GROSS FLOWS OF FORMAL AND INFORMAL WORKERS IN THE MEXICAN LABOR MARKET*

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Resumen: Se hace un análisis sobre doce flujos brutos de trabajadores en México, para ello se considera la condición de empleo informal, asi como un análisis temporal y cíclico. Los flujos hacia y desde la inactividad son relativamente grandes. El riesgo de ser informal es mayor para los hombres y los trabajadores veteranos, mientras que el riesgo de caer en la inactividad es mayor para los jóvenes y las mujeres. Los flujos tienen fuertes componentes temporales y el análisis cíclico muestra que todos los flujos hacia y desde el desempleo tienen características contracíclicas. Los trabajadores femeninos son el grupo más afectado por el ciclo de negocios.

Abstract: This paper is an analysis of twelve gross flows of workers in the Mexican labor market considering the condition of informal employment. It also contains a seasonal and cyclical analysis. Flows in and out of inactivity are relatively large. The hazard of employment in the informal sector is higher for male and older workers, while the hazard of economic inactivity is higher for younger and female workers. The gross flows have strong seasonal components and the cyclical analysis shows evidence that all gross flows into and out of unemployment have countercyclical patterns. Female workers are the group that is least affected by the business cycle.

Clasificación JEL/JEL Classification: J63 and J64.

Palabras clave/keywords: flujos brutos de trabajadores, informalidad, propiedades cíclicos brutos, temporalidad en los mercados de trabajo, desempleo, gross flows of workers, informality, cyclical properties of gross flows, seasonality in labor markets, unemployment.

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1.Introduction

Changes in absolute levels of unemployment and employment are usually small in most economies. In the Mexican labor market, aggregate unemployment has remained relatively low, and has shown little change over time compared with other developed countries. When looking at the official unemployment statistics from 2005 to 2011, the average rate of unemployment in Mexico was relatively stable, about 4.4% with a standard deviation of 0.88. Canada had a higher mean unemployment of about 7% with standard deviation of 0.99, and US had a mean unemployment of 6.85% with a 3.2 standard deviation in the same period. The US had a larger unemployment rate and greater fluctuation during this period due to the financial crisis in 2008. Just looking at these simple statistics it seems that the Mexican official unemployment is lower and fluctuates much less than the US and Canada. However, just examining the stability of the aggregate unemployment rate does not offer information about how often workers enter the labor force and stay employed or unemployed.

The absolute numbers (stocks) of workers employed, unemployed or outside the labor force are the most common labor statistics available. Using these statistics, the unemployment rate and other important indexes can be easily estimated. But gross flows of workers also provide important information for policy makers in charge of macroeconomic policy and stability. The flows and transitions help us to understand how often people change their labor status over time, and this information has important macroeconomic implications. The information on the cyclical components of gross flows of workers is relevant for researchers as well as policy makers because it helps us to understand the dynamic characteristics of the labor market during periods of economic downturn and recovery. Information like this may help to construct anticyclical policies at macro-level, but also to understand workers' behavior and heterogeneity on a more micro level. For example, understanding the labor flows of young and female workers may help policymakers to develop specific policies to promote stable employment for these groups.

This paper contains an analysis on the gross flows of Mexican workers using the microdata from the *Mexican National Survey of Employment and Occupations* (ENOE) from 2005 to the first quarter of 2012. The ENOE began in 2005 as the result of merges and improvements in some previous labor surveys. This new survey is representative for the whole country rather than only urban workers as in previous labor surveys.

Although the ENOE is reliable and consistent, we must also keep in mind that this survey continues to differ from labor surveys in other countries. For example, the differences between Mexico and the US-Canada labor aggregates go beyond the mere methodologies of the labor surveys: it has to do with the different methods of household accounting. The tax system in US and Canada request adult population to keep a basic accounting of their households, making easier to separate household income from that of a family business. In Mexico, not all households are required to file income tax returns, and most family businesses do not separate their accounts from that of the household itself. This leads to a problem often referred in the economic literature as the informal economy. The reason for, and nature of, informality is still an ongoing debate. One explanation might be that the Mexican labor market has different institutional arrangements which are said to produce an informal sector and reproduces other types of jobs (workers) commonly known as "informal workers". Gong and Van Soest (2002) summarize the two views about informal sector. The first view is that informal jobs are secondary jobs and workers might prefer to work in the formal sector, which is rationed. In this view informal employment is a buffer between formal employment and unemployment. The second view is that workers are heterogeneous but choose optimally to be informal or formal depending in their marginal productivities.

The *Instituto Nacional de Estadística, Geografía e Informática*, INEGI, defines informal employment (occupation) as employment in an economic unit that uses resources from the household but without legally becoming a firm, so that its activities cannot be differentiated from the activities of the household itself. This is the official concept of informality that is included in the ENOE and used throughout this paper to separate formal and informal employment.

Literature about gross flows of workers in Mexico is scarce. Bosch and Maloney (2007) wrote a well-known work of gross flows in Mexico. They include information on gross flows and transitions, which are estimated for urban workers, and consider the option of employment in the informal sector. They estimate the transition of work categories using longitudinal data from the *Mexican National Survey of Urban Employment* (ENEU) from 1987 to 2002, which is a predecessor of the ENOE. The main problem of their work is that the data used was only representative for urban workers in some large cities.

Levy (2008) conducted a comprehensive study on worker conditions in the labor market with the presence of informality. He offers an analysis of worker mobility using data from the Mexican Insti-

tute of Social Security (IMSS). His analysis shows how often workers remain in the formal sector, considering income and individual differences. He also analyzes aggregate employment data, in order to compare the percentage of formal and informal workers, using the ENEU from the years 1998 and 2001 as well as the ENOE from 2006. He does not estimate any kind of flows or transitions in the labor market. Similarly, Kaplan, Martinez and Robertson (2007) studied the employment dynamics in Mexico also using the IMSS data. They matched workers and firms to develop a measure of access and job separation in order to identify net job creation and destruction. The limitation of this analysis is that the IMSS data is only available for the formal sector.

Blanchard *et al.*(1990) wrote a pioneering analysis of gross labor flows for US. They estimate the gross flows using adjusted data and estimate the seasonal and cyclical properties of the flows. They use the *Current Population Survey* (CPS) dataset from 1968 to 1986 and disaggregate data by age and sex. They also include a simple model to analyze the cyclical behavior of workers. The estimation of adjusted gross flows follows the methodology of Abowd and Zellner (1985) to estimate the missing observations in the CPS every month. Jones (1993) analyzed of gross flows of labor for Canada using the Labor Force Survey, which contains monthly data from 1976 to 1991. He employs unadjusted data to estimate the flows and captures the seasonal and cyclical properties of the Canadian gross flows of workers. Jones and Riddell (1998) conducted a similar analysis of gross flows using comparable unadjusted data for US and Canada.[1] Other authors, such as Davis and Haltiwanger (1998), and Faberman and Haltiwanger (2006) analyze gross flows but the focus is on workers turnover and the forces that determinate the creation and destruction of jobs in order to analyze the influences of the flows of workers as well as job creation.

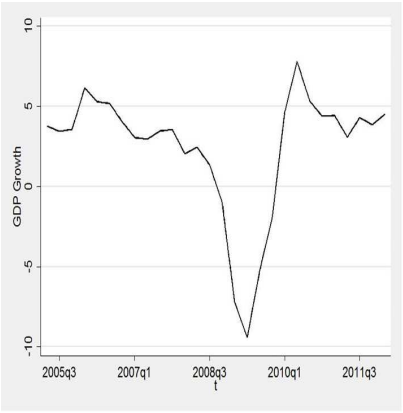
The present paper follows a similar approach as in Blanchard *et al.* (1990) and Jones (1993). The advantage of matching workers' labor status over time is useful to understand the transitions inside the labor market. We are not analyzing job creation or destruction but the cyclical analysis intuitively shows how gross worker flows behave during times when both job creation and destruction are high. Our

[1] In longitudinal surveys there is a loss of information due to non-random factors like people dropping out of the sample voluntarily. The difference between adjusted and unadjusted data is that adjusted data contains estimations of the data loss using statistical techniques. Abowd and Zellner (1985) offer a statistical procedure to estimate de loss of information for the American CPS.

objective is twofold: First, to estimate the gross flows and transitions of workers in the Mexican labor market using unadjusted data;[2] and second, to test empirically possible cyclical properties of these flows.

In addition, we established an additional objective: to highlight the dynamic characteristics of the Mexican labor market in the presence of informal employment. To this end, we use twelve flows instead of the traditional six flows analysis of Blanchard *et al.* (1990) and Jones (1993). We denote four labor market categories as: Not-in-the-labor force (N), formal employment (EF), informal employment (EI) and unemployment (U).[3] We also disaggregate the total flows by age and sex in order to consider some important individual characteristics. The period of analysis includes a short expansion phase of the Mexican GDP from the first quarter of 2005 to the first quarter of 2006, a contraction phase from the second quarter of 2006 to the second quarter of 2009 and a recovery phase from the third quarter of 2009 to 2012. Figure 1 shows the evolution of the real GDP growth rate of Mexico during this period.

Figure 1
Mexican real GDP growth from 2005 to 2012



[2] Jones and Riddell (1998) give a full explanation of how the unadjusted flows are useful for labor market analysis. Blanchard *et al.* (1990) also shows how the unadjusted data can render acceptable results.

[3] The subdivision into twelve flows can be turned back into six if we sum up the flows of informal employment (EI) and formal employment (EF) to get total employment (E). But this is not true for the transitions probabilities, which must be re-estimated.

The organization of this work is as follow: the first section is a brief introduction, the second contains the analysis of the gross flows for a quarterly dataset from 2005 to 2012; the third presents an analysis of the cyclical properties of the gross flows. Section four contains the conclusions and final comments.

2. Gross flows from 2005 to 2012

Labor flows of workers are affected by several factors on both the supply and the demand side of the labor market. The move from one labor category to another could be due to individual motives or to external forces governing the macroeconomy or the business environment. On the supply side, we have several individual factors that induce people to change labor status. These individual factors could be health issues, schooling, marriage, child birth, job satisfaction, family reallocation, etc. Informal workers may have their own reasons for moving into this category including factors such as the cost of compliance with different regulations, flexible working hours and job conditions, low cost of mobility and reallocation, etc.

Factors from the demand side include demand segmentation, foreign trade policy, macro-financial stability, economic crisis, bankruptcies of large corporations, etc. For these sorts of factors, there are several possible reasons for accepting work in the informal sector, including the segregation caused by unions and trades, asymmetric information, etc. As there is no consensus about the nature of informal employment, we do not intend to give an explanation for these specific flows, but to show each of the flows and their cyclical properties.

We must also consider some other problems facing the estimation of the gross flows like misclassification errors and missing observations. Blanchard *et al.* (1990) and Jones (1993) give a full explanation of these problems in the case of obtaining gross flows from panel data of labor statistics. Missing observations may occur in the survey itself and the degree of correlation of this problem with the labor market activity is not well known. Thus, we cannot infer how employment status has changed for people whose information is missing. The loss of information from non-random reasons is about 20% in the ENOE Sample. Another problem we face is that of spurious transitions due to the misclassification errors in the survey. The degree to which this is a problem in our sample is not known, but we assume that the

errors in different stages offset each other.[4] Although we use unadjusted data, the information obtained is still of much relevance and allows us to estimate the changes in the level of each group and to use weights to get very close to the population totals.

The Mexican labor force contains approximately 45 million people, and a little more than 2 million of these people are unemployed every quarter. As already observed, the unemployment level is relatively low but we do not know how often workers move in and out of this category. We use the official definitions of unemployment and informality formulated by the INEGI. The period under study is January 2005 to March 2012, using the convention that the flow is dated from the beginning of the immediate quarter. Labor statistics from a nation-wide representative sample became available only with the ENOE in 2005, which brings our period of analysis to only 28 consecutive quarters. A positive aspect of this sample is that during this period a major financial crisis occurred with a short but distinctive business cycle,[5] which offers the opportunity to observe some cyclical characteristics of gross flows.

We also disaggregate total flows and stocks by sex and age groups including also the respective hazards[6] (see Table 1). We set the upper limit of age for the group of young workers to 29 years old rather than the 25 year-old limit of Jones (1993). The main reason for this is to include late-comers to the labor market, in order to better capture the dynamic characteristics of this group.[7]

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[4] Misclassification is problematic because one single error can produce two bad records, producing spurious transitions. Misclassification might also be caused by the way the interview is carried out within every survey. Interviews by phone or in person might render different levels of misclassification errors. For that reason the CPS in US requires re-interviews to respondents in order to correct for misclassification. The ENOE uses direct personal interviews by qualified personnel, so we assume that misclassification errors are a minor problem related only to the interviewer's skills.

[5] The definition of business cycle here is perhaps closest to the Juglar- fixed investment cycle.

[6] A "Hazard" contains information on the transition probabilities of each flow. For example, PUEF is roughly the probability of becoming employed in the formal sector (EF) after being unemployed (U). The concept of hazard is similar to that of Jones (1993).

[7] Levy (2008) in his chapter of mobility defines young workers as those who are up to 30 years old and concludes that these workers have a higher rate of mobility than older workers. He uses an index called Frequency of Mobility in order to analyze aggregate entries and exits of workers using IMSS data.

The absorption capacity of the labor market is limited, and asymmetric information is also a problem in the Mexican labor market, so it is possible that proper matching might not be efficient (Levy, 2008:94).

Table 1 shows mean gross labor flows in four groups of workers. The most interesting aspect of the total gross flows in Mexico is perhaps the size of the flows and the heterogeneity. The category not-in-the-labor force (N)[8] has the largest flow into and out of employment, either formal or informal. Every quarter, more than 5 million workers move in and out of inactivity. The monthly average is relatively large compared to those in the US or Canada. Although the absolute flows for formal workers are larger than for informal, this has to do with the fact that informal workers are account for only 25 percent of the total labor force. As can be seen in table 1, the PEFN hazard, i.e. the probability (transition) of becoming Not-in-the-labor force after being employed in the formal sector, is lower than the PEIN hazard, which is the probability (transition) of becoming Not-in-the-labor force after being employed in the informal sector, meaning that informal workers are more likely to become economically inactive than formal workers. On the other hand, PNEF hazard, the probability (transition) of becoming employed in the formal sector after being Not-in-the-labor force is larger than PNEI, the probability (transition) of becoming employed in the informal sector after being Not-in-the-labor force, meaning that is more likely for inactive individuals move to formal jobs rather than to informal. This is especially true for male workers.

Other large flows are those inside the category of employment itself: EFEI, the flow from employed in the formal sector to employed in the informal sector, and EIEF, the flow from employed in the informal sector to employed in the formal sector. These categories show that workers move from formal to informal employment and back very often. The category PEIEF, the probability (transition) of becoming employed in the formal sector after being employed in the informal sector is almost three times larger than the PEFEI, the probability (transition) of becoming employed in the informal sector after being employed in the formal sector, which means that the probability of moving to a formal job after being in the informal sector is three times larger. This also means that either the family business has become a formal business, or some family members have become

[8] All the original phrases for the acronyms used in this section can be found in the appendix.

independent, and have established a formal firm, following the definition of the INEGI. Moreover, the hazard category PEFEI is very large, even among sub-groups, with the only exception being the sub-group of female workers, which shows the lowest probability of moving to the informal sector after having been employed in the formal sector. The PEIEF hazard category, the probability (transition) of becoming employed in the formal sector after being employed in the informal sector is larger for male and young workers than for other categories of workers, which means that male and young workers have a greater probability of becoming employed in the formal sector after having been employed in the informal sector.

The absolute values of gross flows in and out of unemployment are generally low but the hazards of these flows show large differences. For example, the hazard category PEIU, the probability (transition) of becoming unemployed after being employed in the informal sector, is high for all workers except for female workers. With respect to the probability of becoming economically inactive, female workers show higher rates than men. The PUEF hazard, that is, the probability (transition) of becoming employed in the formal sector after being unemployed is almost the same for young and old workers but larger for male workers, and smaller for female workers. Interestingly, the PUEI hazard, i.e. the probability (transition) of becoming employed in the informal sector after being unemployed, is larger for old and male workers. This result is rather puzzling. If the informal jobs are secondary, it might be logical to think that the groups associated with informal work are young people and women. In this case, informal jobs would be considered a middle ground between unemployment and formal work. Table 1 shows that the probability of moving to the informal sector after being unemployed (PUEI) is larger for male and old workers and much lower for younger and female workers. A suggested interpretation might be that informal jobs are not temporary or marginal, but are instead a real and optimal choice similar to formal jobs.

Table 1
Mean quarterly flows and hazards 2005-2012

	Total	*Young*	*Old*	*Male*	*Female*
Stocks					
Employed	44 098 668	14 722 600	29 376 068	27 612 031	16 486 636

Table 1
(*continued*)

	Total	*Young*	*Old*	*Male*	*Female*
Stocks					
EF	33 368 569	11 724 462	21 644 107	21 098 895	12 269 674
EI	10 730 098	2 998 137	7 731 961	6 513 136	4 216 962
Unempl.	2 056 991	1 164 161	892 830	1 261 898	795 093
Not in the labor force	36 547 084	18 896 878	17 650 207	10 295 249	26 251 836
Flows					
EFEI	2 610 799	763 844	1 846 955	1 831 657	779 142
EFN	3 304 510	1 293 371	2 011 139	1 180 095	2 124 414
EFU	570 189	294 728	275 461	385 747	184 442
EIEF	2 618 372	798 017	1 820 355	1 832 372	785 999
EIN	2 067 727	676 117	1 391 610	614 326	1 453 401
EIU	278 459	117 294	161 165	221 646	56 813
NEF	3 404 730	1 428 181	1 976 549	1 559 312	1 845 419
NEI	2 123 565	721 010	1 402 555	759 853	1 363 712
UN	540 942	337 717	203 224	236 403	304 539
UEF	581 079	309 641	271 437	382 379	198 700
UEI	288 677	118 404	170 273	228 025	60 652
UN	495 283	284 686	210 597	189 843	305 439
Hazards					
PEFEI	0.096	0.089	0.098	0.107	0.076
PEFN	0.121	0.151	0.107	0.069	0.207
PEFU	0.021	0.034	0.015	0.023	0.018
PEIEF	0.246	0.267	0.237	0.288	0.183
PEIN	0.194	0.226	0.181	0.096	0.337
PEIU	0.026	0.039	0.021	0.035	0.013
PNEF	0.122	0.120	0.124	0.209	0.090
PNEI	0.076	0.060	0.088	0.102	0.067

Table 1
(*continued*)

	Total	*Young*	*Old*	*Male*	*Female*
Hazards					
PNU	0.019	0.028	0.013	0.031	0.015
PUEF	0.352	0.353	0.350	0.386	0.301
PUEI	0.172	0.133	0.216	0.227	0.090
PUN	0.297	0.323	0.268	0.189	0.458

3. Cyclical components of Mexican gross flows

One traditional approach to analyzing seasonality of time series is the dummy variable model, which assumes that the observed series is the sum of three principal parts: a seasonal component, a trend, and an error or noise. This approach is explained in Plosser (1979) as follows:

$$y_t = y_t^c + \sum_{q=1}^{n} \alpha_q d_{qt} + \varepsilon_t$$

where y_t^c is the trend, usually represented by a polynomial function in t, α_q represents an estimated mean of the quarter q, d_{qt} represents the dummy variable which capture the seasonal component, and ε_t is the error which also can be interpreted as a non-seasonal component. The above equation is the traditional approach for seasonal analysis of times series. It can also be used for decomposing series into seasonally adjusted series. We can also include additional functions in order to analyze business cycles using this approach as benchmark.

This section contains information about the seasonal (short cycles) and cyclical features of the gross labor flows. First we performed an analysis of seasonality of the gross flows using the above equation. The ENOE survey is dated quarterly instead of monthly, limiting our ability to see seasonal components in detail. Despite this loss of information, we still used quarterly flows to capture on average the seasonal mobility of workers. We estimated the seasonal components

in a similar way as in Jones (1993), but using the regressed values of every gross flow on quarterly dummies rather than the traditional monthly dummies. The standard error of the predicted values is used to capture the seasonal components and the standard error of the residuals is used to capture the non-seasonal part. These standard deviations are shown in Table 2. The analysis shows that the seasonal components σ_s are usually larger than non-seasonal components σ_n in most cases. Only the flows of young workers from formal employment to informal employment (EFEI) and from informal employment to formal employment, (EIEF), and the flow of female workers from formal employment to unemployment (EFU) and from inactivity to formal employment (NEF), show larger non-seasonal components.

Another way to look at the effect of seasonality on gross flows is as a percentage of the variance of the seasonal and non-seasonal components over the variance of the predicted value of the flows: $\frac{\sigma_s^2}{\sigma^2}$ and $\frac{\sigma_n^2}{\sigma^2}$. Table 3 shows the relative size in percentage of the seasonal effects on the gross flows by groups. In general, the gross flows of young and female workers are the least affected by seasonality. The flows from employed in the informal sector to unemployed (EIU) and from unemployed to employed in the formal sector (UEF) are strongly seasonal for young workers and the flows from employed in the informal sector to Not-in-the-labor force (EIN) and from unemployed to employed in the informal sector (UEI) are the strongest for female workers. For male and old workers all flows are strongly seasonal. The largest seasonal effects of gross flows for old workers are in the categories of employed in the informal sector to Not-in-the-labor force (EIN) and of Not-in-the-labor force to employed in the formal sector (NEF) while the EIN and UEF are the largest for male workers. We cannot specify the month of the year for which the flows are the highest or the lowest, since the data is quarterly. But it is clear that the aggregate quarterly data also show some seasonality which deserve analysis, especially for those in charge of public policy.

Table 2
Seasonal components of gross flows 2005q2-2012q1

Flow	*Total*			*Young*			*Old*			*Male*			*Female*		
	σ	σ_s	σ_n	σ	σ_s	σ_n	σ	σ_s	σ_n	σ	σ_s	σ_n	σ	σ_s	σ_n
EFEI	122	102	68	40	24	32	103	83	60	84	67	51	50	42	27
EFN	218	185	115	88	68	56	150	127	80	124	104	67	108	85	66
EFU	118	91	75	51	41	30	69	51	47	87	68	54	35	24	25

Table 2
(*continued*)

Flow	*Total*			*Young*			*Old*			*Male*			*Female*		
	σ	σ_s	σ_n	σ	σ_s	σ_n	σ	σ_s	σ_n	σ	σ_s	σ_n	σ	σ_s	σ_n
EIEF	130	99	84	39	21	33	106	78	72	87	64	58	55	41	37
EIN	190	171	84	59	48	34	139	125	61	78	67	39	120	105	58
EIU	73	60	42	28	24	15	47	37	29	59	48	35	15	12	8
NEF	182	149	104	104	78	70	128	115	57	123	108	60	77	48	60
NEI	201	170	108	54	41	35	156	134	81	85	73	43	125	100	75
NU	129	104	76	73	60	41	60	48	37	61	50	35	73	58	44
UEF	116	101	58	57	48	30	63	55	31	84	73	42	35	30	19
UEI	79	67	42	31	26	17	50	41	29	64	52	38	18	16	8
UN	116	99	61	57	48	30	61	52	32	52	45	27	67	55	39

Notes: σ is the standard deviation of the flow, σ_s shows the standard deviation of the predicted values which is considered the seasonal components and σ_n is the standard deviation of the residuals which shows the non-seasonal components.

Table 3
Seasonal components of gross flows 2005q2-2012q1

Flow	*Total*		*Young*		*Old*		*Male*		*Female*	
	Seasonal	*Non seasonal*	*Seasonal*	*Non seasonal*	*Seasonal*	*Non seasonal*	*Seasonal*	*Non seasonal*	*Seasonal*	*Non seasonal*
					(%)					
EFEI	69	31	35	65	66	34	63	37	72	28
EFN	72	28	59	41	72	28	71	29	62	38
EFU	60	40	64	36	54	46	62	38	49	51
EIEF	58	42	30	70	54	46	54	46	55	45
EIN	81	19	66	34	81	19	75	25	77	23
EIU	67	33	73	27	61	39	65	35	71	29
NEF	67	33	55	45	80	20	76	24	39	61
NEI	71	29	58	42	73	27	74	26	64	36
NU	65	35	68	32	63	37	67	33	63	37

Table 3
(*continued*)

Flow	*Total*		*Young*		*Old*		*Male*		*Female*	
	Sea-sonal	*Non seaso-nal*	*Sea-sonal*	*Non seaso-nal*	*Sea-sonal*	*Non seaso-nal*	*Sea-sonal*	*Non seaso-nal*	*Sea-sonal*	*Non seaso-nal*
					(%)					
UEF	75	25	73	27	75	25	75	25	72	28
UEI	72	28	71	29	67	33	65	35	82	18
UN	73	27	72	28	73	27	74	26	67	33

Notes: The column with seasonal component shows the percentage of seasonality on the variation of the predicted values of the flows $\frac{\sigma_s^2}{\sigma^2}$. The non-seasonal column shows the percentage of non-seasonal component on the total variation of the predicted values of the flows $\frac{\sigma_n^2}{\sigma^2}$.

Figure 2 is a bar plot of the seasonal coefficients from the OLS regressions by groups. It shows that moving from formal to informal employment and back (EFEI and EIEF) is more frequent in the first quarter. It shows that leaving employment for inactivity (EFN and EIN) also happens more often in the first quarter. Here the decision to change labor status might be facilitated by the yearly bonus (*aguinaldo*) and other fringe benefits that allow workers to change jobs or just become inactive. The flows from unemployment into the formal and informal sectors, UEF and UEI, peak in the last quarter of the year, as do flows from economic inactivity to the informal sector, NEI, perhaps following the seasonal pattern of retail sales due to high demand at the end of every year. Business hire more personnel in this quarter, due to increased sales projections for the end of the year along with higher household consumption. The flows from informal employment and economic inactivity into unemployment (EIU and NU) are the highest in the third quarter, usually a time where some workers begin looking for new positions.

Other useful tools for cyclical analysis are scatter plots, presented here in figures 3 and 4 with the gross flows and hazards plotted along a cubic spline. This spline is allowed to change at the end of the recession. A vertical line is set at the first quarter of 2009 to divide the recession from the recovery. From figure 3 we observe that all flows in and out of unemployment (EFU, EIU, NU, UEF, UEI and UN) have

a distinctive italic-style "S" shape spline. An intuitive interpretation of these figures is that the flows in and out of unemployment increase during a downturn in economic activity and decrease during economic recovery. A similar shape is shown for the PEFU, PEIU and PNU, the hazards associated with moving into unemployment from the other sectors, in figure 4.

Figure 2

Seasonal components of gross flows
(*Thousands*)

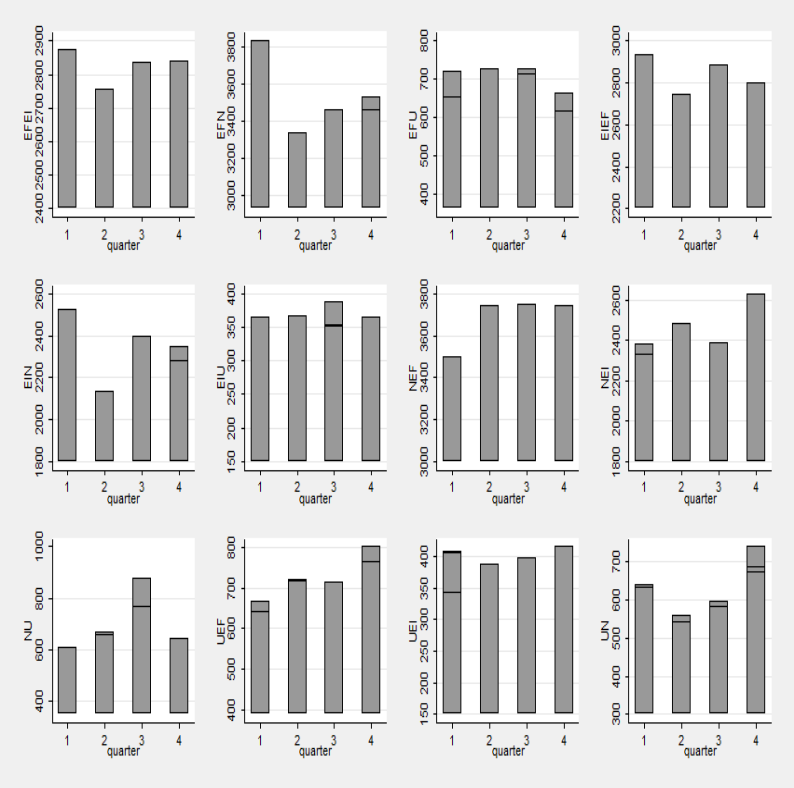
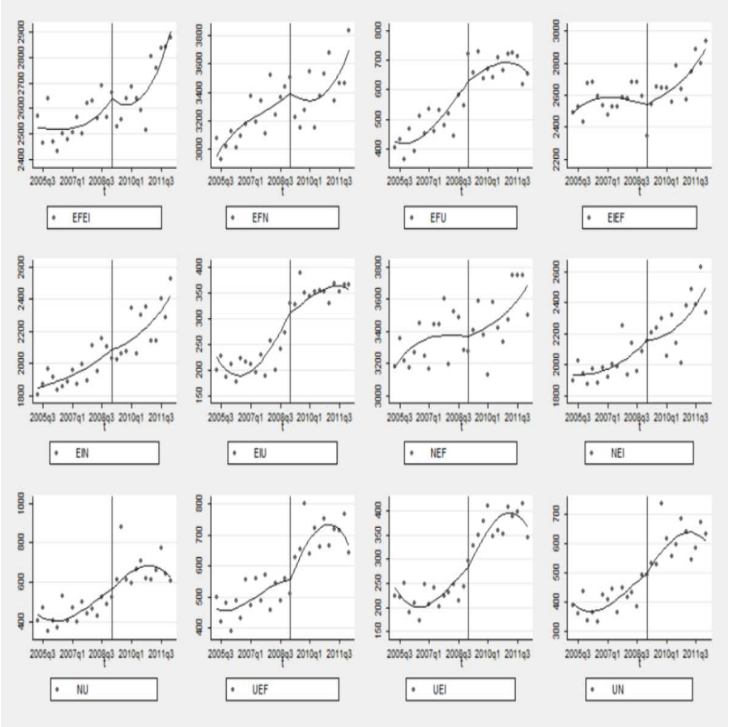


Figure 3
Gross flows
(*Thousands*)



We can also express the flows and hazards net of seasonal dummies, as in figures 5 and 6. In addition to the vertical line that divides the recession and the recovery, we also added a horizontal line to divide the negative and positive flows and hazards net of seasonal components. In this way we constructed a graph with four quadrants to examine the properties of the flows and hazards along the business cycle. For example, if the flows are counter cyclical then flows must be negative but increasing (third quadrant) during the recession and positive but decreasing during the recovery (first quadrant). Furthermore, we made a separate linear fit during the recession and during the recovery. Using this simple analysis, we observe in figure 5 that the flows into unemployment (EFU, EIU, NU), and the flows

out of unemployment (UEF, UEI and UN) are negative net of seasonal components in the third quadrant and positive flows in the first quadrant. The linear fit of the first three flows have positive slope during recession and negative during recovery, while the last three have positive slopes in both periods. A similar analysis is performed on the hazards net of seasonal dummies in figure 6. The dispersion is much larger with hazards than with flows and only the PEFU, PEIU and PNU, the hazards of moving into unemployment, show evidence of counter cyclical components. But figure 6 also shows some peculiarities, including a pro-cyclical PUEF hazard that follows the business cycle, positive but decreasing flows net of seasonal components during recession (second quadrant) and negative but increasing flows during recovery (fourth quadrant).

Figure 4
Hazards

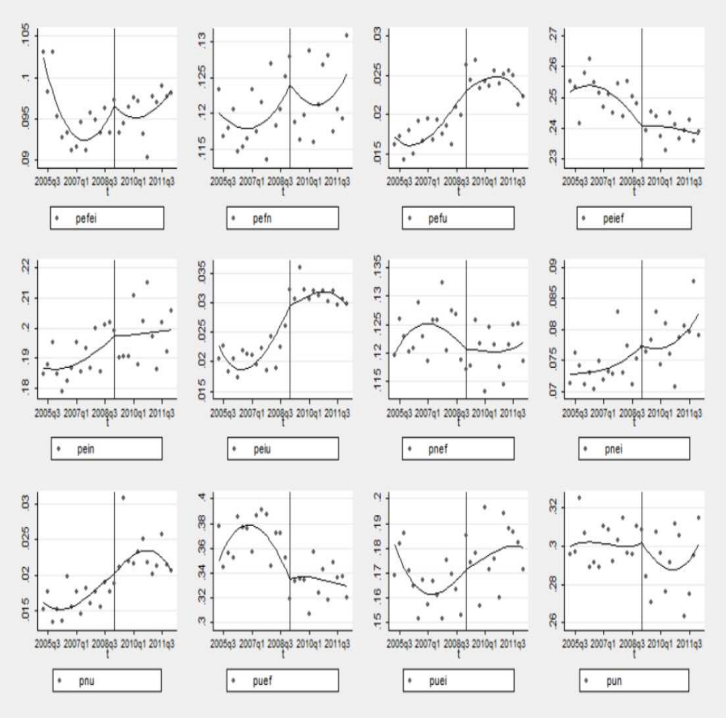
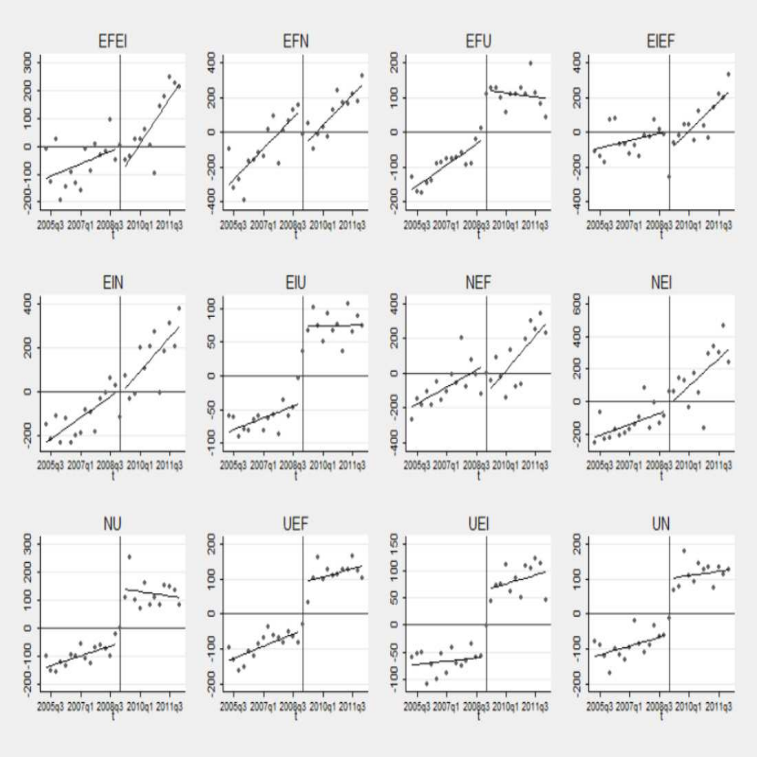
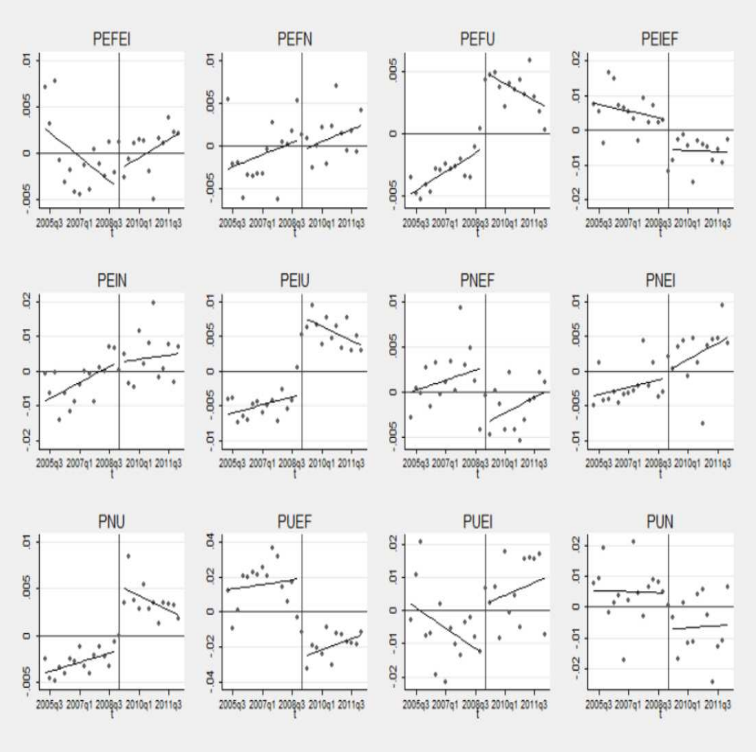


Figure 5
Gross flows net of seasonal dummies



A standard statistical analysis is needed to confirm these findings. The period under analysis includes a downturn and then a recovery of economic activity related to a short business cycle that might allow us to make statistical tests to detect cyclical properties. So we added an additional variable to detect such properties. We used the growth rate of real GDP as a cyclical variable. We made an OLS regression of the flows on the quarterly dummies, the cubic time variable and a variable that contains information about the business cycle. The estimates of these regressions on flows and hazards are shown in tables 4 and 5.

Figure 6
Hazards, net of seasonal dummies



Most estimates of the cyclical component of flows associated with unemployment are negative and highly significant. The flows from employment in the formal and informal sectors to unemployment, EFU and EIU, are highly significant and countercyclical for all groups and the same happens for the flows from unemployment to employment in the informal sector and to economic inactivity (UEI, UN, respectively), and from economic inactivity to unemployment (NU). The only exception is the UEF flow, from unemployment to employment in the formal sector, which is only significant for the total, for male and for old workers. This is a standard result which shows the counter-cyclical behavior of unemployment.

Table 4
Cyclical components of gross flows 2005-2012

Flow	*Total*	*Young*	*Old*	*Male*	*Female*
EFEI	-1.479	2.882***	-4.362	-0.676	-0.803
	(3.104)	(1.171)	(2.878)	(2.123)	(1.378)
EFN	-7.449	1.064	-8.514***	-5.509***	-1.940
	(5.086)	(2.323)	(3.276)	(2.207)	(3.653)
EFU	-12.315***	-4.236***	-8.079***	-9.223***	-3.092***
	(2.322)	(1.035)	(1.394)	(1.367)	(1.077)
EIEF	7.176	4.922***	2.254	4.994*	2.182
	(4.962)	(1.724)	(4.086)	(2.868)	(2.305)
EIN	-2.325	-0.770	-1.556	-3.591**	1.266
	(3.202)	(1.222)	(3.343)	(1.623)	(1.997)
EIU	-6.638***	-2.165***	-4.473***	-5.825***	-0.812
	(1.794)	(0.574)	(1.268)	(1.322)	(0.541)
NEF	-2.709	0.789	-3.498	-4.427*	1.719
	(4.008)	(2.624)	(2.132)	(2.275)	(2.725)
NEI	-11.073***	-1.270	-9.803***	-6.714***	-4.359
	(3.786)	(0.952)	(3.395)	(1.116)	(3.001)
NU	-10.464 **	-5.691***	-4.773**	-4.432***	-6.031**
	(4.536)	(2.349)	(2.250)	(1.887)	(3.052)
UEF	-4.766*	-1.095	-3.671***	-4.095**	-0.671
	(2.877)	(1.631)	(1.373)	(2.068)	(0.897)
UEI	-4.169***	-1.316***	-2.854**	-3.489***	-0.680***
	(1.548)	(0.508)	(1.227)	(1.392)	(0.276)
UN	-6.312***	-3.315***	-2.997**	-2.809***	-3.503**
	(2.501)	(1.186)	(1.387)	(0.973)	(1.748)

Notes: Every entry corresponds to the coefficient of the real GDP growth rate of Mexico taken from regressions where the gross flows are regressed on this growth rate, quarterly dummies and a cubic time trend. The ***, ** and * symbols represent coefficients that are statistically significant different than zero at 2%, 5% and 10%, respectively. Standard errors are in parenthesis.

The EIEF flows, from informal to formal jobs, for young and male workers are the only pro-cyclical ones in the entire regression. Thus, we would expect that in an expansion phase, more workers move from informal to formal jobs. Also the EFEI flow, from the formal to the

informal sector, is pro-cyclical for young workers, meaning that less young workers will move to the informal sector during the recession, and more will do so during a recovery.

Table 5
Cyclical components of hazards 2005-2012

Transitions	*Total*	*Young*	*Old*	*Male*	*Female*
PEFEI	0.005	0.018*	-0.00001	0.003	0.006
	(0.011)	(0.011)	(0.014)	(0.010)	(0.014)
PEFN	-0.015	-0.015	-0.021	-0.029***	0.019
	(0.013)	(0.019)	(0.013)	(0.010)	(0.031)
PEFU	-0.044***	-0.057***	-0.041***	-0.054***	-0.028
	(0.009)	(0.014)	(0.008)	(0.009)	(0.011)
PEIEF	0.072**	0.098*	0.059	0.084***	0.054
	(0.033)	(0.053)	(0.040)	(0.030)	(0.043)
PEIN	-0.026	-0.092**	-0.005	-0.059***	0.023
	(0.024)	(0.044)	(0.031)	(0.024)	(0.026)
PEIU	-0.065***	-0.088***	-0.058***	-0.094***	-0.020
	(0.017)	(0.020)	(0.016)	(0.021)	(0.013)
PNEF	0.020*	0.031	0.012	0.069***	0.019
	(0.012)	(0.021)	(0.010)	(0.025)	(0.012)
PNEI	-0.022*	0.002	-0.039**	-0.029***	-0.014
	(0.013)	(0.007)	(0.020)	(0.011)	(0.015)
PNU	-0.033**	-0.042**	-0.027**	-0.042*	-0.028*
	(0.016)	(0.019)	(0.014)	(0.023)	(0.015)
PUEF	0.219***	0.302***	0.129**	0.243***	0.217***
	(0.043)	(0.060)	(0.055)	(0.065)	(0.051)
PUEI	-0.029	-0.012	-0.022	0.010	-0.021
	(0.034)	(0.050)	(0.060)	(0.051)	(0.022)
PUN	0.029	-0.006	0.048	0.010	-0.066
	(0.040)	(0.048)	(0.051)	(0.039)	(0.057)

Notes: Every entry corresponds to the coefficient of the real GDP growth rate of Mexico taken from regressions where the hazards are regressed on this growth rate, quarterly dummies and a cubic time trend. The coefficients from the hazards regressions as well as the standard deviations are multiplied by 100. The ***, ** and * symbols represent coefficients that are statistically significant different than zero at 2%, 5% and 10%, respectively. Standard errors are in parenthesis.

The EFN flow, from the formal sector to economic inactivity, is significant and countercyclical for old and male workers, and EIN, from the informal sector to economic inactivity, and NEF, from inactivity to formal sector employment, are significant and countercyclical only for male workers. It is not clear why these flows are countercyclical. One hypothesis might be that the distinction between unemployment and not-in-the-labor force is irrelevant. In this case, we might be counting as economically inactive those workers that were indeed unemployed.

The cyclical coefficients of the hazards are shown in table 5. All the hazard categories of unemployment, PEFU, PEIU and PNU, are counter-cyclical and highly significant for all groups, with the only exception being the PEIU for female workers. PUEF is pro-cyclical for all groups, as depicted in the graphical analysis. The hazard of moving from employment in the formal sector to employment in the informal sector, PEFEI, is pro-cyclical for young workers and the hazard associated with movements in the opposite direction, PEIEF, is pro-cyclical for the total, young and male workers. The hazards of workers moving from different forms of employment to economic inactivity, PEFN, PEIN, and from inactivity to the informal sector, PNEI, are all significant and countercyclical for male workers while PNEF, the hazard associated with moving from inactivity to employment in the formal sector, is pro-cyclical and significant for male workers, and for the total. The PEIN hazard, of becoming economically inactive after working in the informal sector, is countercyclical and significant for young workers, and PNEI, the probability (transition) of becoming employed in the informal sector after being Not-in-the-labor force, is also counter-cyclical and significant for total and for old workers.

4. Concluding remarks

This analysis of gross flows of workers in the presence of informal employment in Mexico offers interesting information about mobility of workers inside the labor market. It is important to note that the Mexican labor market is different from the US and Canadian markets, and that the Mexican labor survey reflects the particularity of this market. Although our analysis is not comparable with other countries due to different periodicity, the Mexican labor market is dynamic with large flows of workers that change labor status every quarter. One important feature to emphasize is the relative large flows in and out of economic inactivity (Not-in-the labor Force). There are institutional and economic factors that encourage workers to become inactive, which also implies an economic loss in productive activities for

the entire economy. Although the reasons for becoming inactive are not explored in depth here, further research to evaluate the reasons and economic costs of this large inactive population is recommended.

The traditional view that informal jobs are marginal, and just a middle ground between unemployment and formal employment cannot be directly supported by the analysis of gross flows and hazards. The groups of young and female workers have higher hazards of becoming economically inactive, while male and veteran workers have higher hazards of working in the informal sector. This is a puzzling situation if we believe that informal jobs are just a buffer between unemployment and formal employment. The usual hypothesis is that informal employment might be supplementary for younger workers and for women. The hazards involved with movements into and out of informal work are the highest for older and male workers. This finding does not fit well with the idea that informal jobs are just supplementary. Other works in line with these findings that cast some doubts about this duality view are Maloney (1999, 2003), although further research is needed to confirm this.

Although gross flows and probabilities cannot be compared with other countries like the US or Canada, it is possible to find some other similarities. The cyclical properties of gross flows in Mexico are in part similar to those in US and Canada. All three countries have strong seasonal components. Furthermore, these countries have gross flows into and out of unemployment that are countercyclical.

The analysis shows that seasonal components have less of an effect on gross flows of young workers. On the other hand, gross flows of female workers are much less affected by the business cycle. Gross flows related to unemployment are countercyclical for almost all groups which is a standard result. The implications of the cyclical analysis of gross flows are important for public policy. First, if we want to decrease the size and importance of the informal sector we must improve labor conditions for male and older workers, many of them head of households and main income earners. These workers are moving often into and out of informality, even more often than young and female workers. This conclusion has important implications because it suggests that informal employment might be a real substitute for formal employment. Furthermore, male and older workers are strongly affected by seasonal components and the business cycle. Thus, it might be worth considering public policies that promote stability for male and old workers.

In the other hand, younger and female workers are more likely to move into economic inactivity, which hinders the potential prod-

uct of the entire economy. If the reasons for becoming inactive are retraining or formal education then it is an investment in human capital, but if younger and female workers become inactive dependents and discouraged workers[9] then, there is a loss in economic activity. In that case, public policies to keep young and female workers in the labor market should be considered.

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[9] People who are not working in the formal or informal sectors, and who have decided to stop looking for a job.

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Appendix

Acronym	*Original Phrase*
EF	Employed Formal flow
EI	Employed Informal flow
EFEI	Employed Formal to Employed Informal flow
EFN	Employed Formal to Not-in-the-labor force flow
EFU	Employed Formal to Unemployed flow
EIEF	Employed Informal to Employed Formal flow
EIN	Employed Informal to Not-in-the-labor force flow
EIU	Employed Informal to Unemployed flow
NEF	Not-in-the-labor force to Employed Formal flow
NEI	Not-in-the-labor force to Employed Informal flow
NU	Not-in-the-labor force to Unemployed flow
UEF	Unemployed to Employed Formal flow
UEI	Unemployed to Employed Informal flow

Appendix
(*continued*)

Acronym	*Original Phrase*
UN	Unemployed to Not-in-the-labor force flow
PEFEI	Probability (transition) of becoming Employed Informal after being Employed Formal
PEFN	Probability (transition) of becoming Not-in-the-labor force after being Employed Formal
PEFU	Probability (transition) of becoming Unemployed after being Employed Formal
PEIEF	Probability (transition) of becoming Employed Formal after being Employed Informal
PEIN	Probability (transition) of becoming Not-in-the-labor force after being Employed Informal
PEIU	Probability (transition) of becoming Unemployed after being Employed Informal
PNEF	Probability (transition) of becoming Employed Formal after being Not-in-the-labor force
PNEI	Probability (transition) of becoming Employed Informal after being Not-in-the-labor force
PNU	Probability (transition) of becoming Unemployment after being Not-in-the-labor force
PUEF	Probability (transition) of becoming Employed Formal after being Unemployed
PUEI	Probability (transition) of becoming Employed Informal after being Unemployed
PUN	Probability (transition) of becoming Not-in-the-labor force after being Unemployed