4	72.4	7.5	11.4	18.9	4.4	8.8	13.2	32.1	40.4
1992	2.0	37.5	35.5	73.0	7.4	10.5	18.0	5.1	10.9	16.0	34.0	39.0
1993	-1.4	34.5	36.0	70.5	6.4	9.3	15.7	6.1	11.0	17.1	32.9	37.7
1994	2.0	37.2	35.2	72.4	6.7	12.4	19.2	5.5	11.6	17.1	36.3	36.1
1995	-4.6	30.8	35.3	66.1	6.0	8.6	14.6	6.6	12.5	19.2	33.8	32.4
1996	7.7	36.3	28.6	65.0	7.0	12.3	19.4	4.9	6.8	11.7	31.0	33.9
1997	13.0	42.7	29.8	72.5	10.0	14.7	24.7	4.7	7.0	11.7	36.5	36.0
1998	5.3	41.0	35.7	76.6	8.6	12.4	21.1	6.2	9.6	15.8	36.9	39.8
1999	5.7	40.4	34.7	75.1	8.2	11.5	19.7	5.7	8.2	13.9	33.6	41.4
2000	-1.4	40.0	41.4	81.5	7.8	9.8	17.6	6.3	12.8	19.1	36.7	44.8
2001	-4.4	40.4	44.8	85.3	7.7	10.6	18.3	7.6	15.2	22.8	41.1	44.2
means	4.3	37.8	33.5	71.3	7.3	11.8	19.0	5.2	9.6	14.8	33.8	37.5

Notes: All Data come from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. See text for details. Several of the columns are algebraically related. Column 1, net employment growth, is equal to the sum of columns 2 and 3. Column 1 is the difference between jobs created (column 7) and jobs destroyed (column 10). Furthermore, the sum of accessions and separations (column 4) can be decomposed as the sum of job creation and destruction (column 11) and excess worker flows (column 12).

Table 3: Average Job and Worker Flows Statistics by Age and Average Size of Establishment

age of estab	net growth perc	accession perc	separation perc	sum of accession and separation	job creation perc	job destruction perc	sum of job creation and destr	excess worker flows
1 <= age < 2	-4.1	57.1	61.1	118.2	32.7	36.7	69.4	48.8
2 <= age < 3	-4.9	48.4	53.3	101.7	22.4	27.3	49.7	52.0
3 <= age < 4	-2.8	46.3	49.1	95.4	20.6	23.3	43.9	51.5
4 <= age < 5	-2.6	43.7	46.3	90.0	18.6	21.1	39.7	50.3
5 <= age < 6	-4.5	40.3	44.7	85.0	16.0	20.4	36.4	48.6
6 <= age < 7	-3.8	39.1	42.9	82.0	15.3	19.1	34.5	47.5
7 <= age < 8	-2.6	38.1	40.7	78.8	14.5	17.1	31.7	47.1
8 <= age < 9	-2.3	37.2	39.5	76.8	14.0	16.3	30.3	46.5
9 <= age < 10	-2.8	36.2	39.0	75.2	13.5	16.3	29.8	45.5
10 <= age < 11	-1.8	36.4	38.2	74.6	13.7	15.5	29.2	45.4
age >= 11	-2.9	25.5	28.4	54.0	7.9	10.8	18.7	35.3
average size of estab								
avesize < 50	4.8	46.6	41.8	88.3	29.0	24.2	53.2	35.1
50 <= avesize < 100	4.7	41.8	37.2	79.0	19.1	14.4	33.5	45.5
100 <= avesize < 250	5.1	40.1	34.9	75.0	17.1	12.0	29.1	45.9
250 <= avesize < 1000	4.3	34.2	29.9	64.1	13.2	9.0	22.2	42.0
avesize >=1000	2.8	23.8	21.0	44.9	9.0	6.2	15.1	29.8

Notes: All Data come from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. Averages by establishment age are from 1996-2001. Averages by establishment size are from 1986-2001. See text for details.

Table 4: Net-Growth Percentages by Establishment-Size Category

	All Industries					Manufacturing					Non-Manufacturing				
year	ave empl < 50	ave empl at least 50 & < 100	ave empl at least 100 & < 250	ave empl at least 250 & < 1000	ave empl >= 1000	ave empl < 50	ave empl at least 50 & < 100	ave empl at least 100 & < 250	ave empl at least 250 & < 1000	ave empl >= 1000	ave empl < 50	ave empl at least 50 & < 100	ave empl at least 100 & < 250	ave empl at least 250 & < 1000	ave empl >= 1000
1986	1.8	-0.3	0.3	-0.6	2.8	-3.2	-5.2	-4.7	-2.3	-2.6	3.6	2.8	4.3	1.5	5.1
1987	10.3	10.7	11.5	14.4	17.1	15.1	14.9	14.6	13.4	8.1	8.6	8.0	9.0	15.7	20.6
1988	11.0	8.2	8.6	8.1	6.7	11.8	10.5	10.5	8.4	9.6	10.7	6.8	7.0	7.6	5.5
1989	8.7	7.4	6.9	4.9	3.0	8.2	8.4	6.3	4.1	3.5	8.9	6.8	7.3	5.9	2.8
1990	14.2	8.1	8.7	5.3	6.4	13.1	6.5	9.1	3.7	0.5	14.6	9.1	8.3	7.0	8.9
1991	9.3	5.1	5.0	3.7	2.0	6.1	3.5	3.2	3.0	4.3	10.3	6.1	6.5	4.5	1.0
1992	3.6	3.9	1.5	0.3	-0.1	-0.8	0.8	-1.3	-1.7	-1.9	4.9	5.7	3.6	2.4	0.7
1993	-2.9	-1.1	0.1	-2.1	0.7	-8.2	-4.1	-3.1	-2.9	1.0	-1.3	0.4	2.4	-1.3	0.6
1994	0.7	3.8	3.9	6.6	-1.3	-2.4	2.4	2.9	4.5	6.2	1.6	4.5	4.7	8.5	-4.6
1995	-8.7	-6.2	-4.1	-2.4	0.8	-10.8	-3.4	-1.3	0.1	2.0	-8.1	-7.5	-6.0	-5.0	0.3
1996	7.9	8.8	10.3	8.5	5.1	12.3	14.3	13.0	11.7	7.8	6.7	6.0	8.3	5.2	3.8
1997	15.1	16.6	15.6	14.5	5.7	14.1	15.3	14.4	15.4	7.9	15.4	17.3	16.4	13.5	4.5
1998	6.3	7.4	8.6	7.1	-0.4	7.1	8.3	9.0	7.5	4.9	6.0	6.9	8.2	6.7	-3.7
1999	6.4	6.0	7.3	4.9	4.4	5.8	5.6	8.6	7.2	7.4	6.6	6.2	6.4	2.6	2.3
2000	-4.8	0.0	1.7	0.8	-0.7	-7.6	-5.3	-0.1	1.0	4.5	-4.1	2.3	2.8	0.5	-4.7
2001	-2.0	-3.9	-3.4	-6.0	-7.4	-8.8	-12.4	-11.1	-10.6	-17.0	-0.2	-0.3	0.8	-1.8	-0.4
means	4.8	4.7	5.1	4.3	2.8	3.2	3.8	4.4	3.9	2.9	5.3	5.1	5.6	4.6	2.7

Notes: All Data come from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. See text for details.

Table 5: Net-Growth Percentages:
Comparing the Border to the Country as a Whole

year	northern border			rest of Mexico		
	all inds	manuf	non manuf	all inds	manuf	non manuf
1986	3.0	0.2	5.6	1.1	-3.7	3.6
1987	15.6	22.0	9.2	12.5	12.1	12.7
1988	13.6	18.5	7.9	8.5	8.9	8.2
1989	8.1	8.5	7.8	6.1	5.4	6.5
1990	6.6	4.5	9.2	9.8	7.0	11.2
1991	5.5	6.4	4.6	5.7	3.9	6.6
1992	4.4	5.4	3.3	1.7	-2.2	3.5
1993	3.2	6.2	-0.6	-1.9	-5.5	-0.3
1994	10.1	13.5	5.4	1.2	0.4	1.5
1995	4.3	7.4	-0.2	-5.6	-5.0	-5.8
1996	10.3	11.4	8.7	7.4	11.4	5.7
1997	12.7	11.8	14.1	13.0	13.5	12.8
1998	6.6	6.9	6.2	5.1	7.1	4.3
1999	7.3	7.8	6.6	5.5	6.9	4.9
2000	1.5	3.9	-2.2	-1.8	-1.4	-2.0
2001	-11.8	-17.9	-2.5	-3.5	-10.9	-0.2
means	6.3	7.3	5.2	4.1	3.0	4.6

Notes: All Data come from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. The border region is defined to contain the following cities: Mexicali, Tecate, San Luis Río Colorado, Tijuana, Ciudad Acuña, Piedras Negras, Ciudad Juárez, Nogales, and Agua Prieta. See text for details.

Table 6: Net-Growth Percentages for Men and Women by Firm Age

firm age	average net perc for men	average net perc for women	average diff in net perc	average perc of male empl	average perc of female empl
less than 1	200.0	200.0	0.0	7.2	5.9
1 to 2	-7.9	6.9	-14.8	6.3	6.1
2 to 3	-7.8	-2.4	-5.5	5.5	5.6
3 to 4	-5.6	-4.5	-1.1	5.0	5.1
4 to 5	-5.6	-3.9	-1.8	4.4	4.6
5 or more	-3.9	-2.3	-1.6	71.6	72.7

Notes: All Data come from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. Averages are from the 1990-2001 results. See text for details.

Table 7: Average Job and Worker Flows Statistics by Age of Worker

worker age	net growth perc	acc perc	change in acc perc from previous category	sep perc	change in sep perc from previous category	creat perc	change in creat perc from previous category	destr perc	change in destr perc from previous category
15 <= age < 20	49.0	93.1	--	44.0	--	65.3	--	16.3	--
20 <= age < 25	7.9	51.9	-41.1	44.0	0.0	28.1	-37.2	20.2	3.9
25 <= age < 30	1.5	37.3	-14.6	35.9	-8.1	20.7	-7.5	19.2	-1.0
30 <= age < 35	0.0	30.7	-6.6	30.6	-5.2	18.5	-2.2	18.4	-0.8
35 <= age < 40	-0.3	27.2	-3.5	27.5	-3.1	17.7	-0.8	18.0	-0.4
40 <= age < 45	-1.0	24.4	-2.7	25.4	-2.1	17.1	-0.6	18.0	0.0
45 <= age < 50	-1.7	22.6	-1.9	24.2	-1.1	16.6	-0.4	18.3	0.3
50 <= age < 55	-2.5	21.3	-1.3	23.8	-0.4	16.3	-0.3	18.9	0.6
55 <= age < 60	-3.2	20.7	-0.6	23.8	0.0	16.2	-0.1	19.4	0.5
60 <= age < 65	-16.3	20.0	-0.7	36.3	12.5	15.3	-0.9	31.6	12.3

Notes: All Data come from Social Security Records from the Instituto Mexicano del Seguro Social (IMSS). The denominator for all percent changes is the average of employment in the current and previous year. Employment measurements are taken on December 31 of every year. Averages are from the 1986-2001 results. See text for details.

Figure 1: Mexican Macroeconomic Indicators: 1987-2002

Unemployment
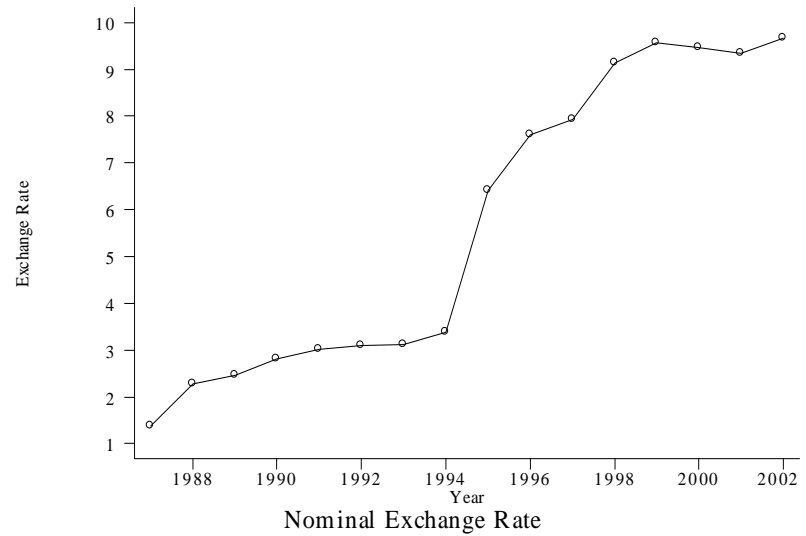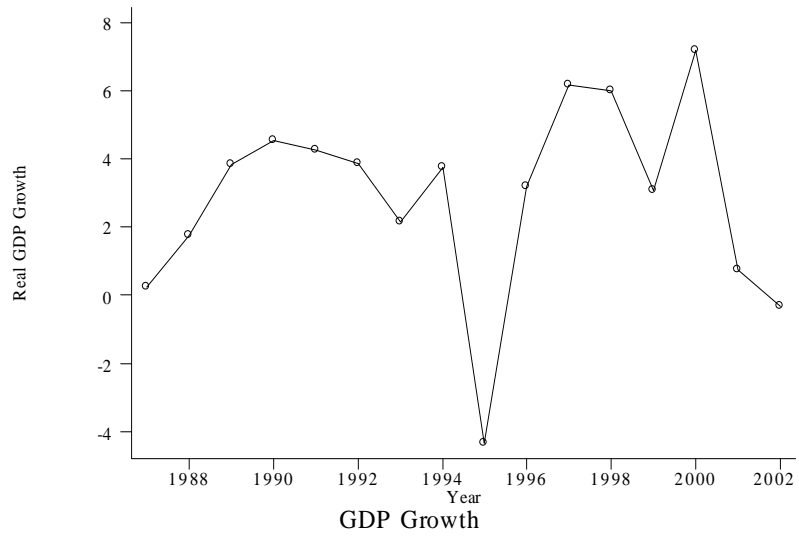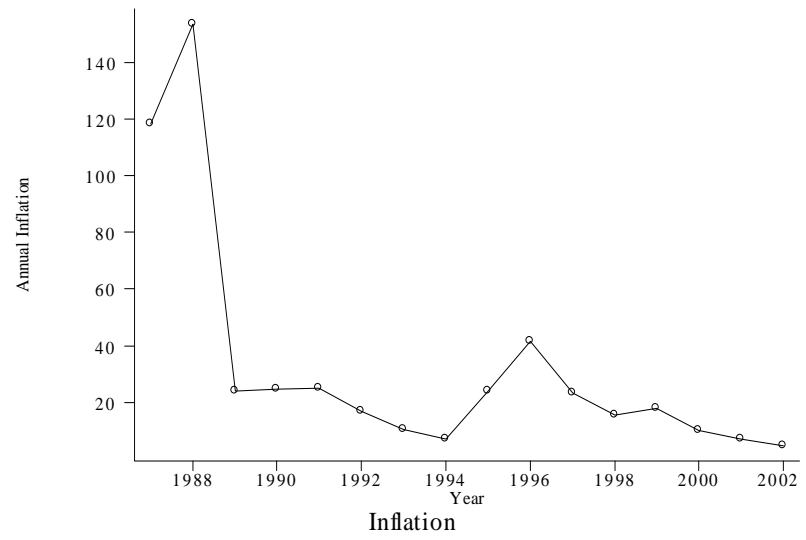

Inflation

GDP Growth

Nominal Exchange Rate

Figure 2: Trends in Worker and Job Flows in Mexico: 1986-2001