

Output Fluctuations, Employment Protection Reg-
ulations and the Mobility of Workers Between For-
mal and Informal Job Status in Mexico's Urban
Labor Market

Key words: Labor Markets in Developing Countries; Mobility of Workers; Informal Jobs; Employment Protection Regulations; Mexico

Abstract

Available evidence for most developing countries suggests that workers are constantly receiving shocks, looking for new information and revising their choices about their preferred job status: a non-negligible number of employees in the formal sector move to the informal sector and other job statuses, at the same time that others, conversely, leave these sectors to join the formal sector. In addition, few job offers to informal workers are for sustained formal jobs leading to greater human capital accumulation. As a result, those employees returning to formal jobs are likely to experience another spell of informal employment within a short span of time.

We use methods to analyze time-to-event data (statistical survival analysis) in an empirical analysis aiming at capturing the heterogeneous and disaggregated nature of the dynamics of job status mobility in Mexico's urban labor market. We found that workers with less human capital are more likely to be trapped in cycles of long spells of informal employment followed by short-term jobs in the formal sector and displaced again to informal jobs. These results conform with analytical predictions from models that have followed and extended to a developing country context the labor market approach initially put forth by Mortsen and Pissaridis, 1994.

We compared two quantitative results as a suggestive indicator of the relevance that employment protection legislation may have on the mobility of formal workers to the informal sector. On the one hand the extent to which, other determinants of mobility being equal (including output growth), working with a temporary contract affects a worker's survival in a formal job, relative to an employee hired under a permanent contract with more than six-month tenure with the same employer. On the other hand the extent to which an economic slump, relative to a counterfactual of situation in which GDP grows above average trend, displace formal workers to informal jobs. Results suggests that it is the noncompliance of regulations associated with hiring employees under permanent contracts that enhances the adaptability of the workforce in the formal sector.

We also found that a worker that remains in an informal job for a long time, with respect to another employee with a short stay, has different search intensities for a formal job, as well as effectiveness in finding a formal job. A similar result is observed with an employee in a small formal firm, with relation to another formal employee in a medium or larger firm. We interpreted these results as suggesting that re-employment prospects in the formal sector might be jeopardized by problems of information asymmetry in labor markets, resulting from a recent job experience acting as a signaling device for quality.

1 Introduction

Available evidence for most developing countries suggests that workers are constantly receiving shocks, looking for new information and revising their choices about their preferred job status: a non-negligible number of employees in the formal sector move to the informal sector and other job statuses, at the same time that others, conversely, leave these sectors to join the formal sector. In addition, few job offers to informal workers are for sustained formal jobs leading to greater human capital accumulation. As a result, those employees returning to formal jobs are likely to experience another spell of informal employment within a short span of time.

Recently deployed models for understanding these stylized facts of labor markets have followed and extended the approach initially put forth in Mortsen-Pissaridis, 1994. In these new models (Boeri and Garibaldi, 2006, Albrecht et. al., 2006 and Galiani and Weinschelbaum, 2006), the search strategies of workers and employers determine matches in the formal and informal sectors, given exogenously-determined job creation and destruction rates in each sector. A prediction of them is that a threshold with an upper and lower bound of workers' potential productivity in a formal job, along with employment protection regulations and information asymmetries, determines which workers are likely to be more mobile among job statuses. In turn, an implication of these models is that public intervention targeted at workers trapped in cycles of informal employment and formal jobs of short duration must be a

component of productivity and welfare enhancement programs. Calibration of these models, based on available results from empirical studies or, if unavailable, on "informed guesses" of relevant parameters, has also been useful to shed light on potential impact of labor reforms and other institutional changes- for example, analysis of severance payments in the case of "unjustified" individual dismissals indicate the extent to which spells in informal jobs are longer, relative to the counterfactual situation with no firing costs.

In this paper we use methods to analyze time-to-event data (statistical survival analysis) in an empirical analysis aiming at capturing the heterogeneous and disaggregated nature of the dynamics of job status mobility in Mexico's urban labor market. Unlike previous studies of transitions among job status in Mexico that relied on probit or multilogit models (Gong and van Soest, 2002), ours provides the kind of parameters required to calibrate the above mentioned models and to assess if their analytical predictions conform to labor market experiences in developing countries.

There are two main reasons why it is advantageous to conduct this type of analysis focusing on the Mexican case. One of them is the possibility of working with panel data surveys that capture variables rarely obtained for participants in labor markets in developing countries, most notably: a) job-plant tenure, which along with the type of contract under which employees are hired (a necessary ingredient to assess

the impact on mobility of labor market regulations);¹ b) effective duration of work experience in their lifetime;² and c) training in previous months, which along with education and work experience, capture an individual's level of human capital. In these surveys workers were interviewed quarterly on up to five occasions, thereby registering movements to another job status. We measure how individuals' observed heterogeneity –associated with their potential productivity and with entitlements to job termination severance payments– determines survival in each job status.

The other advantage of focusing on Mexican labor markets is that we can identify the effect on job status mobility of the fluctuations in GDP resulting from shocks of opposite sign in the tradable sector of the economy. The basis of this study is two surveys, one in 1997 and the other in 2001, which are pooled into a single data set. We work with datasets corresponding to these two surveys that were applied in periods in which labor markets reacted to exogenous adjustments initially affecting

¹In Mexico, as is the case of most developing countries, labor codes establish that, in the case of “unjustified” individual dismissals, the employer must make lump-sum severance payments if the worker has a permanent contract. Redundancy and low productivity are not legal grounds for dismissal.

²Individuals in the informal job market tend to exhibit movements out of the labor force for prolonged periods of time. As a result, measurement errors while using a proxy variable for experience –such as age less schooling years– are bound to be significant. The persons interviewed in these surveys explicitly stated how many years they have worked in their lifetime (or months, if they had just joined the labor market).

the tradable sector of the economy. Deviations of GDP growth from its secular trend (considered to be a rate of growth of around three percent) in these years were unambiguously originated in export markets (registered rates of growth in manufacturing exports were 18.1% in 1997 and -2.7% in 2001). Underpinned by robust exports to the United States, output growth in Mexico had a vigorous expansion of 6.4 per cent in 1997. By contrast, Mexico's GDP exhibited no growth at all in 2001; its exports declined strongly in this year, in close synchronization with activity in the United States (OECD, 2004). Strong production-side links between Mexico and U.S. tradable sectors, which resulted in the enactment of the North American Free Trade Agreement in 1994 and domestic expenditure resilience, explain the significant impact of external developments on activity in Mexico during these years (Ramos-Francia and Chiquiar, 2005).

This paper is structured in six sections, in addition to this introduction. Section 2 refers to the analytical arguments related to this topic that have been influential in the economic literature. Section 3 briefly discusses the features of Mexican labor law that might affect job status mobility and discusses deviations of GDP from its trend during the period of our analysis. Section 4 describes the data set, including comparisons of workers' job status at certain point in time with the status they achieve in subsequent quarters. Section 5 describes hazard functions of exiting each job status, which are the statistical models used in this study. The estimates of hazards of transitions from

one job status to another one are analyzed in Section 6. Controlling for the effect of human capital on a salaried worker's hazards out of his current job status, we assess there, on the one hand, the extent to which a permanent contract and length of time spent with the same employer –variables associated with job termination severance payments– affect hazards out of formal jobs and, on the other hand, the extent to which mobility of formal salaried employees to the informal sector increases during a downswing of the economic cycle. Whether time spent as an informal worker with the same employer increases the chances of moving more quickly to the formal sector is also considered there. Section 7 presents concluding remarks.

2 Theoretical background

In order to address formal and informal sectors in labor markets, analytical models have extended the job matching model with market frictions developed by Mortensen and Pissarides, 1994. In these models (Boeri and Garibaldi, 2006, Albrecht *et. al.*, 2006 and Galiani and Weinschelbaum, 2006), workers are heterogeneous and differ with regard to their potential productivity in the formal sector. All workers have the option to take up opportunities in the informal sector as these come along, and all workers are equally productive in that sector, but some employees –those who are most productive in formal sector employment– will reject informal sector work in order to wait for a formal sector job.

The inclusion of liquidity constraints in these models would imply that workers unable to finance search costs for adequate matches with employers in the formal sector are more likely to accept informal jobs. Due to frictions in the process of matching unemployed workers with vacant jobs, individuals with human capital that lose a job in the formal sector may have to engage in low-paying activities in informal jobs where they are less productive.

Empirical results of mobility between job status expected on the basis of these models, given creation and destruction rates in both sectors, are: a) The more qualified and experienced individuals are more likely to enter the formal sector when they can choose in which sector to work and b) Given that a match between an employer and a low-skilled worker ends more easily than one with a skilled worker, for a given size of adverse shock to the productivity of the match, the least productive workers are more likely to be displaced from the formal sector.³

Having an informal job is likely to be a negative signal to potential employers in the formal sector. This information asymmetry problem in labor markets jeopardizes the entrance prospects of workers to the formal sector. The problem is more

³That is, an employee's human capital increases both his or her likelihood of permanence in the formal sector and of escaping from an informal to a formal job. In these studies, labor market segmentation is not a result of entry barriers constraining their movements to the formal sector, but of workers self-selecting into each job status. (For a discussion of dualism vs. self-selection in sectors *cfr.* Magnac (1991), Gong and van Soest (2002) and Navarro-Lozano and Schrimpf (2004).

severe in countries where job termination severance payments prevail by law –as an extension of the model including adverse selection deployed by Kugler and Saint-Paul (2004) would suggest. For our empirical work this suggests that recent job experience in a job status might act as a signaling device for the quality of an employee’s skills and therefore affect the rate at which an informal worker can move to a preferred job status.

In Mexico, as is the case of most developing countries, labor codes establish that, in the case of "unjustified" individual dismissals, the employer must make lump-sum severance payments if the worker has a permanent contract. Redundancy and low productivity are not legal grounds for dismissal. Even in the absence of information asymmetries, the analysis of the functioning of labor markets implies that the length of time that workers remain in formal and informal job statuses, on the one hand, and the cost of dismissing workers, on the other, is related (Bentolila and Bertola, 1990, Bertola, 1990 and Hopenhayn and Rogerson, 1993). This is due to expected firing costs increasing shadow costs of formal job creation, and therefore spells in informal jobs are longer, relative to the counterfactual situation with lower firing costs. The empirical relevance of this conjecture has been demonstrated in countries where labor laws have been modified, as in the case of Colombia (Kugler, 2000).

At the same time, while firing costs make employment more stable for workers with permanent contracts in the event of an adverse shock to formal firms, their

adjustments at the margin are expected to be on employees with temporary contracts and with permanent contracts but lower job-plant seniority (Oi, 1962). In addition, an impact in an economy's competitiveness is expected as well: by raising firms' adjustments costs, protections from dismissal inhibit efficient job separations and, indirectly, reduce efficient job creation as well.⁴

Employers in most countries have increasingly relied on temporary contracts for hiring workers to undertake activities that are not temporary in character, in order to avoid regulation costs in the formal sector. The impact of this practice on the functioning of the Mexican labor market has not yet been assessed. It might be the case that this type of contract has been an effective device for aiding the screening process of employers and therefore reducing adverse effects of asymmetric problems in labor markets. Alternatively, this may have been distorting employers' behavior by inducing them to prefer a higher turnover based on temporary contracts rather than long-term commitments with their employees.

Among the arguments that suggest that workers in small firms in the formal sector are more likely than the rest to move to the informal sector, the following one can be stressed. The formal sector is characterized by the use of efficiency wages to

⁴Reductions in the costs of ending formal jobs also have an impact on the time that persons in other job statuses spend trying to move to it. That is, durations in different job statuses are intrinsically linked to each other in the short run, as shown in Calderón-Madrid (2000), Kugler (2000) and Heckman and Pagés-Serra (2000).

minimize the cost of monitoring workers, as implied in the model deployed by Shapiro and Stiglitz (1984) but the ones which are more likely to pay above their opportunity cost in other activities are medium and large firms. Since small firms monitor workers at a lower cost than larger firms they are less likely to pay a premium for efficiency wages and therefore their employees' wages are likely to be closer to those offered in the informal sector because of their relatively lower productivity. In addition, to the extent that a previous job in a medium or large firm is a signaling device for workers looking for a new job, workers displaced from small firms can suffer adverse selection problems in the hiring process of formal firms. If this is the case, even if their productivity is not low, they will not receive an acceptable job offer from a formal firm and will end up accepting an informal job.

3 Labor market in Mexico

In this section, the structure of the labor market in Mexico and employment and dismissal regulations that may affect job status permanence and mobility are described. The relationship between cyclical fluctuations in GDP growth during the years of analysis and its relation to external shocks is also discussed.

In this paper, a formal employee is defined as a wage-earning person registered in public social security agencies. That is, formal workers have access to a bundle of institutional social security services, which they partly finance with payroll

taxes. These services include health care, life insurance along with work liability and disability insurance, day care centers for children and retirement pension and housing funds.⁵ Unlike the rest, formal employees enjoy labor legislation rights: most notably they are entitled to severance payments in the event of unjustified dismissal and are covered by minimum wage laws. Informal salaried employees, in turn, are defined as wage-earning workers not registered in social security institutions or in retirement pension and housing fund agencies, while the self-employed are non-wage earners working on their own (including business owners with less than three employees).⁶

The majority of informal salaried employees works 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. 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 the health care services or pension and housing funds administered by the government.

⁵IMSS and ISSSTE are the two largest public health care agencies in Mexico. Retirement pensions operate through individual accounts administered by private financial intermediaries under the supervision of an agency named SAR, and INFONAVIT is the official agency in charge of operating housing.

⁶As suggested by Boeri and Garibaldi (2006), this type of job status refers to low- productivity jobs, rather than 'development shadow employment', *i.e.* new jobs with the potential of becoming highly productive after a gestational period.

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. By contrast, open unemployment rates in Mexico are low, with respect to those of developed countries: lack of unemployment insurance and very low levels of workers' savings, make unemployment unaffordable for most participants in the labor market. Figures obtained from household surveys for 12 Latin American countries, in which the existence or absence 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).

Labor market regulations have first-order impact on the structure of employment. To assess them is beyond the scope of this paper; our focus is on how they may affect the permanence of workers in the formal sector. As a first step in this direction, following is a discussion of the main features of Mexican labor law.

3.1 Labor regulation

3.1.1 employment protection: In Mexico severance payment is equivalent to three months' pay plus 20 days of salary per year of service and unless an employee has remained with the same employer for 15 years, he/she will not receive a seniority premium. These provisions of Mexican labor legislation imply transaction costs to firms and workers ending a formal job relationship.⁷

This issue also represents a potential source of conflict, since workers who resign voluntarily have no right to severance payments or a seniority premium; instead, they are incentivized to bring about their dismissal.⁸

Moreover, the relatively high degree of labor authorities' discretion introduces an element of uncertainty in the termination of contracts that further increases their cost. For example, labor codes include a "reinstatement clause"⁹ and another clause

⁷When hiring informal employees, firms forego the payment of taxes and social security contributions, at the risk of facing potential fines from labor authorities for violating the law.

⁸An aspect of Mexican labor legislation that may be causing successful or productive matches to end sooner than what is optimal is associated with "seniority rights for promotion". The employer must promote the employee with the longest tenure that has been trained, instead of the one who is most productive. This regulation reduces the incentives for employers to offer training and for workers to demand it. In addition, this feature may cause workers with less seniority and a high potential for productive capacity to leave the firm in the absence of promotion opportunities.

⁹Employees that have been laid-off may ask to be reinstated by filing a case with the Conciliation Board.

stating that unpaid wages must be restituted until a legal process is concluded (*i.e.* the employee obtains wages between termination and his/her receipt of dismissal payments or his/her reinstatement).

3.1.2 temporary contracts and apprenticeships: Probation periods and apprentice contracts are prohibited in Mexico. Although the use of provisional contracts for activities that are not temporary in character is also prohibited, in practice they are commonly used. Impediments to formal employers for drawing up apprenticeship contracts may be having unintended effects on unqualified workers by forcing them to upgrade their skills in the informal sector, before being offered a formal job. In this case, we would expect that job experience and training help individuals go from the informal sector to a formal job. Section 6 addresses if this conjecture may be backed empirically by the Mexican experience; that is whether time spent as informal worker with the same employer increases the chances of moving faster from the informal to the formal sector.

3.1.3 minimum wages: A distinguished feature of nominal minimum wage levels in Mexico has been its continuous erosion in real terms in the last two decades. By the second half of the 1990's the minimum wage was, in real terms, around one fourth of what it used to be at its peak value in 1976. This decline has had two implications for the functioning of the labor market in Mexico.

First, relative to what would have been the case in the absence of this erosion, the number of workers with low productivity forced to be in the informal sector was reduced. Indeed, according to most studies, minimum wages are so low that they do not represent an entry barrier to the formal sector. Second, labor regulations stipulate a cap for seniority premium to workers earning more than two minimum wages. This is that, after 15 years with the same employer, they are entitled to 24 days of minimum salary per year of service rendered –if they leave voluntarily and, if dismissed, that amount plus lump-sum severance payments equivalent to 3 months’ pay plus 20 days salary per year of service. The decline in the real value of this seniority payment (a year earnings of a nominal minimum salary) has induced mobility by declining the real value of dismissals of workers and by inducing voluntarily separations of workers with less than 15 years of work.

3.2 Fluctuations of GDP growth

Unlike previous experiences in the 1990’s, in 1997 and again in 2001, deviations of GDP growth from its secular trend were unambiguously originated in export markets (registered rates of growth in manufacturing exports were 18.1% in 1997 and -2.7% in 2001). Underpinned by robust exports to the United States, output growth in Mexico had a vigorous expansion of 6.4 per cent in 1997. By contrast, Mexico’s GDP exhibited no growth at all in 2001; its exports declined strongly in this year, in close

synchronization with activity in the United States (OECD, 2004). The symmetry of these shocks of opposite sign allows us to compare, in the following sections, how labor markets in Mexico react to exogenous adjustments initially affecting the tradable sectors of the economy.

Prior to 1996 labor markets responded to different shocks than those registered later. In 1995 there was a major economic recession, along with a five percent drop in GDP and high transitions of formal employees to the informal sector. This was the result of a domestic banking crisis that led to major exchange rate depreciation and an unprecedented fall in domestic demand. As shown in Calderón-Madrid and Voicu, 2003, a large share of the decrease of formal jobs during this contraction is explained by plant closures. Economic expansions that occurred prior to 1994 and their associated formal job creation rates, on the other hand, are related to structural adjustments that respond to the signing of the Free Trade Agreement and to major macroeconomic reforms.

4 Data description

A panel-linked employment survey, the National Survey of Urban Employment (ENEU), applied quarterly by the National Institute of Statistics, Geography and Informatics (INEGI) has been the basis of a number of studies that analyze job status transitions in Mexico (Maloney 1999, Calderón-Madrid 2000, INEGI 2006). It is a rotating

panel of urban workers that substitutes 20 percent of interviewed persons each quarter. Our study uses this survey's data set but unlike previous studies, in this paper additional information about workers, which is not part of the original questionnaire, is appended. This appended information results in working with an employee's duration with the same employer, the individual's effective working experience and whether he/she has received training in the previous 15 months. These additional variables were captured under a cross-section survey, the National Survey of Education, Training and Employment (ENECE), which was applied by INEGI during the second quarters of 1997 and 2001 to a subset of participants in the ENEU panel survey. Since ENECE was applied to employees in the ENEU panel survey only once, follow-up may not be performed on all of the participants for the whole year. This is only possible for those who were in their first interview in the ENEU panel at the time in which both surveys were applied –the rest of them may be traced, for one, two or three quarters.

Our analysis differs from previous analyses conducted on employees who moved from and stayed in a particular job status (Maloney, 1999, Gong. and van Soest, 2002). Unlike those analyses, this study deals with the number of months that individuals remain in each job status, subject to the elapsed duration of employment in their current jobs and not only on whether they remain or not in their job. That is, we rely on methods to analyze time-to-event data, and not on probit or multilogit

models for the analysis of transitions among job status.

4.1 Characteristics of the dataset

We restrict our analysis to male salaried workers from 16 to 65 years of age. They constitute a sample of 22,946 individuals that fulfill two requirements in the ENEU survey. Firstly, the duration in their current job status is known by the years and months previously employed with their employer (plant job-tenure) and secondly, they can be followed for at least one quarter after being interviewed for the ENECE survey. We distinguish between formal and informal salaried employees according to whether or not they are registered in social security institutions (health care, retirement pension and housing funds).

In Table 1, the sample divided by formal and informal salaried workers is presented and the average amount of months spent in the current job status with the same employer is provided. The data set is additionally split in two categories, depending on whether workers' earnings are above or below three minimum salaries. Employees that move out of their job status and those that, within the year in which they were followed with the panel interviews, stayed in the same job status are identified as movers and stayers, respectively.

Because of the rotating nature of the panel data set, a number of persons exit the sample each quarter. These are part of the sample attrition subset.¹⁰ By

¹⁰To simplify the exposition that follows individuals that exit the labor force are also incorporated

subtracting employees that either moved to another job status or went to the sample attrition subset each quarter, we obtain the set of survivor individuals in each job status that can be traced one quarter more. The workers can be followed only for a maximum of five quarters; hence we end up with a number of them -presented in rows 6 and 7 of Table 1- that remain in the same job status all the time. The information provided by this subset has to be incorporated in the analysis; as explained in section 4, they are identified as censored observation and provide relevant information which, if ignored would seriously bias the results.¹¹

The last columns of panels A and B of Table 2 present destinations of workers in each quarter for individuals that constitute the survivor subset in the panel employment survey at the beginning of each quarter. These individuals have been tracked in subsequent quarters to identify if they have stayed in the same job status or moved out to one of three mutually exclusive destinations: from the formal job sector to informal salaried jobs, self-employment or unemployment, and from informal salaried jobs to the formal job sector and unemployment. As it is apparent in these tables, there are significant movements by workers from the formal to the informal job market and self-employment, and from the informal to the formal job market and self-employment. Notice that figures in column 1 of Table 2 correspond

in the sample attrition data set.

¹¹Workers that can be followed for less quarters but remain in the same job status while observed, are also part of the censored data subset.

to individuals that stay in the same job status, relative to those that were still there at the end of the previous quarter of the survey, regardless of length of time already spent in that job status. This is a survival concept different than the one addressed in section 4. That one incorporates length of time already spent in a job status and information provided by individual that remain in the job status at the end of the panel survey.¹²

Finally Table 3 presents distribution of variables, which are included as covariates in the estimation of hazard functions in section 6. Human capital in our empirical study is captured by eight mutually exclusive levels of educational achievement, by the effective amount of working experience and by a dichotomous dummy variable that captures whether a worker was trained during the last fifteen months. Dummy variables of education equal one if the person achieved a given level, otherwise, they are equal to zero, and working experience is introduced as an ordered variable of five years per unit. The estimation also includes the following variables regarding type of contract of a formal worker: one set of six mutually exclusive dichotomous variables. The first one has a value of one if the employee has a temporary contract (regardless of job tenure), otherwise the value is zero. The other five variables have a value of

¹²An actuarial estimator commonly used in the elaboration of life tables by demographers is more related to the survival concept of section 4, This is the so-called 'Kaplan Meir estimator' (Kiefer 1998).

one if a worker, in addition to a permanent contract, has been working with the same employer for a given period of time, otherwise their value is zero. Corresponding periods with the same employer are a) less than six months, b) between six months and one year, c) between one and two years, d) between two and five years, e) between five and ten years and f) at least ten years. Two sets of dummies for the size and sector of the firms where individuals work are also used: a dummy variable identifies the firm as small if it has less than 15 employees, medium if it has more than 15 but less than 50 employees and large if there are more than 50 employees working for the firm. In turn, eight categories of activities are defined as: primary activities (agriculture and mining), construction, manufacturing, financial services, personal services, commerce and restaurants, transport and communications and health and education).

5 Estimation of hazard functions

Following is the description of the model used to calculate the odds that an employment spell in a job status will end in any particular quarter, given that it has lasted up to that time in that status, as well as to quantify how these odds depend on a number of explanatory variables, such as education and training, among others.

5.1 Statistical 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 with a density function $f(t)$. The survivor function is defined as the probability that the duration of a spell will equal or exceed the value t :

$$S(t) = \Pr(T \geq t). \quad (1)$$

The cumulative distribution function, $F(t)$ is thus:

$$F(t) = 1 - S(t). \quad (2)$$

Hence 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*:

$$h(t) = \left(\frac{f(t)}{1 - F(t)} \right). \quad (3)$$

In this relationship, $h(t)$ may be interpreted as an exit rate or escape rate from the state, because it is the limit (as Δt tends to zero) of the probability that a spell terminates in interval $(t, t + \Delta t)$, given that the spell has lasted t periods. (Notice that the hazard can alternately be expressed as the logarithm change of the survival function).

The specifications of hazard functions that are estimated in the following section correspond to the so-called ‘mixed proportional hazard’ model. This has two parts: a

‘baseline’ hazard and a ‘systematic part’ which takes form of an exponential function. Thus, the hazard rate is multiplicative in all the separate elements of the covariates, viz:

$$h(t; X,) = h_0(t) \exp(X\alpha) \quad (4)$$

The baseline hazard, $h_0(t)$, captures the common hazard among individuals in the population, while the systematic part captures the individual observed heterogeneity through the effect of a set of covariates on the hazard rate. α is the vector of parameters to be estimated. The larger the exponential of the parameters in α are, the more probable it is that the individual with characteristics represented by X will exit the job status, given that the spell has lasted t periods.

The survival and baseline function can be calculated by:

$$S(t; X) = S_0(t)h_o(t) \exp(X\alpha) \quad (5)$$

$$S_0(t) = \exp - \int_0^t h_u du \quad (6)$$

Where $S(t;x)$ is the survivor function represented by $(1-F(t))$ in the denominator of (3).

5.2 Specification of covariates

The following section has four aims. One is to quantify the effect of human capital on a salaried worker’s hazard out of his current job status. Another is to assess

empirically the extent to which a permanent contract and the length of time working with the same employer (both variables associated with the effects of job termination severance payments) affect hazards out of formal jobs. A third aim is to consider if time spent as an informal worker with the same employer increases the chances of moving sooner from the informal to the formal sector. A fourth aim is to control for the effect on the mobility of salaried workers of the following three variables: a downswing in economic growth relative to a year of growth; the size of the firm in which the person is employed at the moment of the first interview of the panel and the job sector in which the firm is located. To achieve these aims, we specify next the hazard model to be estimated and describe its covariates.

The vector of variables X in equation (4) is constituted by characteristics of the individual representing his human capital, for formal job type of contract under which the employee is hired and size and sector of the firms where individuals work.

Human capital in our empirical study is captured by eight mutually exclusive levels of educational achievement, by the effective amount of working experience and by a dichotomous dummy variable that captures whether a worker was trained during the last fifteen months. Dummy variables of education equal one if the person achieved a given level, otherwise, they are equal to zero, and working experience is introduced as - ordered variable of five years per unit. To assess the relationship between job termination severance payments and departures from formal jobs, the specification of

hazards out of this job status includes one set of six mutually exclusive dichotomous variables. The first one has a value of one if the employee has a temporary contract (regardless of job tenure), otherwise the value is zero. The other five variables have a value of one if a worker, in addition to a permanent contract, has been working with the same employer for a given period of time, otherwise their value is zero. Corresponding periods with the same employer are a) less than six months, b) between six months and one year, c) between one and two years, d) between two and five years, e) between five and ten years and e) at least ten years.

The specification of covariates also includes a dummy for fluctuations in GDP, year, which has a value of one if the cohort belongs to recession (2001) and zero if it belongs to a 6.5 percent growth rate (1997) and two sets of dummy for the size and sector of the firms where individuals work. A dummy variable identifies the firm as small if it has less than 15 employees, medium if it has more than 15 but less than 50 employees and large if there are more than 50 employees working for the firm. Eight categories of activities were defined as follows: primary activities (agriculture and mining), construction, manufacturing, financial services, personal services, commerce and restaurants, transport and communications and health and education). Hazard functions for informal salaried workers include a covariate, duration in current job, which represents length of job tenure as an ordered variable capturing the number of quarters in that job status.

6 Results

The estimated hazard functions out of formal and informal job status are reported in Tables 4 and 5 for salaried workers. Column 1 presents the results of salaried workers moving from a formal job to an informal salaried job and column 2 from a formal job to self-employment. As stated in section 5.1, the hazard rate denotes the probability of transition out of a job status within a short time interval, conditioned by the worker's remaining in the same job status when the interval started; a value below 1 implies that the corresponding variable contributes to the survival of the individual in that status.

Our first result refers to human capital as a determinant of the permanence of an employee in a formal job and of his mobility from the informal to the formal salaried status. Hazard ratios of educational achievement in column A of Table 4 imply that formal workers who have not completed secondary education are more likely to be displaced to an informal salaried job¹³ and that individuals with less working experience remain in the formal sector for shorter periods of time. (The corresponding parameter suggests that 15 years of working experience reduces the hazard rate of leaving the formal sector by ten percent). Table 5, in turn, presents an opposite image of worker mobility in the other direction: the odds of becoming a formal jobholder

¹³The omitted education category in these estimations is primary education, whether it has been completed or not.

are higher for informal salaried workers who have completed at least secondary school and for individuals with more working experience. These estimations also indicate that individuals who receive training are more likely to remain in the formal job market and to obtain a formal job when they are in the informal job sector.¹⁴

With regard to the sector in which employees are located, results show that manufacturing activities (the omitted dummy variable in the estimation) provide relatively more stability to workers in the formal sector, while informal workers in this sector are more likely to move to a formal job status.

In turn, results reported in column A of Table 4 indicate that, relative to growth periods, the mobility of formal salaried employees to the informal sector increases during a downswing of the economic cycle.¹⁵ The value of the coefficient of the

¹⁴Three caveats regarding the impact of training on these functions arise. First, the parameter obtained for the impact of training on hazards may be biased, given that workers may be self-selecting themselves into training. Second, the implied causality may not hold. That is, the case may be that formal employees receive training because their employers have decided to retain them and not the other way around. Finally, knowledge of where informal workers are trained is required. This is because it might be the case that employers in the informal sector providing training to their employees achieve effective job attachment commitments from them.

¹⁵We tested the hypothesis that the effect of education and employment protection variables on mobility depend on economic growth. The hypothesis was rejected. We included the multiplicative effects of the dummy Year with education, contract and tenure categories. These were statistically insignificant.

dummy variable Year lends itself to the following interpretation: compared to what would have occurred with a 6 percent rate of economic expansion, the hazard to move from formal to informal job status of a manufacturing worker with less than secondary school is 40 percent higher when the economy stagnates, even if they have a permanent contract and a working relationship of more than ten years with the same employer. This interpretation follows because the omitted dummy variables in the specification of the hazard takes on a value of one in the case of workers with this profile and because the dummy that captures economic growth equals one for the year 2001 –with zero GDP growth– and zero for 1997, when the economy’s GDP increased by 6.4 percent. Another results apparent in Table 4 is that workers with temporary contracts are the most likely to be displaced to the informal sector. They suggest that the noncompliance of regulations associated with hiring employees under permanent contracts enhances the adaptability of the workforce in the formal sector. These results are also consistent, but do not necessarily imply a causal relationship, with a positive effect of employment protection regulations on job stability.¹⁶

As expected, the importance of this effect increases as workers spend more time in the same job, since dismissal costs are lower for those with a shorter tenure. As is apparent in column A of Table 4, employees who have spent between six and

¹⁶The lack of exogenous variations in the cost of breaking up job matches in Mexico does not allow for an effective identification of how employment protection regulations affect job status mobility as has been done, for example, in Peru by Saveedra *et. al.* (2001).

forty months with the same employer have higher hazard ratios of exiting the formal sector than those with longer job tenures, and lower hazards than those with tenures of six months or less.

A suggestive indicator of the relevance that employment protection legislation may have on the mobility of formal workers to informal jobs follows by comparing the relative values of two hazard ratios in Table 4: the dummy representing work under a temporary contract and the dummy capturing the effect of economic growth. Based on the relative magnitudes of these ratios, we can posit that *work under a temporary contract adversely affects a worker's survival in a formal job more than an economic slump affects the likelihood of permanence of workers with permanent contracts. This implication also applies to workers with permanent contracts and who have spent less than six months with the same employer, with respect to workers with a relationship of more than ten years with their employers.*

It is possible to obtain a first approximation of how temporary contracts accelerate mobility out of the formal sector. From our data set we know that, subject to the time already spent with their current employer, jobholders with permanent contracts lasted an average of 2.6 quarters, or approximately 250 days, more in their job status. Consequently, the parameter of the hazard ratio corresponding to temporary contracts reported in column 1 of Table 4 implies that workers with this type of contract spend half of the time in the formal sector, relative to what individuals with

permanent contracts spend in the same sector. Hence, we can interpret Table 4 as stating that workers hired under temporary contracts in the formal sector remain, on average, only 169 days more than those with permanent contracts in that job status before moving on to an informal salaried job.

A result worth discussing is the lower possibilities that formal workers in small firms have of remaining in a formal job status. This is the joint result of different causes, namely, the reasons why small firms have higher job destruction rates, on one hand, and why a formal worker dismissed from a small firm is less likely to find another formal job, on the other. Regarding the causes for the former, it has been well-documented that small businesses have higher mortality rates and more flexibility to adjust their labor force. It is generally easier for them to evade labor regulations and their employees do not belong to trade unions. With regard to the reasons for the latter, an explanation may be that wages in small firms are lower than they are in medium and large firms. Hence, for workers in small, formal firms, earnings paid in the informal sector are an attractive alternative option, thereby suggesting voluntary movements between job statuses. By contrast, if the explanation were more related to stigmatizing effects, as discussed in the following subsection, the phenomenon could be reflecting a problem that merits public attention.

6.1 Stigmatization effects or skill obsolescence?

Formal employees of small firms that lose their jobs may share a problem with workers in the informal sector. This is that they may find their re-employment prospects in the formal sector jeopardized by problems of information asymmetry in labor markets, resulting from a recent job experience in a medium or large size firm acting as a signaling device for quality.¹⁷

That is, in addition to the previous remarks concerning workers in small firms, it may also be the case that their job history constitutes a negative signal to employers in the formal sector that may consider offering the individual a job. This is an information asymmetry that may also affect informal workers and if so, the longer the stay in an informal job status, the less likely it is that they move to a formal job. Regarding this last case, figures in Table 5 support this argument.

Thus, our results indicate that a worker that remains in an informal job for a long time, with respect to another employee with a short stay, has different search intensities for a formal job, as well as effectiveness in finding a formal job. A similar result is observed with an employee in a small, formal firm, with relation to another formal employee in a medium or larger firm. This effect may be aggravated by the

¹⁷The information asymmetry problem arises since an employee that has not worked in a medium or large firm (which in general provide more training and require constant skill upgrading) cannot signal that he/she is as skilled as one that has worked in a large firm.

effects of discouragement on the searching behavior of workers.

6.2 Mobility of salaried workers to self-employment

In contrast to the results reported in the previous subsection, those of columns 1 and 2 of Tables 4 and 5 imply that heterogeneity in education is not a relevant determinant of staying in the formal sector, with relation to moving toward self-employment, or of staying in an informal salaried job status, with relation to becoming self-employed. These tables also suggest that workers that move from salaried jobs to self-employment are those with more working experience. Another result worth mentioning, after comparing columns in these tables, follows by comparing corresponding ratios for the variable that captures what happens when GDP stagnates: in economic recessions the likelihood of an informal salaried worker becoming self-employed increases, thereby suggesting that this job status absorbs workers when job offers decline. (Results obtained indicate that hazard rates from formal jobs to self-employment, and from informal salaried jobs to self-employment, are relatively more sensitive to recessions than the hazard rates of formal to informal salaried jobs and of informal jobs to self-employment).

7 Concluding remarks

We found that workers with less human capital are more likely to be trapped in cycles of long spells of informal employment followed by short-term jobs in the formal sector and displaced again to informal jobs. These results conform with analytical predictions from models that have followed and extended to a developing country context the labor market approach initially put forth by Mortsen and Pissaridis, 1994. In the Mexican case, mobility out of the formal sector to an informal salaried job is relatively higher for uneducated workers (less than secondary school finished), for those with less working experience and no recent training, and for employees hired with a temporary contract or with a permanent contract, but with less than a year with the same employer and, conversely, that mobility of this kind of employees is relatively slower from an informal to a formal job.

We were able to assess impact of output growth fluctuations on hazard out of a job status. This was possible by working with surveys that were applied in periods in which labor markets reacted to upswings and downswings in GDP growth clearly initiated, in both cases, in the tradable sectors of the economy. We also addressed the following question: controlling for the effect of human capital on a salaried employee's hazards out of his current job status and for other determinants of mobility; what is the extent to which heterogeneity, with regard to the type of contracts and to the length of time working with the same employer, affects hazards out of formal jobs?

We compared two quantitative results as a suggestive indicator of the relevance that employment protection legislation may have on the mobility of formal workers to the informal sector. On the one hand the extent to which, other determinants of mobility being equal (including output growth), working with a temporary contract affects a worker's survival in a formal job, relative to an employee hired under a permanent contract with more than six-month tenure with the same employer. On the other hand the extent to which an economic slump, relative to a counterfactual of situation in which GDP grows above average trend, displace formal workers to informal jobs.

We found that an economic slump affects the likelihood of permanence in the formal sector of workers with permanent contracts less than what, other things equal (including output growth), being hired under a temporary contract affects a worker permanence in that job status. This implication also applies to workers with permanent contracts and who have spent less than six months with the same employer, with respect to workers with a relationship of more than ten years with their employers. This suggests that it is the noncompliance of regulations associated with hiring employees under permanent contracts that enhances the adaptability of the workforce in the formal sector.

Our empirical study shares with the rest done for Mexico and most other developing countries a major criticisms: results are not based on a "natural experiment" that

could provide compelling evidence for a causal link between employment protection regulations and the degree of mobility of workers between formal and informal job statuses.¹⁸ Given that there have not been variations in the cost of breaking up job matches in Mexico (labor legislation has not been modified in Mexico for decades and is the same all over the country), our results must be taken with caution. They are consistent, but do not necessarily imply a causal relationship, with a positive effect of employment protection regulations on job stability.

There are two important questions which have been beyond the scope of this paper and should be addressed in further research to help policy debates in Mexico. The first is to what extent firm-specific training would be affected if severance payments in the event of dismissal were not a part of a worker's contract. The second is to what extent mandatory job termination payments slow down reallocation of resources from old and declining sectors to new and dynamic ones, thereby reducing productive efficiency.

Regarding hazards out of an informal job status, we found that a worker that remains in an informal job for a long time, with respect to another employee with a short stay, has different search intensities for a formal job, as well as effectiveness in finding a formal job. A similar result is observed with an employee in a small

¹⁸Notable exceptions are the studies for Colombia, Peru and India by Kugler (2001), Saveedra *et al.* (2001) and Besley and Burges (2002), respectively.

formal firm, with relation to another formal employee in a medium or larger firm. We interpreted these results as suggesting that re-employment prospects in the formal sector might be jeopardized by problems of information asymmetry in labor markets, resulting from a recent job experience acting as a signaling device for quality. An analytical question that deserves future analysis is if -as an extension of the model by Kugler and Saint-Paul (2004) would suggest- entrance prospects to the formal sector are further jeopardized when these information asymmetry problems are present together with regulations that establish that severance payments for job terminations prevail by law.

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Table 1
Male salaried workers

Observations	Formal job status	Informal job status
Total	14,691	8,255
1997	8,584	4,354
2001	6,107	3,901
less than 3min wage	5,517	4,965
more than 3 min wage	9,174	3,290
stay all five quarters in same job status		
1997	1,042	183
2001	1,876	552
Mean tenure (months)		
Total		
all	87.00	73.66
less than 3min wage	65.98	60.50
more than 3 min wage	99.73	83.90
Movers		
all	73.66	58.32
less than 3min wage	60.50	52.47
more than 3 min wage	83.90	65.28
Stayers		
all	89.71	69.05
less than 3min wage	67.29	67.26
more than 3 min wage	102.49	71.99

Table 2
Male salaried workers
Percentage of workers in formal jobs that retain their job status or move to another one
% of observations in each quarter, excluding sample attrition*/

		A			
		Transitions from formal sector			
		<u>Survive in the Formal Sec.</u>	<u>Escape to the Informal Sec.</u>	<u>Escape to Self. Emp.</u>	<u>Escape to Unemployment</u>
First quarter after the questionnaire was applied	1997	85.65%	9.28%	3.70%	1.36%
	2001	81.42%	10.48%	6.65%	1.44%
Second quarter, given that they survived up to the first	1997	91.24%	5.89%	2.20%	0.68%
	2001	85.82%	7.77%	5.03%	1.37%
Third quarter, given that they survived up to the 2nd	1997	93.62%	4.08%	1.42%	0.89%
	2001	85.50%	7.56%	5.96%	0.98%
Fourth quarter, given that they survived up to the 3rd	1997	94.41%	2.97%	1.80%	0.81%
	2001	85.72%	6.98%	6.30%	1.00%

		B			
		Transitions from informal sector			
		<u>Survive in the Informal Sec.</u>	<u>Escape to the Formal Sec</u>	<u>Escape to Self. Emp</u>	<u>Escape to Unemployment</u>
First quarter after the questionnaire was applied	1997	61.78%	21.07%	14.02%	3.14%
	2001	61.12%	19.18%	18.05%	1.65%
Second quarter, given that they survived up to the first	1997	71.62%	16.47%	9.87%	2.04%
	2001	72.77%	12.59%	12.79%	1.86%
Third quarter, given that they survived up to the 2nd	1997	77.59%	11.48%	7.47%	3.46%
	2001	76.64%	10.66%	11.15%	1.56%
Fourth quarter, given that they survived up to the 3rd	1997	81.70%	10.27%	6.70%	1.34%
	2001	78.81%	9.72%	10.53%	0.94%

*/sample attrition is due to the rotating nature of the panel data set and due to the exclusion of those that move out of the labor force.

Table 3
Descriptive statistics

Job status of employees at the time of their first interview					
A			B		
Workers that initially in the formal sector			Workers that initially in the informal sector		
	Mean	Std. Dev.		Mean	Std. Dev.
temporary contract	0.18		Year (2001=1)	0.47	
perm. contr. & in job < 6 months	0.04		elementary school unfinished	0.20	
perm. contr. & 6 <in job <12months	0.03		elementary school finished	0.22	
perm. contr. & 13 <in job <24months	0.08		secondary educ. unfinished	0.08	
perm. contr. & 25 <in job <40months	0.10		secondary educ. finished	0.21	
perm. contr. & 41 <in job <60months	0.08		high sch. educ unfinished	0.10	
perm. contr. & 61 <in job <120months	0.10		high sch. educ finished	0.06	
perm. contr. & more than 120 months	0.39		Post high sch. studies	0.05	
Year (2001=1)	0.42		university finished	0.06	
elementary school unfinished	0.09		more than university	0.01	
elementary school finished	0.16		training in last fifteen months	0.17	
secondary educ. unfinished	0.06		primary activities	0.09	
secondary educ. finished	0.22		manufacture	0.16	
high sch. educ. unfinished	0.13		construction	0.13	
high sch. educ. finished	0.08		transport and communications	0.11	
Post high sch. studies	0.07		personal services	0.29	
university finished	0.17		commerce and restaurants	0.18	
more than university	0.03		financial services	0.04	
training in last fifteen months	0.46		small firms	0.75	
primary activities	0.02		medium firms	0.08	
manufacture	0.32		large firms	0.03	
construction	0.05		work experience	3.21	2.6
transport and communications	0.07		age	31.44	12.2
personal services	0.31		tenure (months)	66.23	89.5
commerce and restaurants	0.19				
financial services	0.04				
small firms	0.14				
medium firms	0.14				
large firms	0.72				
age	34.72	11.12			
work experience	3.61	2.38			

Table 4
Cox proportional hazard functions for salaried workers

	from formal job status to informal salaried job (1)	from formal job status to self-employment (2)
	Hazard Ratio	Hazard Ratio
temporary contract	1.9420** (0.1416)	1.5828** (0.1554)
perm. contr. & in job < 6 m.	1.6987** (0.1588)	1.7465** (0.2196)
perm. contr. & 6 <in job <12m.	1.3950** (0.1360)	1.2277 (0.1695)
perm. contr. & 13 <in job <24m.	1.4279** (0.1268)	1.2294* (0.1503)
perm. contr. & 25 <in job <40m.	1.4330** (0.1330)	1.3268** (0.1685)
perm. contr. & 41 <in job <60m.	1.2815** (0.1153)	1.3398** (0.1549)
perm. contr. & 61 <in job <120m.	1.2688** (0.0989)	1.4097** (0.1330)
Year (2001=1)	1.4241** (0.0588)	2.2076** (0.1325)
sec. educ. unfinished	0.9107** (0.0821)	0.9504 (0.1333)
sec. educ. finished	0.8474** (0.0517)	0.8867 (0.0821)
high sch. educ. unfinished	0.7231** (0.0552)	1.0129 (0.1086)
high sch. educ. finished	0.8168** (0.0729)	1.0066 (0.1286)
Post high sch. studies	0.7370** (0.0715)	1.0124 (0.1393)
university finished	0.7527** (0.0567)	1.3462** (0.1301)
more than university	0.9597 (0.1243)	1.2647 (0.2216)
work experience	0.9680** (0.0099)	1.1196** (0.0155)
training in last fifteen months	0.7388** (0.0350)	0.8350** (0.0546)
primary activities	1.4637** (0.1783)	0.7591 (0.1561)
construction	1.7750** (0.1528)	2.2064** (0.2461)
transport and communications	1.2061** (0.1056)	0.9743 (0.1242)
personal services	1.5010** (0.0841)	1.0705 (0.0847)
commerce and restaurants	1.0635 (0.0667)	1.0095 (0.0895)
financial services	1.8149** (0.1958)	1.2924* (0.1914)
small firms	2.0746** (0.1109)	1.5838** (0.1295)
medium firms	1.5600** (0.0892)	1.1485 (0.0992)
No. of subjects	14691	14691
No. of failures	2421	1221
Time at risk	43072	54845
Log likelihood	-22295.09	-11120.00

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

Table 5
Cox proportional hazard functions for salaried workers

	from informal job status to formal salaried job (1)	from informal job status to self-employment (2)
	Hazard Ratio	Hazard Ratio
duration in current job	0.9990** (0.0003)	1.0007** (0.0002)
Year (2001=1)	1.0419 (0.0458)	1.2783** (0.0643)
sec. educ. unfinished	1.1121 (0.0962)	1.1197 (0.1098)
sec. educ. finished	1.1346** (0.0714)	1.0026 (0.0716)
high sch. educ. unfinished	1.2146** (0.0986)	0.9978 (0.1027)
high sch. Educ. finished	1.1841* (0.1099)	1.0702 (0.1204)
post high sch. studies	1.0813 (0.1166)	1.0710 (0.1413)
university finished	1.6003** (0.1398)	1.1238 (0.1332)
more than university	1.5077** (0.2486)	0.9886 (0.2465)
work experience	1.0423** (0.0103)	1.1418** (0.0118)
training in last year	1.4220** (0.0807)	0.9430 (0.0728)
primary activities	0.2822** (0.0357)	1.3759** (0.1380)
construction	0.6224** (0.0533)	1.7631** (0.1621)
transport and communications	0.6875** (0.0566)	1.1658 (0.1189)
personal services	0.8425** (0.0526)	1.2244** (0.1059)
commerce and restaurants	0.7537** (0.0534)	1.1988* (0.1130)
financial services	0.7594** (0.0891)	1.1709 (0.1729)
No. of subjects	8255	8255
No. of failures	2169	1758
Time at risk	25062	25062
Log likelihood	-18706.63	-18706.63

Standard errors are in parentheses. One or two asterisks indicate significance at the 10%, 5% significance level