

## THE DYNAMICS OF THE LABOR MARKETS IN CHILE

### LA DINÁMICA DEL MERCADO LABORAL EN CHILE

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#### Abstract

*Through flows from 3 states, employment, unemployment and out of the labor force, we analyze the dynamics of labor markets in Chile from 1962-2007. We identify some periods of different labor market regimes and relate them with changes in flexibility. We found that reforms such as that of 1967, which introduced the “just cause” requirement to fire workers, did not help workers to keep their jobs, but there is no evidence of significant changes in inflexibility. Other labor regimes significantly affected transitions, but surprisingly, it was the new regime identified in 1990, that increased mobility. We interpret this as the result of the consolidation of a flexibility prone model that, until then, had been associated with an unpopular imposition by the military regime. Finally, we do not find any evidence showing that after 1998 the changes in labor participation and consequently, that the explanations of the changes in the unemployment rate could be associated with “added and discouraged worker effects.”*

Key words: labor markets, transition probabilities, unemployment.

#### Resumen

*A través de flujos provenientes de 3 estados, empleo, desempleo y fuera de la fuerza laboral analizamos la dinámica del mercado laboral en Chile en 1967-2007. Identificamos algunos períodos de distintos regímenes del mercado laboral y los relacionamos con cambios en flexibilidad. Encontramos que reformas tales como la de 1967, que introdujo la “causa justa” como requerimiento para despedir, no ayudó a los trabajadores a mantener sus trabajos, pero no hay evidencia*

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*de cambios significativos en rigidez. Otros regímenes laborales afectaron en forma significativa las transiciones, pero sorprendentemente se encontró que el nuevo régimen laboral de 1990 aumentó la movilidad. Interpretamos este resultado como la consolidación de un modelo que propicia la flexibilidad, el cual, hasta entonces, había estado asociado con una impopular imposición del régimen militar. Finalmente, no encontramos evidencia alguna que muestre que luego de 1998 los cambios en la participación laboral y, por consiguiente, las explicaciones de los cambios en la tasa de desempleo, puedan estar asociados con efectos de trabajador “añadido y desalentado”.*

Palabras clave: *mercados laborales, probabilidades de transición, desempleo.*

JEL Classification: *J38, J63.*

## 1. INTRODUCTION

The study of Chilean labor markets offers significant interest due to at least three reasons. First, Chile went from being a highly regulated economy to being one of the most open and unregulated economies in the world by implementing deep economic reforms in most institutions, including the pension system and the labor markets. Second, the University of Chile employment survey provides a unique historical series, which allows economic and statistical analysis that is not possible in most LDCs. And third, the performance of labor markets in Chile has been puzzling. The jump in the unemployment rate in the middle seventies, when the government carried out the first wave of structural reforms, was not reversed despite the rapid growth of the economy in the last part of that decade. On the other hand, in the eighties, after a much deeper crisis that led the unemployment rate to over 25 percent, the recovery in employment and the growth in wages were much more rapid than expected.

Studying the labor markets dynamics is crucial not only to understand the development process and the perspective of the economy, but also to understand the meaning of some indicators captured through surveys in a particular period. As an illustration for such importance, let's consider two economies in which one twelfth of the workers are unemployed (i.e., the unemployment rate is 8.6 percent in each economy). The unemployment rate is not reliable as a measure of the labor market performance. In the economy 1 the 8.6 percent unemployment is explained because each worker is unemployed for one month every year, while in the economy 2, 8.6 percent of their labor force is permanently unemployed. While both economies have the same rate of unemployment, the two economies have very different dynamics.

The difference between these two economies arises from the flows into and out of unemployment. Attempting to understand the state of the labor market based only on measures of the stock of employed and unemployed workers will present an incomplete picture of the labor market. Thus, it is important to analyze the flows between employment, unemployment, and out of the labor force to have a better understanding of the way in which the labor market works. This is, of course, useful in designing policies to reduce or, at least, lessen the impact of

unemployment.<sup>1</sup> Unfortunately, however, panel data, based on the follow-up of a sample of people (or any other unit of study) across time, is not available from a historical perspective, so only indirect approaches can be carried out.<sup>2</sup>

In this paper we perform a dynamic analysis to analyze whether the changes in the labor laws have affected flexibility in the labor markets in Chile. To do so, we analyze mobility in different periods associated with different labor regulations: 1962-1966; 1967-1973; 1974-1979; 1980-1990; 1991-1998, and 1999-2007. Within each period, labor laws and other institutional arrangements were relatively stable, but the end of each period marks the beginning of a new institutional framework, that is, a set of policies and laws directed at altering the performance of the labor market. We estimate transition probabilities across three possible states: unemployment, employment, and out of the labor force and we associate flexibility with the size of these transition probabilities.

The paper is organized as follows. In Section 2 we describe the Chilean economy during the period 1960-2007. Section 3 presents the methodology to compute transition probabilities and the results. Section 4 concludes.

## **2. THE CHILEAN ECONOMY AND THE LABOR MARKET**

Chile, as most Latin American countries, began to experience strong State intervention in 1930, as a result of the great depression. The great depression was probably the most important conditioning factor that determined the roles that the State and other sectors and entities would play in the economy over the next forty years. In Chile, labor law was very protective of the worker during those years. Only one union per firm was allowed and union membership was mandatory. Strikes had no limit and replacement of striking workers was forbidden. Dismissal of workers was very difficult since 1966, when the law prohibiting dismissals of workers without a justified reason was banned. Due to the rigidity of the labor market, the public sector, the only sector in which wages increased in real terms, was the main generator of employment.<sup>3</sup> In the private sector, wages were closely determined by regulation, including minimum wages and adjustment clauses. State intervention, including labor market regulation, reached its peak in the early seventies during the Allende administration. In 1970, when Allende took office, there were 75 State-owned enterprises; by 1973, there were more than 200, accounting for 39 percent of the country's GDP. Consistent with these institutions, employment growth in the 1960's followed the path of the economy. While relatively low employment output elasticity before the 1970's existed, the unemployment rate remained relatively low due to the increasing schooling rate and lower labor market participation, and to the progressive involvement of the government as an employer.

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<sup>1</sup> Part of the vast literature on the topic is Besley and Burgess (2004), Forteza and Rama (2001); Heckman and Pagés (2000); Karanassou and Snower (1998); and Di Tella (2005).

<sup>2</sup> For some analysis of the Chilean experience, see Haindl (1985), Riveros (1985), Sapelli (1996), Cahmi, Engel and Micco (1987), Larrañaga and Paredes (1999), and Paredes (2003).

<sup>3</sup> See González (1996) for a detailed description of the laws and their changes.

The main changes in institutions and economic performance appeared in 1966 when dismissal at will ended. Between 1967 and 1973 a firm dismissing a worker without a "justified cause," should pay one month per year of work, plus the forgone earnings during the trial. The second largest change came in 1973. In September of that year, a military regime overthrew Allende's government. That year marks the beginning of a process of structural adjustment and reforms. The public sector deficit was the greatest problem faced by the Military Junta in 1973. An increase in taxes and a drastic cut in government expenditures were the first actions that helped reduce the fiscal deficit. Expenditures on civil servants' salaries were reduced by more than 30 percent in four years, as public sector employment was cut by a third (100,000 jobs). Furthermore, from the very outset of the new administration, the government required its agencies to reduce their headcount by 20 percent, discontinued all fund transfers to most State owned firms, did away with discriminatory rules favoring public institutions (basically the Civil Service), and increased the prices of public services markedly. Simultaneously, the new government deregulated most of the previously controlled prices (out of 3,000 initially price-controlled commodities, only 30 were left by 1975), reduced import tariffs from 103 percent to 10 percent, and implemented a tax reform.

Regarding labor, in 1973 and for the following six years, unions were banned and collective bargaining was replaced by a government wage setting plan and although the Labor Code did not change, Courts became "pro firms" and started accepting most reasons for dismissals, something that contrasted with the previous period. The crisis and the institutional and economic changes rocketed unemployment to over 30 percent. Thus, while the law did not change, there was a de facto deregulation. In particular, the Ministry of Labor accepted "economic reasons" as a justified reason to dismiss workers. The consequence: between 1973 and 1978 layoffs increased substantially (González, 1996).

After the crisis, and despite the important recovery of GDP since 1978, the growth of employment and wages was slow. Some reasons may be that the tariff reduction policy implemented between 1974 and 1979 failed to establish clear objectives in terms of product specialization and export orientation (see, Edwards and Edwards, 1987), and that the economy did not have the capacity to readjust its human resources to the new skill needs (Paredes and Riveros, 1996). However, another explanation for the poor performance in the labor markets in late 1970s and early 1980s lies in the rigidities in the market. As a matter of fact, this diagnosis produced a major change in individual rights in June 1978, through the enactment of the Law Decree 2.200. This ended the requirement to ask for permission of the Ministry of Labor in the case of collective (massive) firing something though that in practice was generally allowed. Since then, firms were allowed to dismiss workers for economic needs and it was not required to have a "just cause" anymore.

In 1979, the new Labor Code was approved and sweeping reforms were introduced. Among the most important was the elimination of national unions in favor of firm level ones. Unionization became voluntary and workers' right to strike was curtailed. Since then, striking workers could be replaced from the first day of a strike. In the case of firing workers, a limit was set on the severance payment equivalent to 5 months, reducing firm's burden. In addition, in 1980 all restrictions on sub contracting ended. Also, in the early 1980s the central-

ized pension system was replaced by a private one, which reduced the social contribution from 30 percent to 20 percent.

The international crisis of the early 1980s hit Chile in a context where the economy was in a weak production and balance of payments position. As a consequence and without a structural change, the macroeconomic effect on unemployment was huge. The unemployment rate increased from 10.5 percent in September of 1981 to 24.9 percent in September of 1983 and real wages declined by about 12 percent. The government reacted with a massive temporal emergency employment program.

By mid 1980s the government also initiated a massive privatization program, which included traditionally state owned enterprises.<sup>4</sup> Also the government introduced new rules governing the stock exchange, the insurance industry and mutual funds. The new rules sought to provide transparency and to ensure portfolio diversification. In fact, there is relative agreement that the first privatization stage presented problems mainly because of this lack of regulation (Harberger, 1985). Since 1984, a more coherent policy approach relied on the expansion of labor-intensive sectors by freeing the exchange rate. Fiscal management became even more conservative, shrinking the consolidated deficit to zero.<sup>5</sup>

In 1990 Chile underwent a new institutional change with the recovery of democracy. However, the basic economic aspects initiated with the mid 1970's reforms were retained, especially the macroeconomic policy of the late 1980's. Four governments pertaining to the same party coalition successively took office in 1990, 1994, 2000 and 2006. A main characteristic of these governments is that they kept a basic consensus on the critical role of the private sector and of private property, the importance of non discriminatory policies and the use of markets to achieve efficiency. These governments, though, attached a much more critical role to social policies and were concerned not only with poverty but also with income distribution.

Notwithstanding, in 1991 some changes in the labor law took place. Perhaps the most significant was the increase in the limit to severance payment that went from 5 to 11 months. This amendment in the labor law was considered a final adjustment that would validate most previous changes that took place under the military government. Despite this "additional rigidity" the ratification of most elements of the 1980 Labor Code seems to explain the most impressive increase in foreign investment and the sustained growth of about 6 per cent and the rate of unemployment that remained close to its natural level until late 1998.<sup>6</sup> However, since 1998, without any structural change, there was a macroeconomic downturn in Chile due to two factors: the beginning of the Asian crisis and a truly political cyclical period. The second factor was reflected in an important relaxation of the fiscal discipline, a huge increase in the minimum wages that reached 30%

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<sup>4</sup> For instance, ENTEL (telecommunications), CTC (local telephony) and ENDESA (electricity generation and distribution). For a detailed analysis and description of the privatization process in Chile, see Hachette and Lüders (1993).

<sup>5</sup> This, however, had a negative social impact which, was addressed by providing greater assistance to the extremely needy.

<sup>6</sup> Paredes and Riveros (1996) analyze the level and the causes of unemployment, concluding that in 1990 most unemployment was "voluntarily."

between 1998 and 2001, and the initiation of a debate about new changes in the labor law, that were finally implemented in 2002. The unemployment rate jumped and, despite the increase in the GDP, the employment and the labor force growth froze. Regarding this last effect, an important controversy emerged in Chile on the reasons behind both the persistence of the unemployment and on whether a “discouraged worker” effect explained the labor force stagnation.

In conclusion, and consistently with Montenegro and Pagés (2003), we identify six labor regimes between 1960 and 2003. The first from 1960 to 1966 is characterized by a relatively small, but progressive government intervention. The second starts in 1967, when compensation for foregone wages and 1 month per year compensation were introduced. The third period goes from 1974 to 1979. In this period no collective bargaining was allowed and though formally there were little changes, in practice this was a period of de facto deregulation. The fourth period starts in 1980 and ends in 1990. In that period a new labor law was applied. The fifth period starts in 1990 with the recovery of democracy and with further reforms that suggest a more stable and permanent framework, until 1998, when Chile experienced a macroeconomic downturn, an increase in minimum wages and the debate of new labor rules. The last period starts in 1999 and ends the second quarter of 2007.<sup>7</sup>

TABLE 1  
MAIN LABOR NORMS BY PERIOD

Period	Dismissals	Compensation “Just Cause”	Compensation Unjustified Reason
1960-66	At will	At will	At will
1967-73	Courts opposed	No compensation	1 month p.y. no limit + foregone wages
1974-78	Courts favored	No changes	Irrelevant
1979-90	Economic reasons at will	No changes	1 month p.y. 5 months limit
1991-98	Justify economic reasons	1 month per year limit 11 months	1.2-1.5 months p.y.
1999-07	No changes	No changes	No changes

### 3. GROSS FLOWS AND THE PROBABILITY OF FINDING A JOB

Since Chile only has historical data coming from cross section surveys, the only way to understand the dynamics of the labor market is by using that information. We study the dynamics of Chilean labor markets from the perspective of a highly simplified stock-flow model of the labor markets. The data considered was obtained from the Employment and Unemployment Surveys for Greater Santiago Chile in the month of June, between 1957 and 2007, and the sample covers slightly less

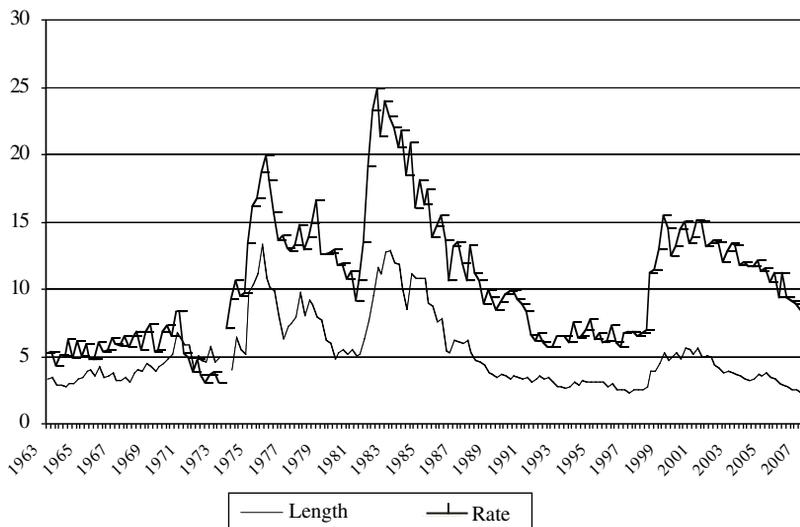
<sup>7</sup> Whilst only in 2002 some new changes in the law were implemented, the debate about taxes and the government intervention make it interesting to split the analysis. See Bergoing and Morandé (2002).

than 50% of the total labor force in the country. This survey has been conducted uninterruptedly, it provides the longest series of data available in Chile and data on stocks of employed, unemployed, and inactive workers.

As mentioned above, understanding the dynamics of labor markets economy is important, and can help us to estimate, for instance, what is the probability of finding a job. While it is true that this probability could be approached by the average duration of unemployment, this information is not only a biased estimation of expected duration, since declared unemployment is interrupted, but may also change dramatically over the years depending on the composition of new unemployed. Thus, the information about unemployment duration, something that has to do with the history on unemployment, tells something that the unemployment rate alone does not. Thus, as apparent from Figure 1, the average length of unemployment and the unemployment rate do not always move closely.

Consequently, to understand some aspects of the way the labor market works, it is necessary to get information on its dynamics. In turn, to characterize the dynamics of the labor markets with cross section information, we need to estimate transitions among states, which requires imputing inter-temporal flows among states as the difference in stocks. This information we do have.

FIGURE 1  
RATE AND LENGTH OF UNEMPLOYMENT  
(% and months)



### 3.1. The Stock-Flow Relationships

The structure of the stock-flow model of the labor market follows Summers (1990) and is adapted from Haindl (1985). He considers two states, employed and unemployed, to compute the expected duration of unemployment, and combines identities, stocks (capital letters) and flow (small letters) relationships. We use

Haindl's model to estimate a corrected probability of leaving unemployment, and then we compute transition probabilities and the Markov matrix. Thus, there are two types of relations in this model: identities that relate different variables within a period and laws of motion that describe the evolution of variables over time. The three states we are interested in to characterize where a person able to work can be are: employed (E), unemployed (U) and out of the labor force (O). Haindl assumes that the changes in (the stock of) U only come from changes in E. Assuming that state dependence does not exist, derives the probability of being hired within the quarter.

We re-estimate this probability considering that the new employed in a quarter may come either from U or from O. From the re-estimated probability, and considering that the normalized flows must add up to 1, we compute all the flows including those in and out of O, as we show next.

### 3.1.1. *Identities*

The first identity sums unemployed workers of different vintages:

$$(1) \quad D(t) = D1(t) + D2(t) + D3(t)$$

where  $D(t)$  is the number of people unemployed in period  $t$ ,  $D1(t)$  is the number of first time searchers;  $D2(t)$  is the number of people who have been unemployed for at most one quarter; and  $D3(t)$  is the number of people who have been unemployed for more than a quarter.

The second identity breaks down the flow into the labor force into two groups:

$$(2) \quad f(t) = f1(t) + f2(t)$$

where  $f(t)$  is the net flow into the labor force;  $f1(t)$  is the number of people entering the labor market for the first time;  $f2(t)$  is the number of people entering the labor market, but who had participated before.

The third identity decomposes the number of hired workers into three categories:

$$(3) \quad c(t) = c1(t) + c2(t) + c3(t)$$

where  $c(t)$  is the flow of people hired in  $t$ ;  $c1(t)$  is the number of first time searchers hired in period  $t$ ;  $c2(t)$  is the number of people hired from among those who have been unemployed for at least one quarter; and  $c3(t)$  is the number of people hired from among those who have been searching for more than one quarter.

Finally, we have an identity that relates the size of the labor force in period  $t$ ,  $F(t)$ , to employment in period  $t$ ,  $E(t)$ , and unemployment in period  $t$ :

$$(4) \quad D(t) = F(t) - E(t)$$

### 3.1.2. *Stock-Flow Relationships*

Equation 5 is the law of motion for the labor force:

$$(5) \quad F(t) = F(t - 1) + f(t)$$

Equation 6 is the flow into employment:

$$(6) \quad E(t) = E(t - 1) + c(t) - d(t)$$

where  $d(t)$  is the flow of people who are fired and those who voluntarily quit their job and  $c(t)$  is the flow of new hired in  $t$ .

Equation 7 is the law of motion for the unemployed, where  $f(t)$  was already defined.

$$(7) \quad D(t) = D(t - 1) + f(t) + d(t) - c(t)$$

Equation 8 shows the unemployed in  $t$ :

$$(8) \quad D1(t) = D1(t - 1) + f1(t) - c1(t)$$

Equation 9 shows those unemployed that had had a job and are searching for one quarter or less.

$$(9) \quad D2(t) = f2(t) + d(t) - c2(t)$$

Equation 10 shows those unemployed that had a previous job and are searching for more than a quarter:

$$(10) \quad D3(t) = D3(t - 1) + D2(t - 1) - c3(t)$$

The problem thus far is that the survey pertains only to unemployment. There is no data which describes flows into employment; therefore, the stocks of hires in period  $t$ ,  $c1(t)$ ,  $c2(t)$ ,  $c3(t)$ , and  $c(t)$  are unobserved.

In order to close the model, it is necessary to either determine or assume how the economy employs individuals. We follow Haindl (1985) and assume that the stochastic process for employment is iid across individuals and has no memory. In any event, this amounts to finding the average probability with which an agent is hired, imposing no duration dependence on unemployment spells, and assuming there are no differences across individuals in the likelihood that they obtain a job offer. Essentially, the model closes by replacing actual flows into employment by their expected values. If we denote the probability that a person who is unemployed at the beginning of a quarter finds a job within the quarter as  $\pi(t)$ , then we can close the model as follows:

$$(11) \quad c1(t) = P(t) f1(t) + \pi(t) D1(t - 1)$$

Equation 11 shows the expected number of hired people among those searching for the first time, estimated as the sum of those who were first time searchers in the previous period and those who found a job but had not worked before.  $P(t)$  is the probability of finding a job by those entering into the labor force, and  $\pi(t)$  is the probability of finding a job for the unemployed in the previous period (they are different since the searching period is different). Also, equation 12 shows the number of hired people among those who were searching less than a quarter, as the sum of the expected number of new hired, taken from the potential population ( $f_2(t) + d(t)$ ).

$$(12) \quad c_2(t) = P(t) (f_2(t) + d(t))$$

And finally, equation 13 shows the number of hired people among those searching for more than a quarter as the expected hired from the potential population, that is, the unemployed at the beginning of the period.

$$(13) \quad c_3(t) = \pi (D_2(t-1) + D_3(t-1))$$

where  $\pi(t)$  is given by:

$$(14) \quad \pi(t) = 1 - (D_3(t) / [D_2(t-1) + D_3(t-1)])$$

If people who enter into the labor force for the first time begin searching uniformly throughout the quarter, the average search time for them in that quarter is one month and a half, and the probability of getting a job during the period of three months  $P(t)$ , comes from  $(1 - P(t))^2 = 1 - \pi(t)$ .

Equation 14 closes Haindl's model. However, unlike his conclusions based on an unemployment duration of  $\pi$ , we use this probability as an input to estimate the conditional probabilities of changing states in a three state model; employed, unemployed, and out of the labor force. In the following sub section we use this probability to solve for the unknown flow parameters  $c(t)$ ,  $c_1(t)$ ,  $c_2(t)$ ,  $c_3(t)$ ,  $f(t)$ ,  $f_1(t)$ ,  $f_2(t)$ , and  $d(t)$  in terms of the known stocks  $F(t)$ ,  $F(t-1)$ ,  $E(t)$ ,  $E(t-1)$ ,  $D_1(t)$ ,  $D_1(t-1)$ ,  $D_2(t)$ ,  $D_2(t-1)$ ,  $D_3(t)$ , and  $D_3(t-1)$ . Once the aggregate flow parameters have been obtained, we compute the flows in and out of the three possible states,  $f_{ij}(t)$ .

### 3.2. Computation of Inter State Flows and Transition Probabilities

Once the model is solved for aggregate flow parameters, it is possible to compute the expected flows across the different states. Let  $f_{ij}(t)$  denote the flow into state  $j$  at time  $t$  of those people who were in state  $i$  at time  $(t-1)$ . These flows can be computed from the stocks of people in different states and the aggregate flows computed in the previous sections.

People who enter the labor force either go directly into employment or are unable to secure a job and become unemployed. Flow into employment is given by the fraction of first time searchers who are able to find a job within the

period in which they enter the labor force. That is, we assume that those coming from O to E never had a job before (i.e., there is no return). If the proportion of people who interrupt their working lives does not change over the years, or if it is uncorrelated with the cycle and the labor regimes, the measurement error would affect only the levels, not the path.

$$(15) \quad \text{foe} = P(t) f1(t)$$

The flow into unemployment is the sum of first time searchers who do not obtain a job in their first period of search and the change in the other labor force veterans, currently out of the labor force, who express a desire to work  $x(t)$ , that is, a group that is not counted but technically unemployed<sup>8</sup>:

$$(16) \quad \text{fou} = (1 - \pi(t)) f1(t) + x(t)$$

Workers in the labor force are re-shuffled between employment and unemployment. A fraction of workers who lose their job are able to find a new job within that same period. Flow into unemployment is, then, composed of people who are either fired or quit their jobs:

$$(17) \quad \text{feu} = (1-P(t)) d(t)$$

The unemployed who flow into employment (equation 18) consist of the new hired who were unemployed for more than a quarter; a proportion of those first time searchers who were unable to secure a job initially, the fraction of fired individuals who become employed within their first period of unemployment, and a fraction of the net flow of workers previously out of the labor force (i.e, this increases employment only if net flow is positive).

$$(18) \quad \text{fue} = c3(t)+\pi(t)D1(t-1)+P(t) (1 - P(t)) d(t)+P(t)\max(f2(t), 0)$$

Finally, the flow out of the labor force comes either from unemployment or employment. These two flows are computed as residual flows; that is, the flow that generates the observed change in the stock of unemployed and employed workers. Therefore, flow out of the labor force from unemployment is given by:

$$(19) \quad \text{fuo} = \text{fou} + \text{feu} - \text{fue} - (D(t) - D(t - 1))$$

while flow from employment to out of the labor force is given by:

$$(20) \quad \text{feo} = \text{foe} + \text{fue} - \text{feu} - (E(t) - E(t - 1))$$

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<sup>8</sup> We use the number of people out of the labor force that would be willing to work at least 20 hours per week.

From these flows, we can compute the average transition probabilities as in equation 21 below, where each element  $p(ij)$  gives the (conditional) probability of going from state  $i$  to state  $j$ :

$$(21) \quad p_{ij} = f_{ij}/S_i(t-1)$$

where  $S_i(t-1)$  is the stock of individuals in state  $i$  at time  $(t-1)$ . For example,  $pe_u$  denotes the probability that an individual will be unemployed in period  $t$ , given that she was employed in period  $t-1$ .

Notice that transition probabilities are conditional probabilities. That is, they tell us the probability of ending up in a particular state, conditional on starting out in a particular state. Conditional probabilities tell us much more than non conditional ones. For instance,  $pe_u$  is the probability that a worker becomes unemployed, given that she was employed in the previous quarter. This is different than the probability of becoming unemployed computed from first time searchers only ( $pu_o$ ), the probability of remaining unemployed ( $pu_u$ ) and the probability of being observed in the unemployment state ( $pu_u + pu_o + pe_u$ ).<sup>9</sup>

The Markov matrix built by averaging the different  $p_{ij}$  over the six relevant periods we identified is reported in Table 2.

TABLE 2  
MARKOV MATRIX IN RELEVANT PERIODS

	pe <sub>u</sub>	pe <sub>o</sub>	pue	pu <sub>o</sub>	poe	pou	pee	pu <sub>u</sub>	poo
1962-66	2.5%	1.1%	76.3%	14.4%	0.3%	1.6%	96.4%	18.4%	98.1%
1967-73	2.5%	0.9%	64.8%	25.3%	0.2%	2.5%	96.6%	14.5%	97.2%
1974-79	4.8%	1.3%	39.9%	12.4%	0.3%	3.0%	93.9%	47.7%	96.7%
1980-90	5.3%	1.6%	49.0%	9.7%	0.3%	3.3%	93.1%	41.6%	96.4%
1991-98	3.9%	1.8%	79.8%	5.8%	0.5%	2.4%	94.3%	15.3%	97.1%
1999-07	6.6%	2.4%	68.9%	0.6%	0.5%	1.2%	91.0%	30.5%	98.2%

We filtered the transition probabilities using Hodrick-Prescott (1997) for two values of  $\lambda$ ; a value of 100,000 that emphasizes the trend, and a value of 1,600 that focus on the cycle. Figure 2 shows the filtered  $pee$  and  $pu_u$  probabilities we call “staying probabilities,” because they show the conditional probabilities of remaining in the same state, employment and unemployment respectively.

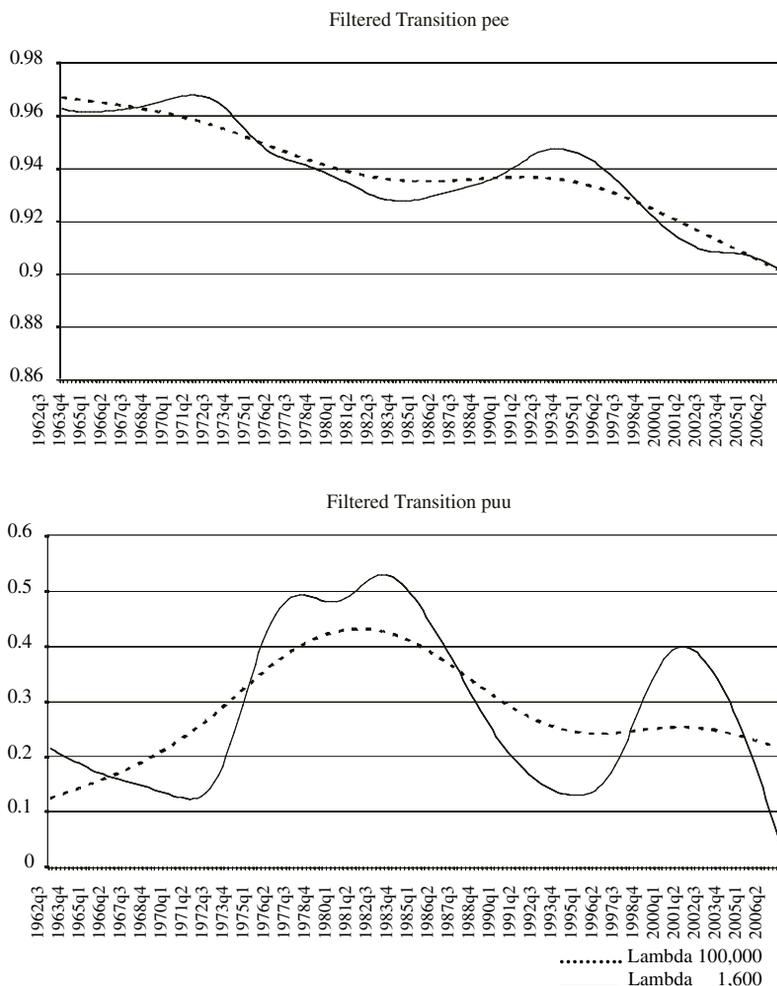
As is apparent, the overall long-run trend in both probabilities (although it is clearer in the case of  $pee$ ), shows that the economy becomes more flexible.

<sup>9</sup> We can compute several interesting elements, such as the probability of finding a job, conditional on staying in the labor force  $pue^* = pue / (pue + poo)$ . This probability nets out the flow from employment to out of the labor force, which includes mostly retired people. We can also define the probability of losing a job, conditional on staying in the labor force as,  $peu^* = pue / (pue + pu_u)$ , which tells the probability that a person becomes unemployed, but stays looking for a job.

Employment is less secure, but also unemployment is less permanent. The trends are however affected in some periods, as for instance, the important fall in  $pee$  in the middle 1970s and in the late 1990s. The latter fall was rather surprising since it remained even after the recovery of the last three years.

A more complete interpretation however, can be made by looking at other transitions, for instance  $puu$ . A fall in  $pee$  can be associated only with a macroeconomic downturn. But a coincident fall in both,  $pee$  and  $puu$  cannot be associated with that and necessarily reflects higher flexibility. That is why the huge changes in this probability over the period, are much more consistent with our hypothesis than the effect of changes in the institutional environment.

FIGURE 2  
FILTERED “STAYING” PROBABILITIES



The above interpretation is supported by the evolution of the two main transition probabilities, *peu* and *pue* (Figure 3). The probability for an employed person of becoming unemployed (*peu*) fell after the reform in 1967 but almost doubled in the 1974-79 period and increased even further in the 1980s.

An exceptional period seems to be 1991-1998. Despite a more rigid labor law, the changes in the probabilities suggest even larger labor mobility and in particular, a clear reduction of the probabilities of remaining unemployed. Especially surprising seems to be the important reversal of the probabilities since 1999 whose effect on labor indicators, particularly the unemployment rate, have been associated with a change in the economic structure. In this period new labor reforms were discussed, an international crisis hit the Chilean economy, and the minimum wage increased over 30 percent. Furthermore, the important jump in open unemployment generated a debate on the sources of information. The official information provided by INE showed a somewhat different evolution of the main market labor indicators than that generated by the University of Chile.<sup>10</sup>

Transition probabilities involving people that change their labor status are also relevant in the analysis. The idea that the increase in the unemployment rate can be explained to “added worker effect” has been common in Chile, though the evidence is scarce. The probability of leaving the work force, given one was unemployed the previous period (*pou*), tells us about the discouraged worker effect, while *peo* and *puo* tell us about the added worker effect. We added flows in and out of O. The first case, when people are moving from O to either E or U, represents more participation, and when referred to as a short term phenomena, we interpret it as the “added worker effect.” In the second case, that is, when people are moving to the O state, we call it “discouraged worker effect.” The evolution of this situation is shown in Figure 4.<sup>11</sup>

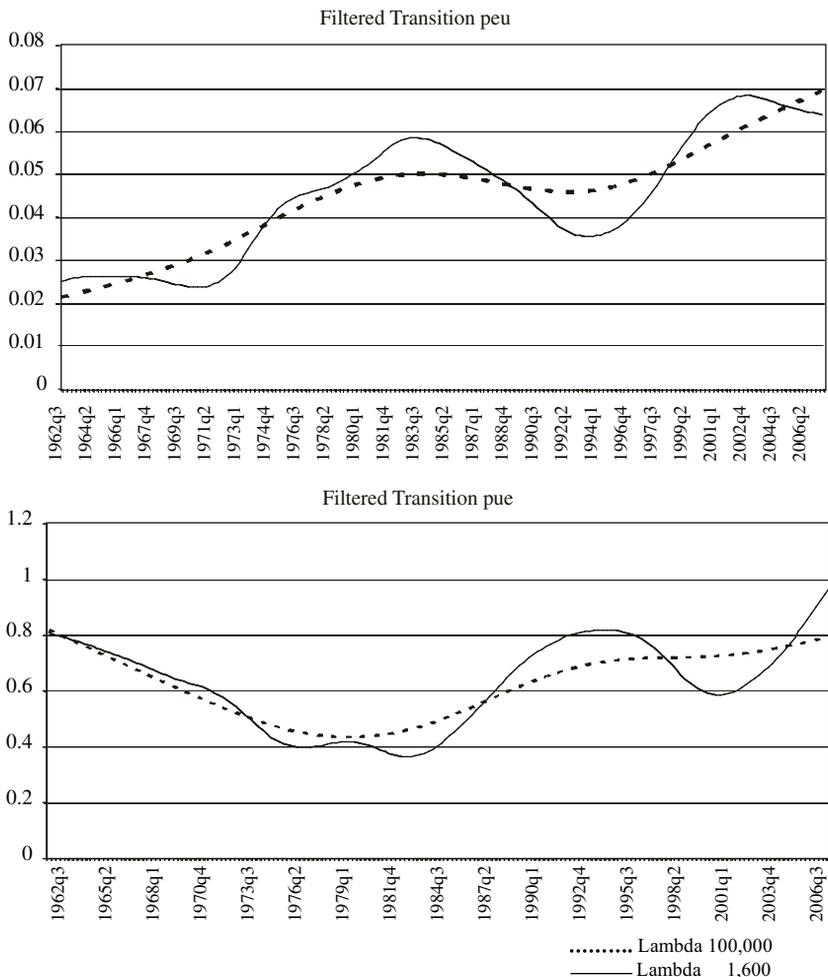
The data suggests that the magnitudes of these transition probabilities changed in the different periods considered, but for the period 1998-2005, particularly when it was thought that these effects would explain the surprising evolution of the labor force, is not supported by the data.

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<sup>10</sup> Whilst an important discussion around this topic exists, most analysts suggest that the data coming from the University of Chile is more adequate. For a discussion, see Chumacero (2000); Bravo, Ramos and Urzúa (1999).

<sup>11</sup> For an analysis of the evolution of the employment in Chile, see Cowan *et al.* (2005), and for an analysis of the debate of the added versus discouraged worker effect, Mimica *et al.* (2007).

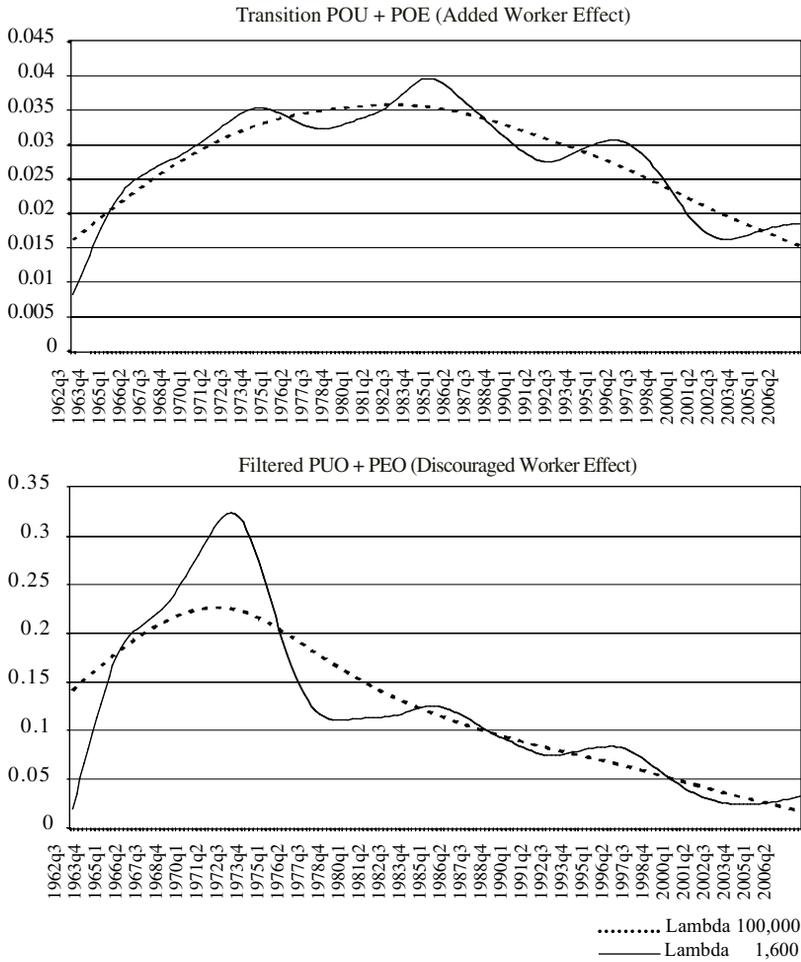
FIGURE 3  
TRANSITION PROBABILITIES FOR WORKERS



### 3.3. Transition Probabilities and the Natural Rate and Length of Unemployment

Transition probabilities tell part of the story and only the interaction of those probabilities has a more clear interpretation. These affect the steady state of the unemployment rate and the expected length of unemployment. To see this, let's consider the three state Markov chain  $P$  in which an individual can find himself at anytime: employed, unemployed or out of the labor force. The transition matrix is given by:

FIGURE 4



$$P = \begin{bmatrix} p_{ee} & p_{eu} & p_{eo} \\ p_{ue} & p_{uu} & p_{uo} \\ p_{oe} & p_{ou} & p_{oo} \end{bmatrix}$$

Notice that  $p_{ee} + p_{eu} + p_{eo} = 1$ , since each individual must end up in some state, regardless of the state in which they begin. This Markov chain is irreducible, since it consists of only one class and communicates all states. If we assume that the transition probabilities are known, we can find the invariant distribution that defines the steady state probabilities. Let's denote  $\pi$  the invariant distribution. It turns out that the invariant distribution is the unique non-negative solution to:

$$\pi_j = \sum_{i=1}^S \pi_i P_{ij}$$

and

$$\sum_{i=1}^S \pi_j = 1$$

with  $i, j = o, u, e$  and  $S = 3$ .

The invariant distribution must add up to 1 ( $\pi_o + \pi_u + \pi_e = 1$ ) and the unique invariant distribution must also satisfy a set of equations that can be written as follows:

$$\begin{aligned} p_{ee} \pi_e + p_{ue} \pi_u + p_{oe} \pi_o &= \pi_e \\ p_{eu} \pi_e + p_{uu} \pi_u + p_{ou} \pi_o &= \pi_u \\ p_{eo} \pi_e + p_{uo} \pi_u + p_{oo} \pi_o &= \pi_o \end{aligned}$$

In a simpler form, these equations state that the unique invariant distribution is also a vector of “stationary probabilities»:

$$X = P' X$$

Where  $P'$  is the transpose of the transition matrix. The invariant distribution is akin to a vector of “steady state” probabilities in the sense that if we start the system out at the unique invariant distribution, this distribution will persist over all transitions of the system.

In order to obtain the steady state probabilities, we solve using the four equations above along with a set of restrictions of the transition probabilities of the type  $\pi_{ii} + \pi_{ij} + \pi_{ik} = 1$  with  $i, j, k$  all the states. The invariant distribution for the three state Markov chain model of the labor market and in particular, the long term relationship between the  $P_{ij}$  and the unemployment (also employment and out of the labor force) rates are given by:

$$\pi_u = \frac{[-p_{eu}(-1+p_{oo}) + p_{eo} p_{ou}] / [1-p_{ou} p_{uo} + p_{eu} (1-p_{oo} + p_{uo}) + p_{eo} (1+p_{ou} - p_{uu}) + p_{oo}(-1+p_{uu}) - p_{uu}]}$$

$$\pi_e = \frac{[-1+p_{ou} p_{uo} - p_{oo}(-1+p_{uu})+p_{uu}] / [-1+p_{eu}(-1+p_{oo}-p_{uo})+ p_{pu} p_{uo} - p_{oo}(-1+p_{uu}) + p_{uu}+p_{eo}(-1- p_{ou}+p_{uu})]}$$

$$\pi_o = \frac{[p_{eu} p_{uo} - p_{eo}(-1+p_{uu})] / [1-p_{ou} p_{uo} + p_{eu} (1-p_{oo} + p_{uo}) + p_{eo} (1+p_{ou} - p_{uu}) + p_{oo}(-1+p_{uu}) - p_{uu}]}$$

Table 3 shows the invariant probabilities of the three states. We interpret them as equilibrium rates of unemployment, employment and non participation. We also include an estimation of the duration of unemployment. Assuming that the employment process of a particular individual begins in the employment state, the expected number of transitions ( $m_{ee}$ ) until the process returns to that state is equal to  $1/(1-p_{uu})$ .

Table 3 shows that while the long run rate of unemployment more than doubled after the reforms in 1974, it remained high until 1990. Since 1991, it fell considerably, however it increased during the last sub-period, when the minimum wage increased and the debate on the last reforms took place. The

TABLE 3

	$\pi_u$	$\pi_e$	$\pi_o$	mee
1962-66	2.93%	54.25%	42.82%	1.43
1967-73	3.03%	57.36%	39.62%	1.30
1974-79	7.05%	48.74%	44.22%	1.93
1980-90	6.90%	52.21%	40.89%	1.69
1991-98	3.76%	54.87%	41.37%	1.21
1999-07	4.77%	39.52%	55.71%	1.44

“long term unemployment rate”, in this last period fell to the lowest historical level, which explains the important increase in the number of periods to find a job. All the information we have presented thus far is suggestive that labor regimes produced changes in the labor flexibility.

The simple observation of the  $\pi_{ij}$  and long-run unemployment *suggest* that there were changes in the structure of the labor market, but *do* not tell us if these changes were significant and/or transitory. To test the significance of these changes we ran a set of regressions with and without economic growth and the ratio of the wages for unskilled labor and the minimum wage as macro controls. We specified the transition probability as  $\ln(\pi_{ij}/(1-\pi_{ij}))$ , such that expected probabilities do not take values out of the (0,1) range and we considered the long run or natural component of unemployment obtained from the H-P filtered series using a  $\lambda = 100,000$ . Table 4 shows the results of this exercise, where we are particularly interested in the difference among adjacent periods.

The results show that in general, considering macro controls do not affect the identification of structural changes in transitions, and they never affect the changes in long-run unemployment. Something in principle rather surprising is that no changes in transition probabilities are observed in the period 1967-73 with respect to the previous one. This is surprising because of the relevant change in the labor legislation. However, it may also be explained by the huge government intervention, in particular the government as an employer, during this period. Since then, in all periods significant changes in all probabilities have taken place. Particularly interesting is the reduction in the probability of remaining unemployed, that in the period starting in 1980 falls significantly with respect to the previous year. Less surprising, the opposite occurs with that probability in 1999, when the Asian crisis hit the economy and the minimum wage rose significantly.

A main observation is that in all the periods previously defined, a structural change in unemployment is observed. In particular, unemployment increases in 1967 with the more rigid structure created by the imposition of the strict job security regulation. The same happened in 1973, and the clearest reason for that, at the light of the results reported for  $\pi_{uu}$ , is that this probability increased significantly, something that can be explained due to the important change in labor demands. In the period 1980-99 structural unemployment also rose. The only period where unemployment clearly fell, was 1990-98 something that could be surprising since we controlled for GDP growth (in that period, GDP

**TABLE 4**  
UNEMPLOYMENT AND TRANSITION PROBABILITIES EVOLUTION

	Unemployment*		Lti(Pue/l-Pue)		L.-/l-Pee)		Ln(Puull-Ptrn)	
1962-1966	0.04 (4.11)	0.05 (30.06)**	0.5 (1.26)	0.27 (3.43)**	1.80 (6.44)0*	1.48 (24.82)**	-1.58 (-2.08)*	-1.12 (-8.9)**
1967-1973	0.07 (6.21)**	0.08 (31.31)**	0.65 (1.34) NC	0.39 (2.0 1)*	1.91 (6.29)** NC	1.56 (21.04)** NC	-2.22 (-2.35)* NC	-1.71 (-4.69)** NC
1974-1979	0.11 (10.08)**	0.12 (55.21)**	0.08 (0.17)	-0.20 (-2.9)**	1.64 (4.96)**	1.24 (24.27)**	-1.27 (-1.43)	-0.71 (-5.94)**
1980-1990	0.12 (13.47)**	0.13 (71.83)**	0.23 (0.58)NC	0.00 (0.02)	1.55 (5.75)** NC	1.22 (23.66)** NC	-1.49 (-1.93)	-1.03 (-8.07)** NC
1991-1998	0.09 (7.87)**	0.10 (175.57)**	0.87 (1.89)	0.60 (8.57)**	1.68 (5.03)** NC	1.28 (26.92)** NC	-1.91 (-2.12)*	-1.39 (-11.91)**
1999-2007	0.10 (7.22)**	0.11 (128.38)**	0.67 (1.19)NC	0.33 (5.66)**	1.51 (3.82)**	1.02 (39.27)**	-1.73 (-1.61)	-1.06 (-12.85)**
$\Delta \ln(\text{GDP})$	0.01 (0.65)		0.76 (1.61)		-0.34 (-0.95)		-1.52 (-1.87)	
$\ln(\text{M.W.A.W})$	0.00 (0.75)		-0.16 (-0.61)		-0.22 (-1.23)		0.31 (0.64)	
Obs.	179	180	175	176	175	176	163	164
R2	0.99	0.99	0.34	0.33	0.96	0.96	0.65	0.65

\*\*Significant at 1% \*Significant at %.

NC: no significative change with respect to the previous period.

grew significantly more than in the previous ones). Our interpretation is that the return to democracy was favorable for the labor market because there was an institutional consolidation of the economic model.

#### 4. CONCLUDING REMARKS

In this paper we use the quarterly employment and unemployment surveys of the University of Chile, to analyze the dynamics of the labor markets in Chile. While this cross section data has important problems in doing that, by using relatively simple and acceptable assumptions, we found results that can illuminate the debate and the analysis of the labor markets behavior.

Our results suggest that the changes in the application of the law, a more general concept than changes in the law, can tell an important part of the story

of unemployment. We found that reforms such as that of 1967, which introduced the “just cause” requirement to fire workers, did not help workers to keep their jobs, but there is no evidence of significant changes in inflexibility. Other labor regimes significantly affected transitions, but surprisingly, it was the new regime identified in 1990, that increased mobility. We interpret this as the result of the consolidation of a flexibility prone model that, until then, had been associated with an unpopular imposition by the military regime. Finally, we do not find any evidence showing that after 1998 the changes in labor participation and consequently, that the explanations of the changes in the unemployment rate could be associated with “added and discouraged worker effects.”

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