

Unemployment duration in Mexico: its determinants and implications for the labor market segmentation controversy and public policy design

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1 Introduction

Little can be understood about the nature and relative importance of a country's unemployment problem by focusing only on open unemployment rate figures -even though the focus is on subsets of the labor force with specific characteristics or different geographical locations. For a broader understanding of the problem, an analysis must follow an approach that considers two components. On the one hand, transitions from unemployment to employment and in the opposite direction. On the other hand, determinants of time spent by individuals in each of these statuses. Moreover, in this approach a country's unemployment rate can be related to flow rates out of employment and average duration of individuals in unemployment.

The studies of Mexico and of other middle-income developing countries that have analyzed movements out of unemployment, have highlighted three stylized facts that distinguish unemployment in their labor markets, from those in developed countries: the majority of unemployed job seekers that opt out of the labor market are individuals whose previous employment was informal; a relevant percentage of unemployed job-seekers who left an informal job became formal employees and, conversely, a non-negligible percentage of workers move from formal jobs to informal jobs after a spell of unemployment (Duryea *et. al.* 2006).

Because these studies focus only on the determinants of the likelihood of transitions from one job status to another one, they have been of limited use in policy

debates. With notable exceptions -*e.g.* Revenga and Riboud 1994, Hoppenheim 2000, Kugler 2000, and Tansei and Mehmet Tasci 2004 - studies that have analyzed workers' movements out of unemployment assume that the transition probabilities from this state do not change as time elapses, do not assess determinants of durations of unemployment, nor how these determinants, (duration of unemployment and job status destination, *ie*: formal, informal or self-employment) are related.

A focus on destinations out of unemployment, together with determinants of the duration of unemployment for workers with different characteristics, are needed to answer questions related to the design of active labor market policies and labor legislation reforms. Among these are the following: how long do workers with different individual and household characteristics spend in their job searches when they become unemployed? How are workers' duration of unemployment and job status destination, related to their having been formal workers in their previous jobs? Does search intensity for a formal job decrease with increasing the lengths of unemployment? Does search intensity for an informal job increase after an unsuccessful job search in the formal sector? Are some job searching methods more effective in helping individuals escape unemployment faster, and are they equally efficient for workers previously employed in the informal sector? Which government interventions are effective in reducing the risks of prolonged unemployment and of getting jobs that not only imply lower earnings than their previous employment, but also losing the ben-

efits associated with being a formal worker? Do workers laid off from their previous jobs who receive severance payments, take longer to find jobs. Do they find better jobs relative to those that received no severance payments? Does a change in labor legislation that decreases the dismissal costs of employees, reduce the duration of unemployment of workers searching for formal jobs?

This paper uses Mexico as a case study to address some of these questions. In addition to the richness of its employment data, it shares with many developing countries institutional arrangements that affect firms' and workers' choices between the formal and informal sectors, the wage dispersion between the formal and informal sectors -*e.g.* no unemployment insurance, labor legislation favoring employment protection and an unequal enforcement of this legislation varying by firm size and type of activities. By virtue of recent modifications to Mexico's questionnaires on quarterly employment, it is possible to count (from 2005 onwards) with precision the time unemployed workers spent in job searching before finding a job, or before moving out of the labor force. For those who got jobs, we know how they contacted their new employers and what kind of status their new jobs had (formal and informal, salaried, or self-employment). Also available are characteristics of the workers (education, age, civil status and number of children under 18 years old), if other members of their household had jobs and information about previous job history, most notably if their previous jobs were formal or not, and their reasons for separating from their

jobs. It also captures determinants of unemployment length specific to developing countries' environments, namely, if unemployed individuals received job separation lump-sum payments associated with their job separation.

We analyze determinants of duration of unemployment spells of individuals that were without a job, but were looking for one during the first quarters of 2005, 2006 and 2007. We use information obtained from a quarterly employment survey that uses a rotating panel of workers and substitutes 20 percent of interviewed persons each quarter.² Our empirical analysis is based on methods to analyze time-to-event data (survival analysis models or competing risks hazard functions) to estimate determinants of the duration of unemployment and people's exits to four different mutually exclusive destinations: formal and informal paid jobs, self-employment, and out of the labour force. Because the cohorts of unemployed individuals belong to years with different rates of economic growth -the year 2006 had economic expansion, with a real rate of growth that was twice the corresponding figures for 2005 and 2007 - we can

²Surveys applied at periodic dates to samples of the labor force over-represent individuals with longer unemployment spells in the population. This is the so-called 'stock sample bias' to which samples based on registers for the total population are not subject. The Mexican panel survey enables us to mitigate this bias; it allows for the measurement of unemployment spells between interviews experienced by individuals employed at the time of the first and second interviews of the year. This is done by means of complementary questions of the second quarter's questionnaire: their job tenure in their current job and when they left their previous job.

assess if escape rates out of unemployment increased (and if the hazard exiting the labour force to non participation status decrease with the upswing of the economic cycle).

Our empirical analysis controls for individual and household characteristics and for job search methods used by unemployed individuals. It assesses the extent to which counting with a "financial cushion" provided by a lump-sum payment for separation from their previous employment, allows workers to look longer for a job with desired characteristics relative to those that do not count with such a "cushion".

Job search models and related frameworks for labor market analysis have put forward a number of hypotheses suggesting that a job-seeker's *criterium* for accepting a job changes with the duration of unemployment (*cfr.* Van den Berg 1990); for example, that the reservation wage of a person entering unemployment is not necessarily equal to his reservation wage after a number of weeks of unsuccessful job searching or that there is a 'systematic search' where individuals first look at the locations that are best according to a prior, and if those are unsuccessful, they proceed to other locations, typically lowering their reservation wage along the way (Rogerson *et. al.* 2006).

Analytical and empirical job search models have not yet considered how unemployment dynamics in environments with formal and informal jobs shed light on the relevance of labor market segmentation. In turn, studies that have addressed the

controversy of whether labor markets are segmented in developing countries, have focussed on relative wage differences between formal and informal job status for individuals with the same observed characteristics, and on welfare implications of barriers to entry into the formal sector (Magnac 1991, Arias and Khamis 2007). None of the studies addressing labor market segmentation has dealt with *hypotheses* about relative search intensities for formal and informal jobs, nor have they considered if the discouragement of searching behavior for formal employment reflects a behavioral response of job seekers, implying that formal and informal segments of the labour market are not as integrated as studies of the Mexican labor market would suggest (Maloney 1999, and Levy 2008).

The results of this paper contribute to the controversy about the relevance of labor market segmentation in middle-income developing countries. They are consistent with the contention that, after a period of job searching, a subset of formal workers that become unemployed, fails to obtain acceptable job offers to remain formal, in spite of lowering their reservation wages. Empirical hazard rates for these individuals indicate that after their initial phase of unsuccessful job searching in the formal sector, their search efforts concentrate in the informal segment of the market where they end up accepting job offers which lack the benefits associated with being a formal worker, and receive no compensation, either, for this lack of benefits. This is in contrast to what is expected from frameworks in which formal and informal segments of the

labor market are integrated -*e.g.* Maloney (1999). In these frameworks, workers that have worked in the formal sector switch to an informal job because they are offered a wage premium above that which they could expect to earn in a formal job.³

This paper is structured in six sections in addition to this introduction. Section 2 briefly discusses relevant theoretical developments as a background for our empirical work. Section 3 describes the main features of the Mexican labor market and Section 4, of the data set. Section 5 presents the statistical model used in this research. Section 6 discusses the results, and Section 7 presents concluding remarks.

2 Theoretical background

Models of labor market segmentation and dualism aiming to understand why job seekers in developing countries are employed in the formal sector while others accept informal jobs, assume payment of efficiency wages in the formal sector (*i.e.* of wage

³We explicitly test the hypothesis that formal job seekers that become informal employees do not earn more than what they would have earned, if they had remained in the formal sector. For this purpose, we use statistical matching methods to 'pair' two groups of unemployed individuals whose previous job was in the formal sector. One group is composed of those that find jobs in the formal sector, and the other by those that become informal employees. These two groups are not statistically different from each other in their observable characteristics. This matching procedure is conducted to obtain counterfactual earnings that would have been paid to workers that became informal employees if they had, instead, remained in the formal sector.

levels above market clearing level paid to increase workers productivity and to attract a larger pool of applicants from which employers can hire more selectively) and barriers to enter into the formal sector (*e.g.* unions, minimum wages, non-competitive hiring in the public sector, excessive regulation and national labor codes). As a result of these kind of assumptions, "good" jobs (those in the formal sector) are rationed, and unemployed workers would like to have a formal job, but get no job proposals from employers in that sector. Implicit in this approach is the presumption that the flow of workers between formal and informal jobs is small and of the existence of non-significant job status switches after an unemployment spell (Dickens and Lang 1985). This follows from the view that opportunities in the formal sector are limited for unemployed persons and informal workers, and that once workers get a formal job, they stay in that sector for the rest of their working life.

Stylized facts of the job market in Mexico and in other middle-income transition economies indicate that -contrary to what is assumed in models with labor market segmentation- a lot of mobility exists between jobs of different statuses. Therefore, for their analysis, an explicit modelling of job status transitions and their determinants is required. This is what recently deployed models for understanding workers in labor markets in developing countries, do. These models have incorporated features that extend the approach initially put forth in Mortensen-Pissaridis (1994). This approach takes as point of departure an explicit modelling of information asymmetries in labor

markets and the relevance of flows of workers between job statuses. Hence, their analysis explicitly considers that time and resources are required for workers to find appropriate jobs, and for firms to find appropriate workers. A main component of this approach is to derive from optimization criteria that unemployed individuals have a "reservation wage", and that job offers with wages below this level are turned down as a result of a trade-off between the prospects of future benefits, and the cost of foregoing earnings. Another component of this approach is that wage offers occur randomly from the point of view of the individual. As stressed by Eckstein and Van den Berg (2007), with these two components, it is possible to decompose exit rates out of unemployment and the mean unemployment duration into choice (voluntary) and chance (involuntary) components. Specifically, the hazard rate for leaving unemployment to employment implied in these models is the product of a job offer arrival rate and an acceptance probability, given the arrival of a job offer.⁴

In models that apply this approach in a developing country context (Boeri and Garibaldi 2006, Albrecht *et. al* 2006, Galiani and Weinschelbaum 2006, Satchi and Temple 2006, and Zenou 2008), search strategies of workers and employers determine matches in the formal and informal sectors, given job creation and destruction rates

⁴Since hazard rates out of unemployment can be fully characterized by the parameters of an analytical model which is based on determinants of the agents' decision problems and exogenous shocks (*i.e.* derived from first principles), they can be used to predict how alternative policy interventions affect behaviors.

in each sector. Implicit in these models is the assumption that, in a stationary environment, formal and informal labor markets are integrated.⁵

For example, in the analysis by Albrecht *et. al.* (2006), workers' search behavior takes place in an environment with formal and informal jobs. They derive conditions under which a worker is indifferent between searching for a job in the formal and informal sectors. The inclusion of an assumption of heterogeneity of workers in terms of potential productivity implies that, in their stationary environment, workers whose potential productivity is below a threshold would only be informal job searchers, those above a second threshold would only be formal job searchers, and those whose potential productivity is within these two thresholds would be "switchers" between formal and informal jobs. In their model, threshold changes result from exogenous shocks.

In spite of assuming integrated labor markets, wages in these models can diverge

⁵When formal and informal labor markets are integrated, an unemployed worker is indifferent between earning a reservation wage in a formal job, and this reservation wage plus a compensation or "wage premium", in an informal job. (This differential in wages compensates for non-pecuniary benefits associated with being formal that a worker will not have, if a job is accepted in the informal sector, *viz.* labor legislation rights, access to a bundle of institutional social security services which include health care, life insurance along with work liability and disability insurance, day care centers for children, retirement pension, and housing funds). That is, as in the case of Khandker 1998, unemployed workers maximize utility rather than income.

among *ex ante* similar workers because of information frictions, luck in the search, and the matching process. This type of wage inequality inherently associated with frictions has been called “frictional wage dispersion” (Hornstein *et. al.* 2008).

Empirical studies for developed economies with no informal labor markets that included information on effective time spent on job search activities and the intensity of these activities, indicate that search intensity decreases with the length of unemployment period (Barron and Gilley 1979). Other studies posit that there is a ‘systematic search’; where individuals first look at the locations that are best according to a prior, and if those searches are unsuccessful, they proceed to other locations, typically lowering their reservation wage along the way (Rogerson *et. al.* 2006); that search efforts affect the job arrival rate (Ljungqvist and Sargent 1998); that search strategies -and not only reservation wages- change as unemployment time passes; and that search costs increase as workers fail to obtain acceptable offers from their closest and better known potential working places. In turn, a number of elements of job searches which have been the basis for empirical analysis of developed economies, have not yet been incorporated in models for labor markets in developing countries: For example, risk adverse individuals, wealth accumulation, borrowing constraints, etc. as in Rendon (2006), or the depletion of resources to finance their search as in Lentz and Tranaes (2001). Lastly, search methods for finding formal and informal jobs and their relation to exits out of unemployment are topics previously addressed

for developing countries by Márquez *et. al.* (2004), Woltermann, S. (2003) and Calvo and Ioannides (2005), but have not been incorporated yet as part of job search models.

As discussed below, Mexico shares with many developing countries a labor code that stipulates that, in case of individual dismissals, the employer must make lump-sum severance payments. Lentz and Tranaes (2001) have shown that workers with liquid assets to finance their search, take longer to accept a job. Along with this presumption of their model, we postulate that job searching is a productive activity in which an individual may invest funds and expect a significant relationship between availability of liquid assets and escape rates from unemployment. That is, we expect an effect on rates of escape from unemployment that can be attributed to a lump-sum payment obtained by separating from their previous job relative to those that obtained no compensation. This is because we expect them to "afford" longer search periods and to have their search efforts increase as their liquid wealth declines.

This is not the only reason why a negative relationship can be expected between job search time, and the availability of liquid resources obtained from being fired from a previous job. Another reason is due to the stigma of those that were dismissed from their jobs. Hence, if asymmetric information prevails, dismissed workers might send a bad signal to potential employers. This implication of asymmetric information in the labor market has been analyzed in a pioneer work by Gibbons and Katz (1991).

In their analysis, employers do not have a clear perception of the workers' productivity when they consider hiring a new worker, but they can know their employment story. On the basis of this information, they form expectations of worker productivity. Canziani and Petongolo (2001), in an extension to this analysis, show that these sources of information asymmetries imply lower job finding rates for dismissed workers relative to unemployed individuals that left their jobs voluntarily. Kugler and Saint-Paul (2004), further extended this framework to consider what happens when dismissal costs of employees are included in this scenario. They show that the shadow cost of hiring workers increases when the likelihood of job termination payments enters in the employers' considerations to offer a job. Hence, their result is consistent with a lemons story; as these costs increase, firms increasingly prefer hiring workers with good a employment history over those without one.⁶

3 Unemployment and Informality in Mexico

In this paper an unemployed individual is defined as an individual without a job, but looking for one, whereas an individual without a job and not looking for one, is identified as being out of the labor force. A formal employee is defined as a wage-earning person registered in public social security agencies or in retirement pension

⁶Kugler and Saint-Paul (2004), show that firms prefer to offer jobs to already employed workers relative to those looking for a job, and among these latter ones, to those not subject to dismissal costs, or to those that lost their job due to end of contracts.

fund agencies. Informal salaried employees, in turn, are defined as employees not registered in these agencies, while the self-employed are non-wage earners working on their own (including business owners with less than three employees). Because of their registration in these agencies, formal workers have access to a bundle of services which they partly finance with payroll taxes. These services include health care, life insurance, work liability and disability insurance, and retirement pensions.⁷ Informal salaried workers cannot exercise their labor rights because they are unable to offer evidence of a working relationship with their employers and have no access to health care services or pension and housing funds administered by the government for formal workers.

Mexico shares with many developing countries a labor code that fixes job separation severance payments. The severance payment is equivalent to three months' pay plus 20 days of salary per year of service. If the employee has remained with the same employer for 15 years, he/she will not receive a seniority premium. Non-wage costs of formal jobs (taxes, non-wage costs and administrative procedures), which represent up to 40% of the wage bill together with the cost of fulfilling labor codes, are often seen as a major cause of a large informal sector. Figures obtained from household surveys for 12 Latin American countries in which the existence or absence

⁷In Mexico there is also an official agency in charge of operating housing funds for formal employees.

of social security contributions is registered for each employee in the sample, indicate that the degree of formalization of salaried workers in Mexico is below average. In contrast to Chile, Uruguay, Brazil and Argentina, where more than half of salaried workers hold formal jobs, only 42 percent of employees in Mexico are formally employed. This figure is slightly above countries with much lower levels of development such as Peru, Bolivia and Ecuador (Galiani and Weinschelbaum 2006). By contrast, the share of informal salaried workers and of the self-employed in the Mexican urban labor force (around 28 and 30 percent, respectively) is relatively large for a middle-income emerging economy.⁸

Relative to figures from developed countries, aggregate open unemployment rates in Mexico are low: below 4% of the active labor force during the period 2005-2007. Little is understood of the nature and relative importance of the unemployment problem in a country by focusing only on open unemployment rate figures -even when the focus of analysis is on corresponding rates for subsets of the labor force with specific characteristics or located in different geographic areas of the country. For example, without explicitly stating why, it is common to attribute these relatively low aggregate rates to lack of unemployment insurance, which makes unemployment

⁸The majority of informal salaried employees work in informal firms which tend to be small in size; the remainder may have a working relationship with a formal firm that fails to register all of their workers in the social security agency and evades other obligations that it should be meeting by law.

unaffordable for most participants in the labor market.

As stressed in this paper, what is required is an analysis of the duration of unemployment spells and their determinants. For example, unemployment rates differ substantially between groups of individuals and between geographic regions of the country. This does not imply that low rates of unemployment necessarily coincide with states and groups where the duration in unemployment is low. Conversely, as the results in the empirical section of this paper indicate, two states that coincide in unemployment rates can have very different escape rates from unemployment. This is because an explicit relationship exists, for any given flow of entry into unemployment, between open unemployment rates, and duration in unemployment. Hence, in a given region, the flow of entry into unemployment might not be a matter of policy concern (*e.g.* resulting from an efficient enhancing restructuring in the economy) whereas flow out of unemployment might be (*e.g.* vulnerable groups may be likely to stay unemployed for long periods).

4 The Data

During many years the Mexican National Institute of Statistics, Geography and Informatics (INEGI) conducted a panel-linked quarterly employment survey (ENEU). This survey did not lend itself to a formal analysis of unemployment duration and job searching strategies. The information concerning the precise time required for finding

a job was unavailable. How unemployed individuals looked for jobs was also not part of the information asked to respondents. In the first quarter of 2005, INEGI'S questionnaire was modified, and a more complete employment survey (*Encuesta Nacional de Ocupación y Empleo – ENOE*) has since been conducted.

This new survey interviews a rotating panel of workers and substitutes 20 percent of the interviewed persons each quarter, and during the second quarter of each year, incorporates additional questions that enable us to measure the effective time required by each worker that found a job after an unemployment spell. We worked with three sets of two-quarters balanced panel data set. This implies an attrition of 20% of the individuals interviewed in the first quarter of each year, namely those that were in their fifth interview (likewise, we do not include those incorporated after the first interview of the year).

When individuals are unemployed during their first interview of the year, they are asked for how long have they been searching for a job. During their subsequent interview in the second quarter of that year, they are asked job tenure in their current job. This information is required to measure precise exit times from unemployment for those that found a job before their second interview. In addition, for individuals employed at the time of the first and second interviews of the year, it is possible to identify if they went through an unemployment spell during the second quarter of the year. If they did, it is possible to know the duration of these spells. This is

done by means of two questions included in the second quarter's complement of the questionnaire: their job tenure in their current job and when they left their previous job.

We restrict our analysis to unemployed male workers between 18 and 65 years old with previous job experience. The cohorts correspond to the first quarter of 2005, 2006, or 2007, and the total initial number of respondents was 6322. For those finding a job on a subsequent date, we not only have information regarding the time required by each of them to find a job, but also what kind of status this job had (formal and informal, salaried, or self-employment). If they were not employed in subsequent quarters, we have two cases: going out of the labor force, or still searching for a job. Among other questions, they answer if, in their previous job, they had access to a bundle of institutional social security services, partly financed by their payroll taxes: That is, if they had a formal or informal job. They also responded whether the reason for leaving their last job was that they were laid off, whether they left voluntarily, or not.

In Table 1 a transition matrix captures the structure of the data set. The columns in this table indicate destinations in subsequent quarters, and the rows classify individuals according to their previous job status. Their new status in the subsequent quarter could be as a formal or an informal employee, self-employed, out of the labor force, or still unemployed. In turn, their job status in employment before their un-

employment spell could have been one of two types: formal or informal (included in this latter are non-formal wage earners and the self-employed). This table shows that while 44% of the previously formal workers found a new job within the same status, 26% ended up as informal employees and 5% as self-employed. Stated differently, out of the totality of unemployed workers that were previously formal and that found a job, 31% of them moved to the informal sector.

TABLE 1
Unemployed male workers with previous job experience
Transition matrix

	Job status in new employment after					Number of Observations */
	Formal	Informal	Self-employment	Out of the labor force	Remained unemployed	
TOTAL	1551	2856	359	745	811	6,322
Job status in previous employment before unemployment spell:						
Formal	44.75%	26.05%	5.36%	6.70%	17.15%	1,866
Informal or Self-employment	16.07%	53.19%	5.81%	13.91%	11.02%	4,456
2005						
Job status in previous employment before unemployment spell:						
Formal	40.67%	27.39%	5.21%	6.22%	20.50%	595
Informal or Self-employment	16.03%	51.69%	6.67%	14.38%	11.24%	1,335
2006						
Job status in previous employment before unemployment spell:						
Formal	48.66%	25.83%	3.94%	6.46%	15.12%	635
Informal or Self-employment	16.27%	55.55%	5.93%	12.11%	10.15%	1,586
2007						
Job status in previous employment before unemployment spell:						
Formal	44.65%	25.00%	6.92%	7.39%	16.04%	636
Informal or Self-employment	15.90%	52.05%	4.95%	15.37%	11.73%	1,535

Rows add up 100%

Source: INEGI Encuesta Nacional de Ocupación y Empleo

Our interest in this study is in how quickly individuals escape unemployment, which is implicitly given by the evolution over time of their survival rates in this state. This requires a precise measurement of how many weeks unemployed workers spent searching for a job before finding one or before moving out of the labor force.

It also requires including the time spent job searching by individuals that started a spell of unemployment and were still in the same unemployed status when they were last interviewed.⁹ By virtue of recent modifications to Mexico's questionnaires for quarterly employment surveys, it is possible to obtain (from 2005 onwards) this information (length of unemployment on the day when they were interviewed in the first quarter of the year, plus additional weeks required to exit unemployment).¹⁰ In section 6 of this paper a detailed and rigorous analysis of survival rates in unemployment is presented. In this stage of analysis of the raw data obtained from the employment surveys, it is possible to visualize implied survival rates in unemployment by means of the so-called 'Kaplan Meir estimator'. This is an actuarial non-parametric estimator commonly used in the elaboration of life tables by demographers. It represents exits out of the unemployment state as a percentage of individuals "at risk". As part of this latter subset, it incorporates information provided by those that remain in

⁹If we do not include information corresponding to individuals with unfinished spells (so-called censored data) a measurement bias is introduced against people with longer spells in unemployment.

¹⁰Surveys applied at periodic dates to samples of the labor force over-represent individuals with longer unemployment spells in the population. This is the so-called 'stock sample bias' to which samples based on registers for the total population are not subject. The Mexican panel survey enables us to mitigate this bias; it allows for the measurement of unemployment spells which occurred between interviews of individuals who were employed at the time of the first and second interviews of the year. This is done by means of complementary questions in the second quarter's questionnaire asking about their job tenure in their current job and the date they left their previous job.

unemployment at the time of their last interview and are identified as "right-hand censored data" (Kiefer 1998). Table 2 presents this table. It shows that 70% of unemployed individuals with previous job experience escape unemployment in less than four months and that one out of four unemployed individuals are still without a job after a year.

Table 2			
Unemployed male workers with previous job experience			
Kaplan Meir Survival Rates in Unemployment			
2005-2007			
INTERVAL (IN WEEKS)	Escape from Unemployment		
	At Risk	Escape	Survival Rate
less than 8	6322	2789	0.56
8 -10	3533	299	0.51
10 -12	3234	738	0.39
12 -14	2496	244	0.36
14 -16	2252	521	0.32
16 -18	1731	552	0.29
18 -20	1179	321	0.26

Source: INEGI Encuesta Nacional de Ocupación y Empleo

In Table 3, the distribution of characteristics of respondents is presented. The first categories in which individuals are grouped are age, levels of educational achievement, marital status (grouped in three subcategories: single, married with children under 18, married with no children, or married with children older than 18) and if they are located in an urban or rural area. Two variables were constructed in order to capture whether or not unemployed individuals are able to finance a longer job search to obtain a better job match. The first variable captures whether or not other adults

TABLE 3
Unemployed male workers with previous job experience
Descriptive statistics

	Remained unemployed	Formal salaried	Informal salaried	Self-employment	Out of labor force
Age					
18 to 22 years old	21.58%	26.95%	22.76%	7.80%	36.78%
23 to 28 years old	26.76%	26.43%	20.17%	17.55%	19.46%
29 to 35 years old	15.41%	20.89%	20.48%	21.17%	8.05%
36 to 44 years old	16.15%	14.44%	18.03%	26.18%	7.65%
45 to 65 years old	20.10%	11.28%	18.56%	27.30%	28.05%
Education					
Elementary school	12.70%	17.15%	47.69%	33.70%	20.27%
Secondary school	23.43%	38.10%	31.09%	28.13%	23.36%
High school	20.47%	23.15%	11.97%	15.32%	25.50%
More than high school	43.40%	21.60%	9.24%	22.84%	30.87%
Marital status & children					
Single	58.57%	43.39%	34.03%	17.83%	63.76%
Married or head of household & children under 18	20.72%	35.14%	43.84%	56.27%	12.21%
Married or head of household without children or children older than 18	20.72%	21.47%	22.13%	25.91%	24.03%
Worker in the household					
No	37.00%	30.37%	38.31%	48.47%	21.21%
Yes	73.00%	69.63%	61.69%	51.53%	78.79%
Search strategy followed					
Attending to the establishment directly	73.04%	28.24%	27.24%		
By newspaper, radio or internet	10.79%	23.21%	5.57%		
By friends or family members	6.32%	42.23%	48.35%		
Job was offered to you	-	3.68%	17.65%		
Gov. emp. service, private emp. agency and others	9.86%	2.64%	1.19%		
Previous job was formal					
No	60.54%	46.16%	82.98%	72.14%	83.22%
Yes	39.46%	53.84%	17.02%	27.86%	16.78%
Reason why last job was left					
Other	54.99%	68.02%	50.91%	64.62%	83.49%
Lay off	45.01%	31.98%	49.09%	35.38%	16.51%
Urban area					
No	12.95%	14.83%	40.34%	25.91%	13.83%
Yes	87.05%	85.17%	59.66%	74.09%	86.17%
Lump-sum job separation payment					
No	95.07%	96.13%	97.97%	94.43%	87.65%
Yes	4.93%	3.87%	2.03%	5.57%	12.35%
Previous length of unemployment					
0 to 30 days	41.80%	75.24%	84.21%	79.39%	42.82%
More than 30 to 60 days	25.40%	13.93%	8.26%	12.26%	29.80%
More than 60 to 120 days	18.37%	6.90%	5.22%	4.74%	16.91%
More than 120 days	14.43%	3.93%	2.31%	3.62%	10.47%
Number of observations	811	1551	2856	359	745

Source: INEGI Encuesta Nacional de Ocupación y Empleo

in the household are working, and the second, whether or not they received a lump-sum payment for separation from their previous job. Individuals are also classified according to length of unemployment on the day of their interview in the first quarter of the year. We classified their responses in four categories: less than a month; more than one month, but less than two; between two and four months, and more than four months. Finally, for those finding a job, how they contacted their new employer is classified in one out of five mutually exclusive categories (if they directly contacted business, if they responded to an advertisement for a job on the Internet, on the radio or in a newspaper; if they asked family or friends to recommend them for a job or to keep them informed about possible jobs; if a job was offered to them, or if they got it through a government employment service, through a private employment agency, or through another similar method)¹¹.

Graph 1 shows real levels of GDP growth (relative to its level the same quarter one year before). As is clear from this graph, the year 2006 represents an economic expansion: during the first quarter of the year, GDP grew twice as fast as the rate of growth during the first quarters of 2005 and 2007.

¹¹For those opting out of the labor force, for those that remained unemployed, and for those that went to self-employment, the survey does not ask this question. Hence, for estimation purposes a different question is used with this subset of individuals. The question asked is about how they looked for a job.

In view of the different levels of GDP growth which occurred each year, for estimation purposes, we classified the sample according to the year in which each cohort was interviewed. Mexico is divided in 32 political states. GDP growth, unemployment rates and access to formal sector jobs vary significantly across them. The northern states, for example, have larger shares of formal, relative to informal, sectors. By contrast, economic activities in the southern states are less affected by shocks originating in the U.S.A. Hence, in addition to a location category depending on urban or rural characteristics, we aggregated the sample in 32 groups according to where the person lived.

5 Statistical Models for Survival Analysis

The point of departure of survival analysis is the definition of a non-negative continuous random variable T , which represents the spell duration (duration of unemployment) with a density function $f(t)$ and a cumulative distribution function, $F(t)$. This latter is defined as the probability that an unemployment spell lasts less than t units of time. The survival function, $S(t)$, equal to $1 - F(t)$, is defined as the probability that the unemployment spell will equal or exceed a period of length t :

$$S(t) = \Pr(T \geq t) \tag{1}$$

For any specification of t in terms of a density function, there is a mathematically equivalent hazard function, $h(t)$, which is the conditional density of T given $T > t > 0$;

viz:

$$h(t) = \left(\frac{f(t)}{1 - F(t)} \right) \quad (2)$$

the hazard rate of T, $h(t)$, can be interpreted as the transition rate at time t given survival in the state up to at least t . To see this, note that for small $\Delta t > 0$

$$h(t)\Delta t = \left(\frac{f(t)\Delta t}{1 - F(t)} \right) \approx \frac{\Pr(T \in [t, t + \Delta t])}{\Pr(T \geq t)} = \Pr(T \in [t, t + \Delta t] | \Pr(T \geq t)) \quad (3)$$

is the transition probability in the small interval $[t, t + \Delta t)$ given survival up to the start of the interval. Notice that the hazard can alternatively be expressed as the logarithm change of the survival function and, conversely, that the hazard function allows us to estimate the survival function by:

$$S(t) = \exp\left[-\int_0^t h_u du\right] \quad (4)$$

5.1 Hazard functions and censored data

Hazard functions have the distinct advantage of handling survival periods corresponding to individuals that started a spell of unemployment and were still in the same status when they were last interviewed.¹² If we do not include information corresponding to individuals with unfinished spells (so-called censored data) in our estimations, we throw away part of the data set and introduce a serious bias against people with longer spells of unemployment.

¹²These would constitute a problem for a standard regression model where the dependent variable was the length of the spell of unemployment.

5.2 Competing risks specification

When there is only one unemployment spell, but more than one possible destination out of unemployment, a competing risks specification of hazard functions is required (Van den Berg, 2001). For example, in the case analyzed in the next section, a person who is unemployed can find a job as a formal or informal employee, become self-employed, or go out of the labor force. To specify this, let there be M possible job status destinations out of unemployment. Then, there are M random variables, t_{uj} , associated with each state, where M is the set of possible destinations, indexed by m . That is, when an individual is unemployed, there are M "latent exit times", where $f_{um}(t_{uj})$ is the density function of exit times from unemployment into state j .

The total of survivals in t , that leave unemployment is the sum on m of those who leave this state in order to go to the destiny m . In this formula, with $h_{um}(t_{uj})$ defined as the associated hazard function or failure rate to a specific destiny, we have:

$$h(t) = \sum_{m=1}^M h_{um}(t_{uj}) \quad (j = 1, \dots, M; \quad j \neq u)$$

where the hazard function conditional on survival up to time t is given by:

$$h_{um}(t_{uj}) = f_{um}(t_{uj}) / \exp\left[-\int_{t_{uj0}}^{t_{uj}} h_{um}(u) du\right] \quad (j = 1, \dots, M; \quad j \neq u)$$

5.2.1 Competing risks and censored data For estimation purposes, we assume that unobserved determinants of the transition rates to the possible destina-

tions are mutually independent.¹³ If this assumption holds, it is a valid procedure to estimate competing risks hazards with one hazard function for each possible destination, as if the only destination out of unemployment were the one estimated in the corresponding hazard function. This procedure requires including individual departures to a state different than the one corresponding to the function, as part of the censored data set.

5.3 Hazard function specifications

For estimation purposes, in the following section we work with ‘mixed proportional hazard’ specifications -also called Cox proportional hazards- as functions of the individual’s observed co-variates and year and location specific dummies. This type of specification has two parts: a ‘baseline’ hazard (which captures time dependence in a common way for all individuals) and a ‘systematic part’. This latter takes the form of an exponential function and depends on a number of observed co-variates, X . Thus, the hazard rate is multiplicative in all the separate elements of the covariates:

$$h_{um}(t_{um}) = h(t; x) = h_{0m}(t) \exp(\beta'x) \quad (j = 1, \dots, M; \quad j \neq u) \quad (5)$$

where x is the vector of measured explanatory variables for the i th individual, and β is the vector of unknown regression parameters associated with the explanatory

¹³If this assumption does not apply, the right-censored is dependent, and a more elaborate estimation is required. *Cfr.* Heckman and Singer (1985).

variables (this vector is assumed to be the same for all individuals). The parameters in β are estimated with maximum likelihood methods, which accounts for censored survival times. The baseline hazard, $h_{0m}(t)$, captures the common hazard among individuals in the population. The hazard ratios, computed by calculating the exponential of the parameter coefficients, are useful in interpreting the results. If the hazard ratio of a co-variate is larger than 1, an increment in the factor increases the hazard rate. If the hazard ratio is less than 1, an increment in the factor decreases the hazard rate.

As stated in the review of job search models presented in section II, hazard rates are determined by variables that affect job offer arrival rates, and by those that determine an individual's probability of acceptance of a job offer. In accordance with these models, the right-hand side component of (5) must include, in a reduced form, variables that are expected to affect escape rates out of unemployment *via* these channels. These are specified in the following sections. The length of unemployment in the hazard functions estimated and discussed next refers to the calendar time after the first interview of an individual (the first quarter of the corresponding year). Hence, the length of unemployment prior to the day of the interview in the first quarter of the year is included as a covariate in vector x .

Since our analysis considers exiting unemployment to one of four mutually exclusive destinations (formal or informal employee, self-employed or out of the labor

force), four hazard functions, each one with a specification as in (5), are estimated and discussed in the following sections.

5.3.1 Co-variates representing observed determinants The vector x in (5) of explanatory variables for the estimation of i th individual's hazard rate is constituted by a set of dummy variables. The dummy variables equal one if a requirement is fulfilled, and zero, otherwise. These sets of variables which have already been discussed in section 4 in our comments to Table 2, are the following ones: four dummies for age group (23 to 28, 29 to 35, 36 to 44 and 45 to 65 years old); three for education (secondary school, high school, and more than high school); two for civil status (married with children under 18, and married with children over 18, or with no children); one for another member of the household working; four for search method (if the job was located through an advertisement on the Internet, on radio, or in a newspaper, whether family or friends were asked to recommend a job or to keep them informed about any job possibilities, if the job was offered to them, or if they went to an employment agency); three for previous job status combined with their reason for leaving their previous employment (formal and left voluntarily, formal and laid off, and informal laid off), one for an urban area; one if they received a payment associated with separation from their previous job, two that capture year effects (2006 and 2007) and finally, 31 dummy variables are included to control for geographic regional differences (Mexican states). As mentioned in the last paragraph, the previous

length of unemployment reported by the individual on the day of his first interview, must be included as an explanatory co-variate. In our preferred specification, three dummy variables capturing time already spent in unemployment, are incorporated in the estimated hazard function. These were: more than one month, but less than two; between two and four months, and more than four months.

The omitted variables in the estimation of hazard functions are: age group between 18 to 22 years old, less than secondary school, single, no other member of the household working, directly contacted the business establishment to search for a job, previous job was informal and left it voluntarily, located in a rural area, received no payment associated with separation from previous job, less than a month in unemployment, interviewed in 2005, and located in the capital of the country.

5.3.2 Unobserved heterogeneity In the specification (5), sources of observed heterogeneity affecting hazard rates are captured with the vector x , which is constituted by measured explanatory variables. Incorrect results might be obtained if unobserved sources of heterogeneity exist that are not readily captured by covariates in x . Biases in the estimation originate because, on average, individuals with relatively high hazard rates for unobserved reasons (*e.g.* the lack of precautionary savings or higher intertemporal rates of return) leave unemployment first, so that samples of survivors are selected. Differences between such samples at different times might also reflect behavioral differences as well, such as those associated with the well-known

mover–stayer’s bias.

Hence, if unobserved individual heterogeneity (or ‘frailty’) is important, this must be adequately dealt with. For this purpose we follow Meyer (1990) and specify unobserved heterogeneity across individuals by assuming that, if this is present, it is independent of the covariates in x , that its distribution has a gamma mixture that can be approximated with two points of support, and that it enters the hazard function multiplicatively. Hence, we define the random variable, Ω_i and specify the hazard function as:

$$h_{um}(t_{um}) = h(t; x, \Omega_i) = h_{0m}(t)\Omega_i \exp(\beta'x) \quad (j = 1, \dots, M; \quad j \neq u) \quad (6)$$

It is important to check to see if our results are incorrect because of the presence of unobserved heterogeneity. Most notably, negative duration dependence at the individual level and unobserved heterogeneity both lead to negative duration dependence of the observed hazard rate, but they have different policy implications. Negative duration dependence implies that emphasis should be put on the prevention of long-term unemployment (pointing to the usefulness of policies aimed at intervening long before individuals become long-term unemployed). This type of policy, however, will be inadequate if unobserved heterogeneity is the cause of negative duration dependence of the observed transition rate. In this case, policies should be aimed at the screening of the newly unemployed.

6 Results

6.1 Determinants of job search duration

Tables 4 and 5 report results for hazard function specifications in (5) and (6) and for different job status destinations. That is, they report hazard ratios for covariates determining escape rates from unemployment to formal and informal salaried jobs, to self employment, and out of the labor force, for two hazard function specifications; one assuming no unobserved heterogeneity, and the other one, assuming it exists.

Since none of the signs in hazard ratios in Table 4 differ from corresponding ones in 5, we do not consider unobserved individual heterogeneity to be an important source of bias, and therefore, concentrate our analysis in results according to specification (5). Table 6 presents an alternative hazard function specification. Instead of capturing the effect of the co-variate, previous length in unemployment, by a set of co-variate dummy variables, it is captured with a variable representing length in unemployment in units of two weeks, its squared value, and its value to the third power. Results were not substantially different than those in Table 4.

Time dependency and hazard rates

Hazard rates to formal and informal salaried jobs, and to self employment, as implied by figures in rows 20-22 of columns 1, 2, and 3 of Table 4 indicate that the longer an individual searches for a job, the lower their hazard rates out of unemployment

TABLE 4
Hazard functions for unemployed male workers
(Cox Proportional Model)
(Time of unemployment after first interview in days)

Variable	Transition rates from unemployment to			
	Formal Job	Informal salaried job	Self-employment	Out of the labor force
Age				
23 to 28 years old	1.1221 [0.0778]*	0.9899 [0.0514]	1.9350 [0.4527]***	0.6550 [0.0681]***
29 to 35 years old	1.0788 [0.0860]	0.9351 [0.0524]	2.0554 [0.4930]***	0.5951 [0.0892]***
36 to 44 years old	0.9544 [0.0877]	0.8849 [0.0531]**	2.6592 [0.6338]***	0.5303 [0.0838]***
45 to 65 years old	0.6967 [0.0709]***	0.7509 [0.0461]***	2.3858 [0.5982]***	0.9296 [0.1325]
Education				
Secondary school	1.4742 [0.1107]***	0.8344 [0.0330]***	1.1990 [0.1706]	0.9978 [0.1176]
High school	1.5120 [0.1282]***	0.6536 [0.0388]***	1.2440 [0.2245]	1.0237 [0.1199]
More than high school	1.2166 [0.1083]**	0.4559 [0.0318]***	1.3240 [0.2150]*	0.8981 [0.0967]
Civil Status				
Married or head of household & children under 18	1.3244 [0.0968]***	1.2771 [0.0638]***	3.1429 [0.5613]***	0.7242 [0.1033]**
Married or head of household without dependent children or children older than 18	1.2508 [0.0895]***	1.1554 [0.0598]***	2.2905 [0.4228]***	0.9940 [0.1226]
Worker in the household	1.0595 [0.0599]	0.9922 [0.0354]	0.7298 [0.0814]***	1.1119 [0.0962]
Search Method				
By newspaper, radio or internet	3.2566 [0.2370]***	1.3057 [0.1096]***		
By family or friends	2.3504 [0.1510]***	2.4380 [0.1067]***		
They offered you a job	1.1648 [0.1672]	2.7228 [0.1413]***		
Gov. emp. service, private emp. agency and others	1.1023 [0.1851]	0.6405 [0.1135]**		
Previous job status and reason why he left it				
Previous job was formal & left his previous job voluntarily	1.9075 [0.1160]***	0.7214 [0.0458]***	0.8322 [0.1332]	0.6229 [0.0660]***
Previous job was informal & lay off	0.5231 [0.0494]***	1.3534 [0.0506]***	0.7082 [0.0986]**	0.6194 [0.0675]***
Previous job was formal & lay off	1.7946 [0.1187]***	0.7613 [0.0507]***	0.7383 [0.1252]*	0.2596 [0.0466]***
Urban area				
	1.3761 [0.1004]***	0.8178 [0.0293]***	1.1270 [0.1491]	1.1578 [0.1339]
Lump-sum job separation payment				
	0.7090 [0.0942]***	0.6747 [0.0846]***	0.7210 [0.1761]	1.8150 [0.2348]***
Previous length of unemployment				
More than 30 to 60 days	0.8342 [0.0652]**	0.6348 [0.0437]***	0.6383 [0.1088]***	1.1137 [0.0950]
More than 60 to 120 days	0.6628 [0.0685]***	0.6819 [0.0578]***	0.3735 [0.0948]***	1.0972 [0.1096]
More than 120 days	0.5386 [0.0717]***	0.4638 [0.0581]***	0.4237 [0.1252]***	0.9631 [0.1119]
Year control				
Year (2006=1)	1.1637 [0.0702]**	1.0343 [0.0416]	0.9883 [0.1294]	0.8224 [0.0728]**
Year (2007=1)	1.0065 [0.0614]	0.9822 [0.0396]	0.9507 [0.1235]	1.1312 [0.0933]
Controls for Mexican state effects (31 dummy variables)				
Observations	6322	6322	6322	6322

Standard errors are in parentheses. One, two and three asterisks indicate significance at the 10%, 5% and 1% significance level respectively.

Reference category: age group between 18 to 22 years old, less than secondary school, single, no other member of the household working, attended directly to the establishment to search for a job, previous job informal and left it voluntarily, located in rural area, received no payment to separation from previous job, less than a month in unemployment, interviewed in 2005 and located in the capital of the country.

TABLE 5
Hazard functions for unemployed male workers with previous job experience
(Cox Model with unobservable heterogeneity)*/
***Time of unemployment after interview in days**

Variable	Hazard Ratios		
	Formal	Informal	Out of the labor force
Age			
23 to 28 years old	1.2144 [0.1444]	0.8656 [0.0721]*	0.5400 [0.0996]***
29 to 35 years old	1.1173 [0.1521]	0.8179 [0.0779]**	0.5226 [0.1175]***
36 to 44 years old	0.9058 [0.1345]	0.7365 [0.0759]***	0.8317 [0.2027]
45 to 65 years old	0.6566 [0.1044]***	0.5635 [0.0627]***	4.0602 [1.1134]***
Education			
Secondary school	1.9767 [0.2467]***	0.5642 [0.0448]***	1.2407 [0.2287]
High school	2.1535 [0.3026]***	0.4398 [0.0440]***	2.2930 [0.5134]***
More than high school	1.7434 [0.2418]***	0.3204 [0.0340]***	2.2075 [0.4809]***
Civil Status			
Married or head of household & children under 18	1.3800 [0.1656]***	1.3925 [0.1170]***	0.1207 [0.0354]***
Married or head of household without children or children older than 18	1.3177 [0.1586]**	1.1134 [0.0921]	0.3123 [0.0710]***
Worker in the household			
	1.1706 [0.1093]*	0.9619 [0.0594]	1.2460 [0.1840]
Search Method			
By newspaper, radio or internet	7.4060 [1.7990]***	1.2689 [0.1328]**	
By family or friends	2.7572 [0.3252]***	3.8636 [0.3753]***	
They offered you a job	0.9533 [0.1710]	9.1609 [1.8887]***	
Gov. emp. service, private emp. agency and others	1.2089 [0.2692]	0.7234 [0.1390]*	
Previous job status and reason why he left it			
Previous job was formal & left his previous job voluntary	3.2202 [0.5182]***	0.4863 [0.0438]***	0.3427 [0.0734]***
Previous job was informal & lay off	0.4035 [0.0508]***	1.9553 [0.1596]***	0.2809 [0.0634]***
Previous job was formal & lay off	2.8894 [0.4383]***	0.5749 [0.0530]***	0.0988 [0.0339]***
Urban area			
	1.7162 [0.1923]***	0.6016 [0.0432]***	1.4231 [0.2312]**
Lump-sum job separation payment			
	0.6017 [0.1229]**	0.6476 [0.1056]***	8.3758 [3.1015]***
Previous length of unemployment			
More than 30 to 60 days	0.7691 [0.0922]**	0.5912 [0.0521]***	4.0450 [1.0397]***
More than 60 to 120 days	0.5629 [0.0896]***	0.6837 [0.0738]***	3.6436 [0.9590]***
More than 120 days	0.4266 [0.0896]***	0.4592 [0.0697]***	3.7826 [1.1276]***
Year control			
Year (2006=1)	1.1802 [0.1146]*	0.9787 [0.0655]	0.9216 [0.1372]
Year (2007=1)	0.9613 [0.0958]	0.8651 [0.0594]**	1.4334 [0.2297]**
Controls for Mexican state effects (31 dummy variables)			
Unobservable Heterogeneity	x [0.2865]**	x [0.2990]**	x [0.3677]***
Observations	6322	6322	6322

Standard errors in parentheses. One, two and three asterisks indicate significance at the 10%, 5% and 1% significance level.

Reference category: age group between 18 to 22 years old, less than secondary school, single, no other member of the household working, attended directly to the establishment to search for a job, previous job informal and left it voluntarily, located in rural area, received no payment located in rural area, received no payment associated to separation from previous job, less than a month in unemployment, interviewed in 2005 and located in the capital of the country.

TABLE 6
Hazard functions for unemployed male workers with previous job experience
(Cox Proportional Model)
(Time of unemployment after interview in two week periods)

Variable	Hazard			
	Formal	Informal	Self-employment	Out of the labor force
Age				
23 to 28 years old	1.1154 [0.0724]*	0.9872 [0.0458]	1.9534 [0.4554]***	0.7480 [0.0601]***
29 to 35 years old	1.0865 [0.0819]	0.9615 [0.0470]	2.1330 [0.5069]***	0.7064 [0.0844]***
36 to 44 years old	0.9598 [0.0835]	0.9233 [0.0486]	2.8016 [0.6608]***	0.6689 [0.0860]***
45 to 65 years old	0.7243 [0.0702]***	0.7868 [0.0422]***	2.6008 [0.6449]***	1.1059 [0.1271]
Education				
Secondary school	1.5100 [0.1080]***	0.8466 [0.0287]***	1.2195 [0.1707]	0.9296 [0.0794]
High school	1.5224 [0.1215]***	0.6712 [0.0361]***	1.2928 [0.2310]	1.0404 [0.0892]
More than high school	1.2640 [0.1075]***	0.4840 [0.0316]***	1.4526 [0.2333]**	0.8826 [0.0706]
Married or head of household & children under 18				
	1.2459 [0.0867]***	1.1952 [0.0525]***	2.7487 [0.4892]***	0.6192 [0.0702]***
Married or head of household without children or children older than 18				
	1.1998 [0.0823]***	1.0992 [0.0503]**	2.0989 [0.3828]***	0.8328 [0.0803]**
Worker in the household				
	1.0652 [0.0565]	0.9833 [0.0304]	0.7433 [0.0824]***	1.0907 [0.0756]
Search Method				
By newspaper, radio or internet	3.0628 [0.2097]***	1.2416 [0.0979]***		
By family or friends	2.1973 [0.1350]***	2.2565 [0.0899]***		
They offered you a job	1.0669 [0.1491]	2.4757 [0.1107]***		
Gov. emp. service, private emp. agency and others	1.1026 [0.1769]	0.6620 [0.1139]**		
Previous job status and reason why he left it				
Previous job was formal	1.8450 [0.1068]***	0.6939 [0.0412]***	0.7834 [0.1233]	0.6751 [0.0583]***
Lay off	0.5110 [0.0479]***	1.2902 [0.0424]***	0.6707 [0.0927]***	0.6229 [0.0573]***
Previous job was formal & Lay off	1.7771 [0.1110]***	0.7388 [0.0466]***	0.7254 [0.1221]*	0.2800 [0.0462]***
Urban area				
	1.3972 [0.0979]***	0.8416 [0.0255]***	1.1512 [0.1501]	0.9493 [0.0816]
Lump-sum job separation payment				
	0.6994 [0.0881]***	0.6969 [0.0814]***	0.7748 [0.1864]	1.6878 [0.1469]***
Previous length of unemployment				
Previous length of unemployment (in two weeks period)	0.9294 [0.0391]*	0.8349 [0.0293]***	0.6998 [0.0694]***	1.0860 [0.0400]**
Previous length of unemployment (in two weeks period) ^ 2	1.0026 [0.0052]	1.0110 [0.0044]**	1.0238 [0.0121]**	0.9924 [0.0040]*
Previous length of unemployment (in two weeks period) ^ 3	1.0000 [0.0002]	0.9998 [0.0001]	0.9996 [0.0003]	1.0002 [0.0001]
Year control				
Year (2006=1)	1.1444 [0.0654]**	1.0034 [0.0356]	0.9641 [0.1242]	0.9571 [0.0641]
Year (2007=1)	1.0079 [0.0585]	0.9471 [0.0338]	0.9262 [0.1196]	1.1343 [0.0721]**
Controls for Mexican state effects (31 dummy variables)				
Observations	6322	6322	6322	6322

Standard errors in parentheses. One, two and three asterisks indicate significance at the 10%, 5% and 1% significance level respectively.

are.

These results suggest workers' and employers' behavior changes over time. For example, search intensity of workers decrease with the length of unemployment or job offers arrive less frequently, the longer a worker is unemployed (*e.g.* because employers take the view that too long a period of unemployment sends a bad "signal", or because their productive ability effectively declines). They also highlight usefulness of timely interventions before individuals become employed long-term.

In order to check that these results are not due to unobserved heterogeneity biasing the estimation, we estimated the model specified in (5), where unobserved heterogeneity across individuals is assumed to be present independent of the covariates in x , and with a gamma distribution that can be approximated with two points of support that enters the hazard function multiplicatively. A comparison of results in Tables 4 and 5 indicates that negative time duration prevails when unobserved heterogeneity is incorporated as part of the specification. That is, after comparing the figures obtained when estimations are based on the model in (6) (which incorporates unobserved sources of heterogeneity that are not readily captured by covariates in x) with those obtain in (5) (which does not incorporate them), we reject the hypothesis that negative time duration is attributed to unobserved heterogeneity biasing specification results, and we cannot reject the hypothesis positing that it is attributed to

negative duration dependence at the individual level.¹⁴

Hazard rates and the economic cycle

These results are consistent with the contention that during years in which GDP growth accelerates, formal job offers arrive faster to unemployed workers.¹⁵ The last two rows of the first column of Table 4 imply that the workers' escape rate from unemployment to formal jobs was 16% higher in 2006 than in 2005 and 2007.¹⁶

Conversely, the results in the fourth column of Table 5 state that during periods of economic expansion individuals search longer before opting out of the labor market as is apparent in the last two rows of the third column of Table 4. In years of slow economic growth, unemployed individuals go faster to the non-participation state

¹⁴Because we work with 'mixed proportional hazard' specifications -also called Cox proportional hazards- there is a baseline hazard, $h_0(t)$, which captures the common hazard among individuals in the population. It is, therefore, possible to graph, as in Tansei and Tasci (2004), the baseline hazards evaluated at the means of the co-variates for specification (5) and (6), and assess differences in changes in the probability of finding a job as the time after the first interview changes. This is another possible source of negative duration dependence that is not considered here because time after the first interview is not longer than three months.

¹⁵As shown in graph 1, relative to corresponding rates in 2005 and 2007 -which are the years with slow growth- the average of GDP growth rates during the first two quarters of 2006 are almost twice as fast.

¹⁶Results also indicate that exit rates to informal employment and self-employment are not statistically significantly related to the dummy variables representing years with different rates of growth of GDP.

(the counterpart of high hazard rates to the non-participation state are longer spells of job searching).

The results associated with exits to formal employment are consistent with suggestions that public funding to active labor market intermediation in this segment of the market should be countercyclical: as the economy slows down, more time is required by individuals to find a formal job which offers them an acceptable wage. A related remark is valid for individuals opting out of the labor force: net gains for potential participants in training programs targeted at the unemployed are larger, since opportunity costs for individuals to be in the labor market during the downswing phase of the cycle, are lower.

Hazard rates and search methods

Individuals searching for a formal job *via* newspapers, radio and the Internet escape unemployment faster than those relying on their social and family networks. It is not surprising that these two search methods are relatively more efficient than attending to establishments directly (factory, shop, plant, etc.). However, it is surprising that these methods are relatively more efficient than searching for job via government employment services, via governmental programs of temporary jobs, or through private employment agencies. This result suggests that, in Mexico, these intermediation services must be subject to revision and improvement. They might

help individuals in finding a job, but not in finding one faster.¹⁷

In turn, as expected (Calvó Armengol and Ioannides 2005), those relying on family and social networks to be informally employed escape faster than those having to search via different methods.

Age, education and hazard rates

As shown in the fourth row of columns 1 and 2, relative to younger persons, individuals take longer to find a salaried job -formal or informal- when their age is between 44 and 65 years old.¹⁸ These results would not contradict *hypotheses* stating that firms tend to replace older workers with younger ones, thereby supporting programs that help individuals over 44 years old escape unemployment. By contrast, relative to the rest, individuals over 36 years old spend less time in unemployment before starting to work as self-employed.

In turn, the fourth column of Table 4 indicates which individuals are more likely to take outside opportunities if the labor market is not attractive enough. The first ones to get discouraged about the possibility of finding an acceptable job offer are

¹⁷A different interpretation is also possible, namely that the result is not because of the efficiency of the search method, but because of a self-selection of individuals with low potential productivity for this method.

¹⁸A distinguished feature of Mexican labor legislation may jeopardize these age groups' prospects of exiting unemployment to a formal job. This is that, once in a job, there is no age for compulsory retirement. Hence, potential employers consider that if laid off, they have to be indemnized.

youngsters under 23 years old and senior workers over 44.

Regarding the results on how education levels affect unemployment duration according to different job status destinations, the results in the fifth row of columns 1 and 2 of Table 4 show that individuals with less than a secondary education (corresponding to the omitted dummy variable in the estimated hazard functions) become informal employees faster than more educated unemployed workers. Conversely, relative to the rest, individuals with low education levels require longer job search spells for formal jobs.

As stated in the theoretical review section of this paper, the hazard rate for leaving unemployment to employment implied in job search models is the product of the job offer arrival rate and an acceptance probability, given the arrival of a job offer. Hence, it's possible to suggest that the main reason for these relative magnitudes is because most firms requiring workers with low skill levels, self-select into the informal sector. That is, that formal job offer rates for unskilled workers are low, and therefore, hazard from unemployment to formal jobs for these individuals, is low. In economies with high non-wage costs of formal jobs, as is the case with the Mexican economy, formal employers will be willing to incur these costs if they are able to transfer them to their workers in the form of lower salaries. Workers with less education might be less willing or less likely than more educated workers to afford paying the benefits associated with formality: at low levels of income, their discount

rates are so high that the perceived benefits do not match the cost of giving up actual levels of consumption.

Signalling

In contrast to what happens in the search for informal jobs, workers who left their previous job voluntarily, become formal employees faster than workers who left it involuntarily. This suggests that job dismissals do not constitute an adverse signalling in informal jobs, whereas, for formal jobs, they do. They might suggest to potential employers that, relative to workers who voluntarily left their previous job, their productivity is lower, as posited by the work of Canziani and Petongolo 2001, referred to in the theoretical review section of this paper.

Escaping to formal jobs

Regarding determinants of duration in unemployment for those that find a formal job, from the first column of Table 4, it is possible to infer profiles of individuals requiring the shortest searching time. These are individuals located in urban areas that enter unemployment for a reason other than being laid off, that were formal workers in their last job, younger than 44 years old, with a secondary education or higher and that contact their new employer *via* newspaper, radio or the Internet. In addition, it also states that relative to single workers, married ones with children cannot afford to look as long for a suitable job and that, alternatively, the latter receive more wage offers.

Finally, as it follows from row 18, when a person with these characteristics has no resources (provided by a lump-sum payment for job separation from his previous employment), he is employed faster. This is because, relative to those that count with a "financial cushion" to finance their job search, they cannot look so long for a job with desired characteristics.

Escaping to self-employment

Becoming self-employed requires financial capital and job experience. This could explain why, in the third column of Table 4, young unemployed individuals take longer to become self employed and why human capital, captured by education level and being between 23 and 44 years old, helps them find a job faster.

An interesting result is related to the statistical significance of the variable that the individual is not the only person in the household earning an income. If another member of the household works, as well, individuals take longer to exit from unemployment to self-employment.

Escaping to non-participation

Figures in Table 1 indicate that a non-negligible percentage of job seekers opt out of the labor market in Mexico, and that the percentage is larger for those whose previous employment was informal. This stylized fact has been previously pointed out – for Mexico and other Latin-American countries- Duryea *et. al.* (2006). These authors estimated determinants of the likelihood of these transitions. Our approach differs

from theirs in that it estimates, instead, how long it takes for those in unemployment to become discouraged about finding a job; our results allow us to state that workers whose previous job was informal search for a shorter period before moving out of the labor force, and to quantify how much longer a worker with previously formal job experience will persist in his search for a job.

6.2 Escaping to informal salaried jobs and the controversy of labor market segmentation

In the previous subsection we highlighted a difference in behavior between two groups of homogenous individuals that only differed in their previous job status. This was regarding their persistence in searching for an acceptable job before moving out of the labor force: relative to those whose previous experience was in an informal job, individuals whose job experience before transiting to unemployment was in the formal sector, search for jobs for a longer time before moving out of the labor force. Why would the former opt out to non-participation in the labor force, sooner than the latter? One answer to this question is that those with better employment stories, have higher expectations of receiving an acceptable job offer because they signal to prospective employers a higher potential productivity.

If this is the correct answer, another implication of signalling to prospective employers a higher potential productivity with their employment story, would be that

a previously formal worker is expected to exit unemployment faster than a similar worker whose previous job was informal. Our results indicate that, controlling for other determinants of unemployment duration, this is indeed the case regarding hazards out to formal employment, but not out to informal salaried jobs.¹⁹

Figures in rows corresponding to previous job status in columns 1 and 2 in Table 4 indicate: a) that relative to those who were previously formal, those that had an informal job status require longer search periods to find a formal job; b) that those who were formal workers in their last job require more time to find an informal job than individuals with similar characteristics, but that were informal in their last job. That is, relative to those that remain informal workers, those changing from formal to informal job status took longer to find their job. Why would a previously formal worker take longer to find an informal job than an individual with the same observed characteristics except that he was an informal employee before entering unemployment?²⁰

¹⁹This is controlling for the effect of two variables that would imply that these individuals escape unemployment faster to informal jobs: search method (informal workers that search for informal employment are more likely to rely on social and family networks) and 'lump sum payments from previous job separation' (the majority of previously informal workers are without this type of 'financial cushion' to smooth their consumption and to search for an adequate job match).

²⁰An alternative answer is that the effect of the work experience might be different and could depend on the sector in which the worker has been occupied (Woltermann, 2004). That is, while formal job experience is required for formal jobs, informal job experience is preferred for informal

Unsegmented labor markets

A first hypothesis of why this occurs follows the lines of reasoning implicit in frameworks suggesting integrated formal and informal labor markets: workers voluntarily shifted their job status, which implies that a compensating wage premium above formal wages was offered to them. They might take longer to find a job because their knowledge of informal labor market conditions is not as good as that of workers with previous informal jobs, but they improve their income relative to staying formal.

A test of the *hypothesis* of the existence of a wage premium for moving from the formal to the informal sector after an unemployment spell requires comparing earnings obtained by individuals accepting informal jobs, with hypothetical earnings of what each of them would have obtained, had they worked, instead, in a formal job. A counterfactual estimation of earnings, based on Kernel matching methods, allows us to fulfill this requirement. Hence, we use this method to obtain a group of individuals with statistically similar observable characteristics that shifted job status after their unemployment spell, comparing them to the set of workers that also experienced an unemployment spell, but were formal in both their previous and their new jobs. We call it the control group. The counterfactual estimates of what workers in the group that switched status after unemployment, would have earned, if they had remained formal, were obtained from the control group using the matching method.²¹

jobs.

²¹The specification of the kernel matching methods, and the assumptions required for their appli-

Table 7 presents the workers' average hourly earnings in their new job, relative to their level in their previous job. The first column corresponds to counterfactual earnings, which, in turn, were those of the control group obtained with the matching method.

The second column corresponds to those belonging to the group of unemployed workers that were formal workers and became informal employees.²² A statistical test of the discrepancy in the mean of these two groups' earnings, rejects the hypothesis of a wage premium obtained by moving from the formal to the informal sector after an unemployment spell. Based on these results, we conclude that, as opposed to what happens with workers with similar characteristics that, after their unemployment spell, remain formal, individuals that were formal in their previous jobs, are not better off in terms of salary if their new job status is informal employment.

cations are relegated to the appendix.

²²Because the size of the former group resulted smaller than the size of the latter one, the matching method was applied with replacement, to pair each member of the switcher group with a member of the comparison group with similar observable characteristics.

TABLE 7

Unemployed male workers with previous working experience in the formal sector					
Earning variations of switchers from formal to informal jobs					
KERNEL Matching Method					
	Counterfactual result	registered result	Difference	S.E.	T-stat
	Formal - Formal	Formal - Informal			
	hourly earnings relative to previous job				
2005	1.06	0.89	0.16 ***	0.0451	3.66
2006	1.06	0.91	0.15 ***	0.0410	3.56
2007	1.07	0.96	0.11 ***	0.0458	2.43

Standard errors in parentheses. One, two and three asterisks indicate significance at the 10%, 5% and 1% significance level respectively.

Segmented labor markets

An employment history in the formal sector signals to prospective employers a higher potential productivity than one in the informal sector signals. One would, therefore, expect that an informal job would be found faster by an individual that was a formal worker before entering unemployment, than by another one with same observed characteristics except that his previous job was in the informal sector. Our results show that this is not the case: Rows 15 and 17 of Table 4 show that it takes longer to find an informal job for an individual that was a formal worker before entering unemployment, than for another one with same observed characteristics except that his previous job status was informal. An explanation is that the informal sector was not the first choice for this set of workers whose previous job was formal, but they ended up working as informal employees never-the-less.

They spent time searching for a formal job, but got no acceptable offers from employers in this sector; after a time threshold -dependent on availability of resources to finance their job search- they looked for an informal job. That is, since they failed to receive acceptable offers from employers in the formal sector, their search intensity for a formal job decreased, and they concentrated their search efforts in getting an informal job.²³ In terms of the elements of the job search model referred to in Section

²³A similar explanation could be suggested for young unemployed individuals that become self-employed: relative to older workers with more working experience, it takes them longer to become self-employed because this job status was not their preferred option. They initially spent time

2, in the first months of unemployment, the main element at work is the increase of the acceptance probability, given a decreasing pattern of reservation wages. But as soon as this phase passes, the only element present in the hazard rate of escaping to the formal sector is the offer arrival rate, because acceptance probabilities are, in fact, equal to one. We posit that the lack of formal job offers arriving to these individuals from the formal section, reflects segmentation.

A more complete information set about search behavior would be required to further substantiate this hypothesis. This would require employment surveys to capture if workers search simultaneously for formal and informal jobs, or if do they do so sequentially;²⁴ if it is the case that their search is sequential, is it after becoming discouraged with the prospect of achieving their preferred job status, that previously formal workers start searching for an informal job?

looking for salaried employment.

²⁴One would like to have answers to the question: given that your new job is an informal employee, did you also search for a formal job? If so, for how long? With this additional information, a multi-spell variation of a hazard function could be applied, as in in Van den Berg (2001) and Calderón-Madrid and Trejo (2002). In this framework, searching for a formal job and searching for an informal job can be estimated as different spells that occur one after the other.

7 Concluding Remarks

A stylized fact of the Mexico's labor market dynamics is that a significant share of unemployed individuals that found a job as informal employees, were formal workers before their unemployment spell. Based on the estimates of higher counterfactual earnings in formal jobs for those in this subset during the first semesters of 2005, 2006 and 2007, we argued that these kind of switches between job sectors are not consistent with the *hypotheses* implying voluntary movements in response to higher wages offered to them in the informal sector. A comparison of the longer lengths of time previously formal employees took to become informal employees, compared to similar individuals who previously held jobs in the informal sector, also indicates that the informal sector was not their preferred option.

We substantiated this hypothesis of an informal job as a non preferred option for unemployed workers who previously held formal jobs -and its implications for the labor market segmentation controversy- with an application of time-to-event statistical methods applied to panel linked employment survey data sets applied quarterly in Mexico since 2005. With these methods, we identified that unemployed individuals who previously held formal jobs, relative to those with previous informal employment, require longer searching spells and efforts to get a job in the informal sector -controlling for effects attributed to social networks and other search methods, for financial resources provided by previous job separation, for regional and year effects,

and for other determinants of individual duration in unemployment.

The result is consistent with the contention that, after a period of job searching and, in spite of lowering their reservation wages, a subset of formal workers that become unemployed, fails to obtain acceptable job offers which would permit them to remain in their preferred job status. After this initial phase of unsuccessful searching for a formal job, they concentrate their search efforts in the informal segment of the market where they end up obtaining job payments that lack the benefits associated with being a formal worker, nor do they receive compensation for this lack of benefits.

Among the main factors that an analytical model aiming to explain this process should have are the following: market frictions in the formal segment of the labor market,²⁵ the increasing costs as time lapses in searching for formal jobs, with the impossibility of financing such searches due to credit market imperfections, low levels of precautionary savings, and expectations that informal job offers arrive relatively more frequently. Another factor that could complement the analytical explanation is that workers might consider the informal job as a temporary one with short expected duration. That is, that given evidence of considerable mobility between informal and formal jobs in Mexico (Calderón-Madrid 2000), workers might have expectations of receiving a formal job offer while working as an informal employee, or during their next unemployment episode.

²⁵Zenou, Y (2008), for example, introduce a urn-ball and coordination failures.

This has an important implication for public policy design for formal workers. This is that active labor market policies must not only shield employees from labor market malfunctioning resulting in the risk of prolonged unemployment, but also from the risk of being involuntarily displaced to a low income job with no benefits associated with being a formal worker. Another implication for the design of active labor market programs derived from this study is that public funding for active labor market programs in the formal segment of the market, such as training programs targeted at the unemployed, should be countercyclical. We show that, as the economy slows down, more time is required by individuals to find a formal job, and their opportunity cost of being out of a job in that phase of the cycle is lower²⁶. We also demonstrated that the longer an individual searches for a job in the Mexican labor market, the lower their hazard rates out of unemployment, a result suggesting that workers' and employers' behavior changes over time, which highlights the usefulness of timely interventions before individuals become unemployed long-term.

In turn, our study points out that a search for employment in Mexico via the government employment services, a public program for temporary jobs, or a private employment agency, might help individuals find a job, but don't help them find it faster than is the case via other methods: We found that individuals escape unem-

²⁶A related remark is valid for workers opting out of the labor force when the economy slows down.

ployment faster searching for a formal job via newspapers, radio and the Internet, and for informal employment, via social and family networks. This suggests a need for the revision of these kinds of publicly sponsored intermediation activities.

We also assessed what happened with previously informal workers that, after an unemployment spell, became formal employees. We found that they require longer searching spells and efforts to get an acceptable job offer in the formal sector relative to those with the same observed characteristics, but with previous formal job experience. This result suggests that recent job experience within a job status might be a signaling device to employers in the formal sector of the quality of an employee's skills. In terms of feedback for program design, it indicates that entrance prospects into the formal sector for workers without formal job experience might be jeopardized by malfunctioning of the labor markets due to information asymmetry problems, and not only by the kind of barriers to entry which are commonly put forth to explain labor market segmentation. Hence, the corollary is that programs targeting the unemployed with no previous formal job experience, will increase their effectiveness when accompanied with assessment and certification of labor competency granted by institutions who have credibility with potential employers.

Last, but not least, this result also has implications for labor legislation reforms: strict employment protection regulations in Mexico might be aggravating problems originating from asymmetric information in labor markets. When employment pro-

tection regulations increase the shadow cost of hiring workers in an environment with asymmetric information, there might be more reluctance by employers to hire workers with no formal job experience. In a context of a firm's limited knowledge of the productivity of workers, employers take into consideration the fact that they may want to dismiss them in the future, thereby undergoing costly firing procedures. Because of this, relative to another worker with equal observed characteristics, but coming from a previous informal job, employers would hire those that signal their potential skills with a previous formal job experience.

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8 Appendix

To construct the required counterfactual earnings in the formal sector of workers that, after unemployment, move from formal to informal jobs, we followed a matching procedure similar to the one in Pratap and Quintin (2006). As in the research of these authors, earnings of employees that changed job status are compared with their counterfactual outcome, had they stayed in the same job status. For this purpose, movers from a job status are paired with stayers in that status that have similar characteristics, applying propensity score matching methods.²⁷

In view of the large number of pre-treatment observable characteristics, we applied the propensity score method variant of matching (Rosenbaum and Rubin (1983)). This variant has the advantage of reducing the dimensionality of the matching problem down to matching on one scalar, while considering the importance of all pretreatment variables included in the analysis. This scalar is the propensity score, $P(W)$, defined as the probability of switching from the formal to informal job status after unemployment, conditional on observable characteristics. We incorporated as predictor variables in a logit regression the following: the reason the previous job was

²⁷This procedure to estimate counterfactual earning of workers is based on assumptions that are not fulfilled when individuals self-select into a job status on the basis of characteristics not observed by an analyst. For an specification of the statistical assumptions under which this procedure are based, *cfr.* Heckman *et. al.* 1998.

left, geographic zones where the individual was be located; three categories of family position, civil status; characteristics of previous job: part- or full-time, formal or informal sector, whether the individual was a wage earner or self-employed; age; nine categories of education, and ten of occupation in their previous job.²⁸

The Kernel Matching Estimator

Let T be the set of workers moving out of a job status, C , the set of individuals remaining in that status, Y_i^T and Y_i^C , respectively, the observed earnings of the workers moving, after an unemployment spell, from the formal to the informal sector, and of those staying in the formal sector. The kernel matching estimator of the average discrepancy in earnings of these sets, τ^K , is given by:

$$\tau^K = \frac{1}{N^T} \sum_{i \in T} \left\{ Y_i^T - \frac{\sum_{j \in C} Y_j^C G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in C} G\left(\frac{p_k - p_i}{h_n}\right)} \right\} \quad (7)$$

where G is a kernel function, and h_n is a bandwidth parameter, the number of units in the movers group is denoted by N^T , and p_i is the propensity score of the individual i . Under standard conditions on the bandwidth and kernel,

$$\frac{\sum_{j \in C} Y_j^C G\left(\frac{p_j - p_i}{h_n}\right)}{\sum_{k \in C} G\left(\frac{p_k - p_i}{h_n}\right)} \quad (8)$$

is a consistent estimator of the counterfactual outcome we are interested in estimating.

The standard errors for statistical testing are obtained by bootstrap.

²⁸Logit results are not presented here, but are available upon request to the author.