Studies in Structural Change and Labour Market Adjustment

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PREFACE

There appear to be two standard openings of dissertations. Either one starts by telling the story of how it all began or claims in a more or less poetic way that the thesis is a result of team-work. Since I, by now, do not remember how it all began, the latter is the only possibility. I am perfectly aware that the team will not take responsibility for what is written in this book. I would, however, not have got far enough to be the one to blame, had I not received substantial support from many colleagues and friends. I wish to thank them all.

Karl Jungenfelt has been my thesis adviser. He once convinced me to enter the doctoral program. Ever since, the door to his room has always been open. I have benefitted greatly from his creative comments on several versions of all the studies.

Peter Englund has also made substantial contributions to all the studies, especially Chapter 3. His role goes, however, far beyond that. Without his continuous encouragement during the last ten years I would perhaps not have started and definitely not finished this work.

It is impossible not to be caught up by the enthusiasm for labour economics and labour market policy shown by Anders Björklund. He has commented constructively throughout. Furthermore, his suggestion four years ago, that I should explore the possibilities of using the Labour Force Surveys, has probably had a greater effect than any other single comment on this dissertation.

David Brownstone has served as navigator through the tough world of econometrics. His help with the actual empirical work as well as his perspicacious comments on theoretical issues has affected particularly Chapters 4, 5 and 6.

Barbara Mikalson was employed to improve my use of the English language. In fact she did much more. In discussions with her, some of my cloudy thinking was straightened out. Her comments and suggestions have led to substantial changes in the text.

Many people have read drafts of the studies. In particular Inga Persson-Tanimura, Mats Persson, Erik Ruist, Staffan Viotti and Eskil Wadensjö have delivered constructive criticism. I have also in various stages of the work received help from Bertil Holmlund, Lars Hultkrantz, Svante Johansson, Håkan Lyckeborg, Karl-Göran Mäler, Bo Nordin and Pehr Wissén.

The Stockholm School of Economics has been not only a stimulating but also a congenial place in which to work. In this Onerva Lahdenperä, Kerstin Niklasson, Monica Peijne and Marianne Widing have a substantial role. The main burden of typing and re-typing these studies fell on Kerstin Niklasson, who as always did this with excellence and inexhaustible good spirit.

Anja Gonzalez and Siw Andersson drew the diagrams while Bo Dahlberg and Gunnar Gelin from Statistics Sweden delivered the data from the Labour Force Surveys.

Financial support from Jacob Wallenbergs Fond and from the Ministry of Labour is gratefully acknowledged.

Finally, I want to thank Christina Ahlsén for helping me to see that this was a task I had to finish myself despite all help from others, and for not having had unlimited patience regarding this work.

Stockholm in April, 1984

Lars Heikensten

CONTENTS

1. Introduction, Summary and Suggestions for Further Research

1.1 INTRODUCTION

The first two decades after World War II in Sweden were characterized by rapid growth. Adjustment in the labour market to exogenous disturbances was in most respects smooth. By the end of the sixties signs of a more problematic economic development were visible and the 1970's became, indeed, a decade with problems for the Swedish economy.

Employment in manufacturing decreased during the seventies but this was more than compensated by growth in the public sector. This expansion together with ambitious labour market policies kept open rates of unemployment at relatively low levels.

Behind the aggregate unemployment figures disturbing developments had occurred. Some categories of unemployed (such as older workers who had been laid off) had particularly slim re-employment prospects. The probabilities of re-employment were low for youth and older workers in general. Furthermore, the average length of a spell of unemployment appeared to have increased since the sixties.

In this dissertation an effort is made to analyze factors underlying the observed aggregate unemployment figures. Individual data on labour market experiences are utilized in several of the studies. The effects of changes in the economy and in labour market policy on various groups of unemployed

workers is one topic. In another study factors strategic to the re-employment prospects of workers who become unemployed are identified. A third study contains an analysis of the effect of one such factor, the length of the unemployment spell, on the probability of re-employment. The labour market prospects of a particular group of unemployed, those laid off when industrial plants close down, is the subject of the fourth work. Finally, a model for the simulation of the local labour market effects of a plant closure is developed.

Obviously, the studies are devoted to different though related topics. They can be read independently but some effort has been made to minimize overlapping discussions and to point out differences and similarities between the approaches taken and the conclusions drawn.

The first section in this chapter gives a brief description of developments in the Swedish labour market during the 1970's: the changing conditions in the labour market, the political response to these changes and the results from studies analyzing the labour market will be discussed. The purpose is not to give a few stylized facts that will be tested in the following studies. Instead, this first section should provide a basis for appreciating why certain problems have been selected to pursue in the studies. Moreover, the empirical results obtained in the studies can be interpreted against the background of existing knowledge about the Swedish labour market in the 1970's.

The third section is devoted to a discussion of theories of dynamic labour behaviour, in particular search theory. It was these theories which were advanced in the 1970's as a challenge to the view of unemployment as a stagnant pool of helpless individuals. The focus shifted to the importance of labour supply and the underlying mechanisms of individual rational choice. Rather than making an exhaustive survey of new labour market theory, models and arguments useful in interpreting empirical results (particularly those in Chapters 4 and 5) are considered.

Section 1.4 presents a brief summary of each of the five studies. Finally, some suggestions for further research are made in Section 1.5.

1.2 THE SWEDISH LABOUR MARKET - A BACKGROUND

Economic policy during the first two post-war decades was to a great extent guided by the so-called Rehn-Meidner model.[1] According to the model, developed within the Swedish Trade Union Confederation, the objectives of economic policy should be growth, full employment and a more equal distribution of incomes. These could be achieved if the Federation itself, in nationwide collective bargaining, followed a policy for equality, the so-called solidarity wage policy.[2] At the same time, aggregate demand should be kept at a low level to hold down inflation and an "active labour market policy" be pursued to facilitate the mobility of labour between regions and sectors necessary for growth.

The economic program was successful. Labour force participation and employment increased while unemployment was low. Growth in general was rapid. Inflation was relatively high by international standards, but still very low compared to the levels which characterized the seventies. In addition, the solidarity wage policy had the intended effect of equalizing wages. [Öhman (1982)].[3]

The period was characterized by rapid structural changes. These were a consequence of changing demand and supply conditions embedded in the growth process itself. But the process

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[1] An original source is "Fackföreningsrörelsen och den fulla sysselsättningen" (1951). The model is described in English in Rehn (1952).

[2] This policy implied striving towards the same wage for the same work regardless of sector, region etc. as well as towards more equal wages in general.

[3] Lindbeck (1975) surveys Swedish economic policy during this period.

was speeded up by the free trade policies pursued and by the solidarity wage policy, which led to relatively higher wage increases in low paying, often marginal, regions, sectors and firms.

The structural changes required adjustment. Individuals living in contracting regions migrated to a large extent during the first two post-war decades. Consequently, the big cities grew rapidly while other regions lost population. However, for some groups adjustment was not easy. Especially older industrial workers had extremely poor employment prospects when laid off.[1] For this reason, to improve the employment opportunities in regions affected by the structural changes in a negative way, a regional economic policy was introduced.

The Gloomy Seventies

In a small open economy it is crucial to find the level of wages which is consistent in the long run with balanced trade. If wages increase too fast relative to the rest of the world, it will normally result in a trade deficit. This can be avoided if the government can reduce domestic demand via fiscal policy and use the subsequent revenues to create employment for those who are "pushed out" of the sectors competing with foreign suppliers. In a situation of this kind the public sector will expand. In addition, the rate of return would be expected to decrease in the traded sector having a negative impact on investments. This is, according to Wissén (1982), more or less what happened in Sweden during the post-war period. However, it is clearly not a development which is sustainable in the long run and by the middle of the 1970's it came to an abrupt end.

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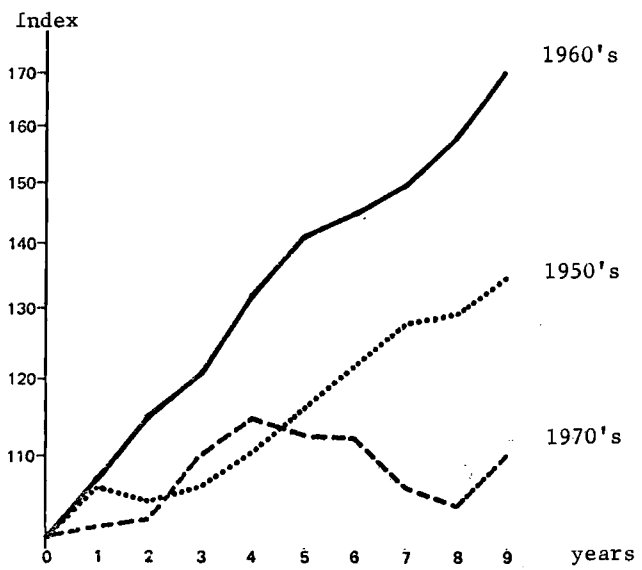
[1] Several studies of the consequences of plant closures were made during the sixties. Gonäs (1974) contains a survey of these studies.

When the so-called oil crisis occurred, with its substantial effects on relative prices, much of Swedish industry was vulnerable. For some sectors (e.g. shipbuilding and iron and steel) previous comparative advantages were lost. The situation was further worsened in 1975 by a wage settlement which severely threatened the competitive position of Swedish industry. Consequently value added and employment in industry began to decrease rapidly. (See Figure 1.1).[1]

Figure 1.1 Value added in industry during the 1950's, 1960's and 1970's. Fixed prices. Index = 100, years 1950, 1960 and 1970. Logarithmic scale



Source: Långtidsutredningen (SOU 1980:52).

[1] In the discussion of the reasons underlying the crisis in the Swedish economy in the late 1970's some researchers have stressed the gradual erosion of Swedish industry from the late 1960's while others have concentrated more on the developments of 1974 to 1976. IVA (1979) is a good representative of the first school and Vägar till ökad välfärd (1979) of the second.

The immediate response from the politicians was to continue as before. Government spending and public sector growth were not curbed because, in addition to other effects, it could have increased unemployment. But with low growth the tax base was eroded and further increases in taxes were being vigorously opposed. As a result, the budget deficit increased at an alarming rate from 1976.

The Response from Labour Market Policy

Government expenditures on labour market policy measures have increased throughout the post-war period (in current or fixed prices and as a share of GNP or government spending).[1] During the 1950's and most of the 1960's public employment services, together with temporary relief works, labour market training and mobility allowances, were allotted almost all of the funds. The same labour market programs were also used in the recession in the early 1970's. They were, however, insufficient to guarantee full employment in a rapidly changing labour market.

Programs to rehabilitate and employ individuals with a weak position in the labour market (work handicapped) had grown in importance from the middle of the 1960's. Between 1965 and 1975 the share of total labour policy expenditures on measures of this kind increased from five to eighteen per cent.[2] The number of individuals in employment of this kind (sheltered work) increased steadily during the seventies (see Figure 1.2).

Another group with an especially difficult situation in the labour market was, as noted earlier, older workers who had been laid off. The laws were consequently changed in several

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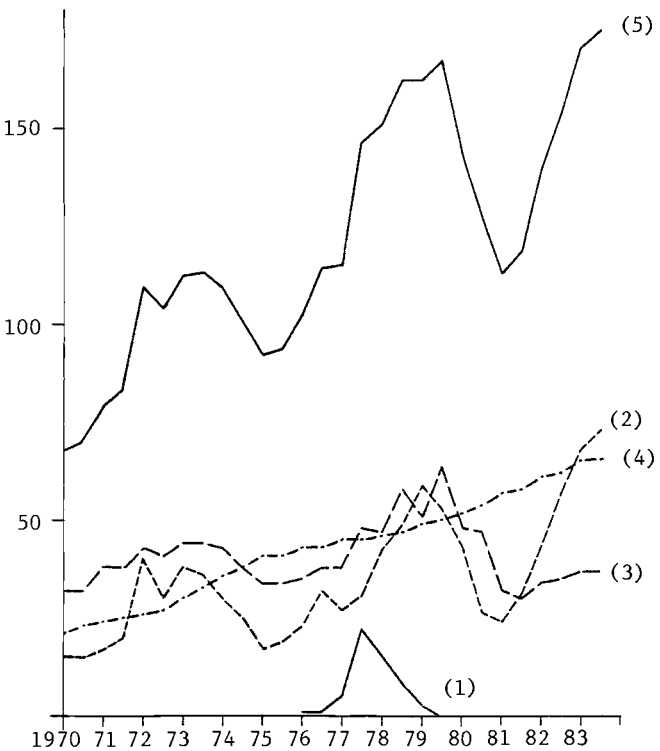
[1] During the fifties and seventies a cyclical pattern is apparent. Spending on labour market policy as a share of government expenditure or GNP increases in recessions and declines thereafter. During the sixties expenditure rose continuously. See Johannesson (1982).

[2] Calculated from Johannesson (1982).

ways to give priority to older workers when firms reduced their personnel. In addition, unemployment benefits were made more advantageous for older persons and disability pensions available for older workers with no other "handicap" than unemployment.[1]

Figure 1.2 Number of individuals benefitting from various labour market policy measures



(1) Training to prevent layoffs and dismissals
(2) Relief work
(3) Labour market training
(4) Sheltered work
(5) Total
(Seasonally adjusted quarterly data, first and third quarter each year, thousand individuals)

Source: A modification of a diagram in Björklund (1984).

[1] In the period studied there have been substantial changes in the laws and regulations governing the labour market as well as in the ways various labour market programs are applied. It is definitely not possible to give a comprehensive description of the institutions in the Swedish labour market and the ways they have changed. Institutional factors are referred to in the text when they are believed to affect the results. Axelsson, Löfgren and Nilsson (1982) or Ettarp (1980) are possible sources for someone with a general interest in the institutional setup of the Swedish labour market.

In 1975 measures were introduced to reduce dismissals and layoffs for all, not just older, workers. Investments in inventories were subsidized (mainly in 1975 and 1976). The employment effect of this policy has been estimated at 15,000 individuals [Praski (1977)]. Towards the same goal, a wage subsidy (the so-called 25-krona) was introduced in 1977 for in-plant-training. Moreover, at least 20 billion Sw.cr. were spent between 1976 and 1980 on various other subsidies to industry in order to "save jobs" [Industri och industripolitik (1982)].

The more traditional policy programs - labour market training and relief work - expanded as well. In 1979, about 50,000 individuals were in labour market training while 55,000 individuals, or 1.3 per cent of the labour force, had regular relief work at the beginning of that year. In addition, 10,000 individuals were employed in "special relief jobs" in industry. These jobs were created with the help of a wage subsidy given to firms employing previously unemployed youths. [Björklund and Holmlund (1980)].

At the "peak" of the relevant period a total of 160,000 individuals were involved in labour market policy programs (excluding inventory subsidies, recruitment allowances and industrial policy measures). This amounted to almost four per cent of the labour force at a time when open unemployment was just slightly more than two per cent.

How Did the Labour Market React?

Naturally, the labour market was affected by the overall changes in the economy, as well as by the more specific labour market policies pursued. First of all, it is important to note that total employment in the 1970's increased by 270,000 individuals, despite the severe crisis in industry. [Långtidsutredningen (SOU 1980:52)].[1] Women entered the labour force

[1] At the same time total hours worked decreased by 0.7 per cent per year. See Långtidsutredningen (SOU 1980:52).

at a rapid rate and most of them were employed in the public sector.[1] Moreover, it is striking how low the rate of open unemployment was, particularly between 1975 and 1977, despite the marked drop in economic activity (see Figure 1.3).[2,3]

This gives a relatively bright picture of the Swedish labour market during the seventies.[4] But it is not the whole truth.

Mobility seems to have gone down, whether measured as the number of individuals who have changed employers or as movements across county borders. [Holmlund (1982)]. The reasons for this have been a matter of some controversy. It is not difficult to find plausible reasons why individuals should be less interested in moving. The solidarity wage policy mentioned earlier and, perhaps more important, the increasing progressivity in the tax system have decreased the economic gains from mobility. Geographic mobility might also have decreased with the increase in households in which both spouses work.[5] Other researchers have stressed the demand side of the labour market, claiming that mobility has gone down because fewer job openings are available.[6]

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1 The number of women employed full time increased between 1969 and 1979 with 479,000 individuals. See Långtidsutredningen (SOU 1980:52).

2 Partial and hidden unemployment (individuals who can and want to work more although they have not been actively searching) is not included in open unemployment as it is defined here and in the following chapters. For a discussion of the different unemployment measures and a presentation of the actual figures from the early 1960's up to 1982, see Björklund (1983).

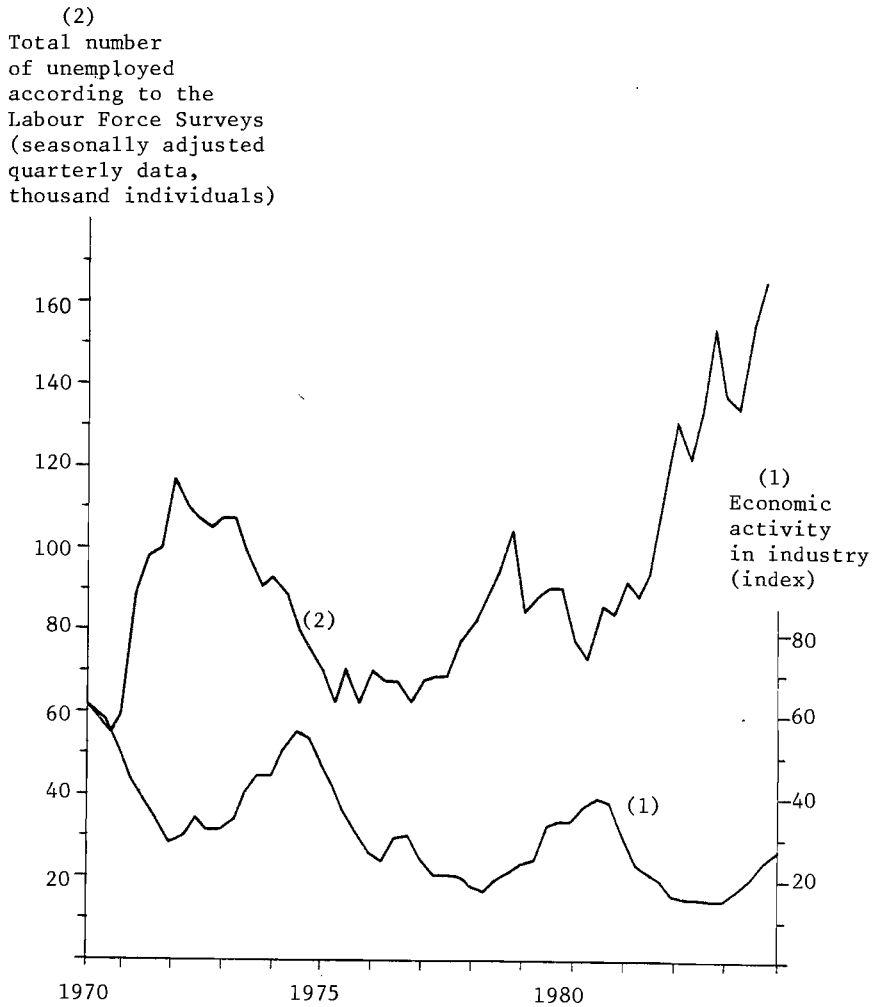
3 The activity index utilized is described in Chapter 4.

4 From 1980 unemployment has increased rapidly. These last years are covered, however, only to a limited extent by the data used in the following studies.

5 This point is developed further in Chapter 6. See also Mincer (1978).

6 Reasons behind - and consequences of - the observed decrease in mobility are discussed in Åberg (1981) and in Nilsson (1982).

Figure 1.3 Open unemployment and economic activity in industry



Source: Björklund (1984) and National Economic Research Institute (1983).

Irrespective of the effects of the decrease in mobility there are indications of higher frictional or structural unemployment. For example, total unemployment in "boom years" increased between 1963 and 1974. Moreover, the unemployment rates of youth and older workers have deteriorated in the same

period relative to the prime-age group (25-54 years old) [Persson-Tanimura (1980)]. In addition, the labour market has become more segmented, in the sense that many more individuals are employed in various kinds of specially created jobs (see Figure 1.2).

Individuals can become unemployed for different reasons. Judging from the Labour Force Surveys, the number of individuals unemployed due to dismissals or to reentering the labour force has not increased in the late seventies. Two causes of unemployment which have increased are recent entrance into the labour force (e.g. youths) and "work completed" (e.g. temporary workers and substitutes). Especially in the last category the increase has been dramatic [Björklund (1983)].[1] This could be an indication of a new employment pattern. For a substantial group of individuals it appears to be difficult to obtain *permanent* jobs.

An observed increase in the average level of unemployment can be a consequence of more individuals *becoming* unemployed. Equally plausible, however, is that unemployed individuals *stay* in that labour market state *for a longer time*. In turn, this is affected not only by the flow into employment but also by the flow out of the labour force.

The inflow and duration components in the unemployment rate differ in importance between demographic groups. Women tend to become unemployed more often than men. Their higher unemployment rates reflect this rather than longer duration. The same pattern even more clearly applies to youth (16-24 years). For older workers (55-64 years) the duration component is more important than to prime-age workers [Björklund (1981)].

A change in the relative importance of the above two components for the unemployment rate occurred between the sixties and seventies. For both sexes, three different age

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[1] Unemployment due to personnel and production cuts appears to follow a business cycle pattern except for 1975-1977, when several policy measures were introduced to prevent layoffs.

groups (16-24, 25-54 and 55-64 years) and the three main regions of Sweden, the duration components have increased in importance [Björklund (1981)]. This is also an indication of increased segmentation: fewer people are unemployed but for longer periods. Björklund concludes that only a small fraction of total unemployment is attributable to persons who are unemployed three months or less during a year.[1]

1.3 RECENT THEORIES OF DYNAMIC LABOUR MARKET BEHAVIOUR

In the 1970's economists, particularly in the U.S., came to view unemployment as a dynamic phenomenon. Theoretical as well as empirical work emphasized the role of turnover in understanding unemployment.[2] The unemployed were no longer viewed as a stagnant pool of job seekers awaiting a business upturn. Instead, unemployment was considered the result of rational individuals entering and leaving unemployment fairly often. According to this view, "problem" unemployment is largely confined to a few demographic groups that display pathological employment instability.

Theoretical research focused on providing explanations of unemployment based on individual maximization. Two paradigms - search theory and the theory of contracts - were developed.[3] Both explain why individuals might rationally choose to be unemployed some of the time. In search theory an individual

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[1] This statement has welfare implications. It indicates that long term unemployment (more than three months) is relatively important for the unemployment rate in Sweden. However, it is far from obvious that it is the best measure of unemployment from a welfare point of view. See Björklund (1983) for a discussion of different measures of unemployment duration that can be computed on the basis of available Swedish statistics.

[2] Influential empirical works are Hall (1972), Smith, Vanski and Holt (1974), Feldstein (1975), Marston (1976) and Salant (1977).

[3] Some of the important early contributions are Phelps et al. (1970), Bailey (1974) and Azariadis (1975). A survey of search theory is available in Lippman and McCall (1976).

stays unemployed to engage in productive search. Contract theories explain why workers might accept contracts that guarantee fixed wages but allow for uncertain employment. Both paradigms provide a coherent account of large flows into and out of unemployment.

The dynamic view of the labour market was questioned in the end of the 1970's. Clark and Summers (1979) claimed that "normal turnover", broadly defined, could only account for a small part of measured unemployment. In fact, a large share of unemployment consisted of long spells. This conclusion appeared to hold across the business cycle and for almost all demographic groups.[1]

The Standard Search Model

Despite the empirical challenge raised, a simple search model will be presented in this section. It offers explanations to some of the behaviour observed in all the following chapters. In addition, a search theoretic frame is used for interpreting the results in Chapters 4 and 5.

In the standard search models, unemployed individuals are assumed to search for employment.[2] They can continue with this as long as they wish, i.e. their lives are infinite. In each period they receive unemployment benefits and have search costs. The difference, the net income in unemployment, will hereafter be called c.

The searchers' skills are invariant in the standard search model, but prospective employers do not necessarily give the same values to them. Different employers may offer different wages. This "dispersion of offers" is incorporated in the model

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[1] In addition, later studies have shown that a substantial share of the unemployed have multiple spells of unemployment. See for example Akerlof and Main (1980).

[2] The following discussion relies on Mortensen (1970), Lippman and McCall (1976) and Björklund (1981).

by assuming that there is a probability distribution F of wages which governs the offers tendered. Thus, on any given day the probability that the searcher will receive an offer of w or less is F(w). The parameters of F (and of the density function f(w)) are known by the searcher.

The process of search is one of sequential random sampling from the population of vacancies. Search takes time. To simplify the analysis it is usually assumed that one and only one vacancy may be applied for within a period of a specified length and that any offer must be answered when it is discovered (no recall). The probability of receiving an offer in a specific period is denoted P^o.

The objective of the searcher is to maximize expected income net of search costs (i.e. he is risk neutral). The specific problem faced by the searcher is to decide on a wage he is willing to accept.[1] On the one hand, the higher he sets his acceptance wage, the longer he can expect to search before finding an acceptable offer. On the other hand, the higher the acceptance wage, the higher the expected wage once employed. As will be shown, the best choice of acceptance wage is that which equates the marginal value of time spent searching to the marginal present value of the future benefits attributable to search.

Let us assume that the unemployed individual has to search for one period before he gets an offer and that both unemployment compensation and wages are paid out at the end of the period. The objective function for an individual maximizing present value from wage income will then be

$$(1.1) \qquad V(\bar{w}) = \frac{1}{1+r}\left[c + P^o \int_{\bar{w}}^{\infty} \frac{w}{r} f(w)dw + \left\{1 - P^o\left(1 - F(\bar{w})\right)\right\} V(\bar{w}^*)\right]$$

---

[1] It has been proved several times that the optimal policy for an individual under the assumptions above is characterized by one single number, the acceptance wage (or reservation wage). See for example Lippman and McCall (1976).

where $\bar{w}$ denotes the reservation wage, r the interest rate and $V(\bar{w}^*)$ the maximum present value from further search according to the optimal acceptance wage, $\bar{w}^*$. The second term within brackets is the probability of obtaining an offer times the expected present value of wage income, given that the wage is higher than the acceptance wage $\bar{w}$. The third term within brackets is the probability of not getting an acceptable offer, multiplied by the present value from further search.

When (1.1) is maximized with respect to the acceptance wage $\bar{w}$, the following first order condition is obtained.

$$(1.2) \qquad \frac{\bar{w}}{r} = V(\bar{w}^*)$$

This implies that all wage offers with a present value exceeding the present value of further search are accepted.

If (1.2) is inserted into (1.1), the acceptance wage is given as the solution to the following equation.

$$(1.3) \qquad \bar{w} - c = p \int_{\bar{w}}^{\infty} \frac{w - \bar{w}}{r} f(w)\,dw$$

An economic interpretation of (1.3) is useful. Each time the individual receives an offer, he has to decide whether to accept it or to search for another vacancy. Suppose he is offered a wage equal to $\bar{w}$. If he accepts it, he will receive this income thereafter. If he rejects the offer, his income in the next period is c. Therefore the certain cost of searching for one more vacancy is $\bar{w}$-c. If that cost is positive he will not search for another vacancy unless he expects to receive a higher wage than his current offer with some positive probability. Since he expects that the search for the next vacancy will yield a net stream of income equal to

$$\int_{\bar{w}}^{\infty} \frac{w - \bar{w}}{r} f(w)\,dw$$

forever with probability P^O, he rejects an offer of $\bar{w}$ if the expected present value of

$$P^O \int_{\bar{w}}^{\infty} \frac{w - \bar{w}}{r} f(w)\,dw$$

exceeds the cost of searching another vacancy $\bar{w}$-c.

From (1.3) it is clear that the acceptance wage increases with the probability of receiving an offer P^O, explained by the fact that the returns from searching for another vacancy are larger if the probability to get a job is higher. In addition, (1.3) shows that an increase in unemployment benefits has a positive effect on the acceptance wage, since the net income in unemployment is increased.[1]

A higher acceptance wage will be associated with a longer expected unemployment time. Thus, in the standard search model higher unemployment benefits will have a positive effect on the duration of unemployment. However, the effect on the length of an unemployment spell of an increase in the probability to get a job offer is more complicated. The direct effect, i.e. holding constant the acceptance wage, lowers duration. But an increase in P^O also induces an increase in the acceptance wage, because such a change reflects the fact that the participant's maximum expected wage has increased. Consequently, the indirect effect tends to offset the reduction in duration attributable to the direct effect.

Some Extensions

In the standard search model there is no change over time in the environment faced by the unemployed. Hence, the acceptance wage generated is constant over successive periods of search. This implies, *ceteris paribus*, that the probability of becoming

[1] Furthermore, an increase in r has a negative effect on the acceptance wage.

employed does not change over time. The constant reservation wage also leads to unambiguous relations between unemployment compensation and both the duration of search and the expected future wage.[1]

To obtain a reservation wage which is not constant, it is sufficient to relax the assumption of infinite life. The acceptance wage will then be a decreasing function of time in unemployment: the shorter the remaining working life, the less there is to gain from a higher future wage. In turn, the decrease in the acceptance wage with time in unemployment implies that the probability to become employed increases.

It can perhaps be questioned whether this "horizon effect" is empirically important. Unemployment spells are relatively short, particularly when compared with the length of time most persons plan to stay in the labour force. However, a declining reservation wage is a characteristic of many search models. One needs merely to assume that unemployment compensation is paid out for a limited period (which is true in Sweden) to get the same result [Burdett (1979 a)].[2]

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[1] Most models of search in the labour market (e.g. the standard search model or the model presented in Chapter 4) are partial. Judging from a survey in Classen (1979) the conclusion that an increase in unemployment benefits has a positive effect on the duration of search, holds in almost all of these models even if the reservation wage is not constant. One exception is Mortensen (1977). When the labour market is integrated in a general equilibrium framework, the effects of unemployment benefits are not as clearcut. See for example Albrecht and Axell (1983).

[2] There are other reasons why optimal reservation wages decline over time. One is risk aversion together with declining wealth or threats of bankruptcy. Another school has relaxed the assumption in the standard model that searchers sample randomly from some known fixed wage distribution. Searchers can, for example, rank firms according to likely wage offers and proceed from higher to lower firms (systematic search). Reservation wages, in this case, decline as search progresses. One may alternatively assume that searchers do not know the wage distribution, collecting information during the search process. Overly optimistic searchers revise their reservation wages downward. Since the more pessimistic ones are likely to have accepted jobs earlier, the reservation wages observed for the whole group will be declining. See Classen (1979) for references.

Most attempts to model search focus on the transition from unemployment to employment. In Chapter 4 a search model developed by Burdett (1979 b) is presented, in which the unemployed can search more intensively by giving up leisure. This model offers the option of analyzing flows in and out of a third labour market state, not in the labour force, an appropriate classification for those who are neither employed nor searching.

In the studies contained in Chapters 2, 3 and 4, flows out of employment and into the labour force are studied simultaneously with the flows out of unemployment. A framework in which these flows can be interpreted is needed as well.

Part of the flow out of employment consists of quits. These have been explained in search models.[1] The decision to quit is made when a wage improving offer is found, while the quit probability is an increasing function of search efforts. One theoretical approach focuses on non-wage job characteristics as a critical factor for quits. [Wilde (1979)]. These are assumed to be unknown by workers when they accept a job offer. The quit probabilities are relatively high at the beginning of the job when additional information of non-wage characteristics is gained most rapidly, but declines with tenure as marginal learning decreases.

A substantial proportion of job separations are layoffs rather than quits.[2] Contract theory has been used to explain

[1] The standard reference is Parsons (1973).

[2] For analytical purposes it seems reasonable to divide the flow from employment to unemployment into two parts, one determined by the employers (layoffs), the other by the employees (quits). But, the literature on layoffs clearly demonstrates that the world is more complicated. Individuals can, at least before they sign a contract and become employees, influence their layoff rates. In the Swedish Labour Force Surveys, utilized in four of the following chapters, eight reasons for unemployment are distinguished. Some of them can easily be classified as layoffs (personnel and production cuts, temporarily laid off without pay), others as quits (e.g. studying, moving to another area), but the reason that has grown most in importance during the last five to ten years, work completed, is difficult to assign to either category. (The importance of different unemployment reasons was commented on in Section 1.2.)

the former.[1] Basic to these models is the idea that employers and employees establish a contract involving a certain combination of wages and unemployment. In general, contracts in the labour market are motivated by information and transaction costs. Incomes and other job related benefits (e.g. self esteem and social prestige) are critical factors for most people. Thus, employees are likely to strive for contracts minimizing both the consequences of mistakes in choosing a job and the risks of losing a job they want to keep. The employers are also faced with imperfect information about the future markets for their products as well as about job applicants. Furthermore they might have an interest in a contract which motivates the employee to improve his skills. The content of the final contract will to some extent reflect the desires of both employees and employers. It can also be greatly influenced by the institutional setting, as in the case of temporary layoffs in the U.S.

1.4 THE FIVE STUDIES

Labour Market Mobility and Unemployment in the Seventies

In the description of the Swedish labour market during the seventies (Section 1.2), it was noted that rates of open unemployment during the latter part of the decade were kept at relatively low levels despite a deep crisis in Swedish industry. This was due partly to a growing public sector, partly to vast sums spent on labour market and industrial policy.

The first study in this dissertation demonstrates effects on the labour market behaviour of changes in general economic conditions as well as in more specific policies pursued in the

[1] There has, mainly in the U.S., been a vast literature analyzing layoffs. An article by Feldstein (1976), claiming that the compensation schemes encouraged temporary layoffs, was the igniting spark. A recent contribution with further references is Topel (1983).

labour market. By so doing, it serves as a background to the following studies.

The study is based on aggregate probabilities of transition between three labour market states: employed, unemployed and not in the labour force. The raw flow rates themselves (computed from the Labour Force Surveys for the years 1971, 1974, 1977 and 1980) reveal new information about aggregate labour market behaviour.[1] They can also be used to compute so-called steady state unemployment rates. The specific effects of each flow on these unemployment rates can be studied.

Flow rates have been computed for males and females separately. Females are found to have higher steady-state unemployment rates than males. One explanation for this difference is that women in employment withdraw from the labour force more often than employed men. However, there appears to have been a decrease in withdrawals among women during the seventies, which should have a positive effect on the unemployment rates for women in the future.

Rates of transition and steady state unemployment rates have also been computed for three age groups (16-24, 25-54 and 55-64 years old). Youth and older workers have higher unemployment rates than the prime-age group. For youth this is mainly a consequence of higher probabilities of becoming unemployed when they are employed. But the "participation pattern" is important as well: young employed workers withdraw more frequently, which in turn affects their unemployment rates. For older workers the higher rates of unemployment are mainly due to lower probabilities of getting a job when, for some reason, they are unemployed.

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[1] The words transition probabilities, transition rates, flow probabilities and flow rates are used alternately.

Comparisons between the four years are also made. When the differences in unemployment rates between 1971 and 1977 or 1980 are decomposed into the effects of various labour market flows, some of the structural trends in the Swedish labour market during the 1970's are demonstrated. Open unemployment was much lower in 1977 and 1980 than in 1971. This is found to be primarily a consequence of the sharp fall in the probability of employed workers becoming unemployed, a fall which is particularly pronounced for older workers. Thus, the policy measures mentioned in Section 1.2, introduced to decrease layoffs and dismissals, appear to have been successful, at least in some narrow sense. But there seems to have been another side of the coin; the probabilities of the unemployed obtaining employment have decreased substantially, especially for youth and older workers.

In the following studies, several of the issues discussed in Chapter 2 will be reintroduced. Lower re-employment probabilities imply longer spells of unemployment. It is of interest from a policy perspective whether longer spells of unemployment *per se* lead to further decreases in the re-employment probabilities. This is a major question in Chapter 4.

The studies presented in Chapters 5 and 6 were both originally motivated by an interest in the employment prospects of a particular group of unemployed, i.e. those laid off. They confirm previous results indicating low re-employment probabilities for this group.

At the same time Chapter 5 indicates that a new unemployment pattern might have developed. Young individuals especially appear to change labour market states rapidly. This could be a consequence of difficulties in obtaining permanent jobs which in turn is partly a consequence of some of the policies mentioned in Section 1.2 (e.g. the security laws).

The Effects of Changing Employment Levels on Regional Labour Markets

It was noted in Section 1.2 that structural changes in Swedish industry caused frictions in the labour market in the late sixties. The problems were aggravated in the seventies, when industrial production as a whole decreased for several years. One aspect of the crisis in industry is the strain on *local* labour markets when big plants close down. In these situations considerable pressure has frequently been applied to public officials to ameliorate the local labour market distress due to plant closures.

The impact of a change in the number of jobs available in a labour market extends beyond those affected directly, such as laid off workers. People who are in the process of searching for work may face altered employment opportunities. This may, in turn, affect the rates of entrance and withdrawal from the labour force. Moreover, it may also influence migration in and out of the region and hence the labour markets in other regions.

Studies on this problem have concentrated on the effects on those laid off in the closures. This will also be the topic of the study in Chapter 6. Chapter 3 is concerned with the local impact more broadly defined. Increased knowledge about the effects on the local labour market as a *whole* should improve cost-benefit studies frequently made to compare policy alternatives when big plants are on the verge of closing down.

In Chapter 3 a simulation model is developed for the analysis of local labour market consequences of plant closures. Underlying this model is the idea that the government might want to influence demand in a local labour market through, for example, the establishment of a new industrial plant. Were a policy of this kind to be enacted adjustment would occur in regional as well as interregional labour market transitions.

The model has three regions - the few large cities, the forest counties and the rest of the country - and three labour market states - employed, unemployed and not in the labour

force. Flows within and out of each region are functions of labour market conditions in the respective regions. Three cases based on actual figures for labour market flows during the seventies and the demand levels in the three regions in 1980 are simulated. The results from these exercises appear reasonable.

It should be stressed that the simulation model ought to be improved before it is used for policy analysis. A meaningful study of the effects of plant closures requires a more limited definition of the local labour market. Theoretically the most natural improvement is to include some mechanism whereby changes in the level of expenditures within the local market, such as those accompanying out-migration, are reflected in the number of local jobs.

The Effect of Duration on Labour Market Transitions

The study contained in Chapter 4 and the two that follow are primarily concerned with the future labour market prospects of unemployed individuals. The studies cover different aspects of this problem and are based on different data.

In the study in Chapter 2 it is noted that the re-employment probabilities appear to have decreased during the seventies. In addition, Section 1.2 referred to studies claiming that the duration of unemployment was higher in the seventies than in the sixties. Against this background it seems to be especially relevant to study the consequences of longer spells of unemployment.

In studies based on aggregate data, it has been observed that the probability of re-employment is a declining function of the length of the spell of unemployment. This finding is open to two interpretations. First, one might conclude that the relationship between time in unemployment and the probability

of re-employment is essentially spurious. One could think of a situation in which better educated workers have high re-employment probabilities and short spells of unemployment, the opposite being true for those with less education. Aggregating across these groups will then generate a spurious relationship between unemployment duration and re-employment probabilities.

According to the second interpretation there is, in fact, a causal link between the length of an unemployment spell and the probability of re-employment. A causal link of this kind could be explained by supply-side factors (e.g. changes in health or attitudes or discouragement leading to a decrease in search activity) or demand-side factors (e.g. decrease in skills or hiring standards discriminating against the long term unemployed).

In practice it is extremely difficult to distinguish between the two interpretations. Consequently, the ambition of the study is merely to investigate whether long spells of unemployment appear to affect prospects of re-employment or withdrawals after controlling (within a logit framework) for the influence of a set of variables assumed to affect labour market behaviour.

When the effect of duration on flows out of unemployment is studied separately, it is pronounced. The re-employment probabilities decrease continuously with the length of the unemployment spell. The probabilities of continued unemployment increase but after some time withdrawals take over. However, controlling for a set of independent variables including education, the coefficients for the effect of duration are no longer significant. This lends support to the first interpretation above: that the observed relation between the length of a spell of unemployment and the re-employment probabilities is spurious.

This finding is not without policy relevance. If there is a causal link between duration and the probability of re-employment it motivates prompt efforts to get the unemployed back to

work. On the other hand, if other factors are responsible for the differences in re-employment probabilities as education appears to be in this case, then programs to affect these factors would be desirable.

Re-employment Prospects for Workers who Become Unemployed

The study in Chapter 5 is devoted to an analysis of the future labour market prospects of individuals who recently became unemployed after having been employed. It was noted previously that some unemployed, such as older workers or workers laid off in plant closures in the sixties and early seventies, had relatively small re-employment probabilities. To remedy this, laws were enacted and labour market programs effected. Judging from the study in Chapter 2 these policies seem to have been successful in the sense that probabilities of becoming unemployed for those employed decreased. At the same time the aggregate figures demonstrated that the employment prospects of those who are unemployed deteriorated. Given this scenario, it is of obvious interest to describe the labour market outlook for individuals who become unemployed and to identify factors which seem to contribute to continued unemployment. The concentration in this chapter on those formerly employed is motivated by an interest in comparisons with other studies of layoffs as well as with the study in Chapter 6.

The transitions out of unemployment are examined within a logit framework, similar to the one used in Chapter 4. The sample analyzed consists of unemployed individuals in the Labour Force Surveys for 1975 to 1979. The primary difference between the two studies is one of time perspective. In Chapter 4, transitions out of unemployment were related to the labour market *histories* of individuals. In this study the reverse approach is taken: what are the *future* labour market prospects of those who have a certain history in common?

Previous studies of plant closures have focused on the distribution of the unemployed over labour market states at one, or even several, times after the shutdown. Many of these studies leave the impression that the process is smooth, i.e. that more and more individuals leave unemployment to become employed or withdraw from the labour force and do not return to unemployment. This is, however, far from being a correct description. Many individuals, in particular youths, move back and forth between states. Multiple unemployment spells are common. Around a third of the full sample change labour market state in each quarter. An indication of the mobility is the fact that only 21 out of 977 individuals appear to have been unemployed for five consecutive quarters.

It is not clear how to interpret these findings. The fact that youths move frequently between labour market states does not seem unnatural. However, individuals in the prime-age group also frequently change labour force status. It is possible that these frequent changes are a consequence of the deterioration in labour market prospects noted in Chapter 2 for youth in particular. According to one hypothesis, a relatively large group moves between various labour market programs, temporary jobs, unemployment and outside the labour force, primarily because they do not get permanent jobs.

Pronounced differences between men and women and between age categories with respect to percentages re-employed and withdrawn from the labour force have been noted in previous studies of plant closures. The same finding is obtained in Chapter 5.

A substantial literature is devoted to the analysis of effects of unemployment insurance. In this study, membership in unemployment compensation funds is found to have a significant effect on the behaviour of the unemployed. The probability of remaining unemployed seems to increase with membership in the compensation funds. However, the most obvious effect of membership is on withdrawals, which decrease to a significant extent.

Objections can perhaps be raised against these results (e.g. that membership acts as a proxy variable for being established in the labour market). Nevertheless, they are, in my opinion, strong enough to motivate further studies of the incentive effects of the Swedish system of unemployment compensation.

Finally, it is noted in this study that workers previously employed in industry have relatively low re-employment probabilities. Individuals unemployed due to layoffs are also found to have a particularly rough labour market situation. This indicates a need to study the labour market prospects of this group more closely. This is the purpose of the last study, contained in Chapter 6.

Consequences of Plant Closures for Individual Employment

It was previously mentioned that the effects of plant closures during the seventies were a matter of strong public concern in Sweden. Several studies in the late 1960's and early 1970's claimed that a large share of the individuals laid off remained unemployed.

The study in Chapter 6 complements preceding case studies. The intention is to describe what happened to individuals who were laid off when industrial plants closed down in Sweden (mainly) during the late seventies. In addition, a set of independent variables (i.e. sex, age, aggregate demand and the size of the plant closed down in relation to local employment) is related in a logit framework to the labour market behaviour of the individuals who were laid off.

The Labour Force Surveys are used for the empirical analysis in Chapters 2-5. In Chapter 6 another data base is used, which includes information on labour force status for about half of the individuals laid off in closures of bigger plants in Sweden during 1975-79. The probability of becoming employed locally is studied first. The probability of migration is then analyzed for those who did not get a local job. Finally, the probability of becoming employed in some government program, of withdrawing or of remaining unemployed is

analyzed only for those who have neither received and accepted a local job nor migrated.

The results confirm some of the conclusions drawn in earlier studies. A lower age substantially increases both the probabilities of becoming employed locally and of migrating. It also has a positive effect on the probabilities of enrolling in labour market education and of getting a relief job.

This study also confirms that women remain unemployed or withdraw to a larger extent. However, it is worth observing that sex has a significant, but in most cases numerically small, effect on the probabilities of becoming employed locally. Its effect on the probability of migration is much greater. This seems to indicate that the relatively high share of women in unemployment, and in different programs organized by the labour market authorities, is a consequence of lower migration, a fact from which policy conclusions could perhaps be drawn.

A higher level of economic activity significantly increases the probability of becoming employed locally. Moreover, in most of the models estimated it has a significantly positive effect on the probability of migration. This last observation could be particularly interesting from a policy point of view. It seems to indicate that demand "pull" is more important for migration than "push". If this is true, a higher level of aggregate demand will increase mobility.

The last explanatory variable included in the estimations is the size of the plant closed down in relation to the size of the local labour market. This is a variable which has rarely been used in previous studies of plant closures. In the few cases when a similar variable has been included, it has not been significant. Judging from the results in this chapter, the plant's share of local employment is important not only for the probability of becoming employed locally but also for the probability of migration.

To conclude, in most of the models explaining the probabilities of becoming employed and migrating, the effects of the explanatory variables included - sex, age, aggregate demand and the share of local employment - are significant. The effects of these variables on the probabilities of different non-employment labour market states are less unambiguous. The reason for this is probably that public policy is to some extent designed to counteract the decisions made by employers and laid off individuals.

1.5 CONCLUDING COMMENTS AND SUGGESTIONS FOR FURTHER RESEARCH

The length of a spell of unemployment can be measured in several different ways. One such used by Björklund (1981) is the expected duration of unemployment for someone who *becomes* unemployed. Another measure, which under reasonable assumptions results in longer unemployment spells, is the average unemployment duration for individuals who *are* unemployed at a certain time.[1]

In the wake of the new dynamic theories of unemployment, empirical articles underpinning the dynamic view of the labour market were published. In these studies the first measure above was frequently used. It indicated that the spells of unemployment in the U.S. were relatively short.

Clark and Summers (1979) challenged the new dynamic view of unemployment. They claimed that other ways of measuring unemployment gave a different perspective. It might be that most unemployment spells were relatively short, but the greater part of total unemployment was caused by rather long unemployment spells. Furthermore, many of the unemployment spells ended outside the labour force and it is often questionable whether these transitions are real, in the sense that they reflect a change in the labour market situation of the unemployed.

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[1] Several other measures can be envisioned. Recent references include Björklund (1983) and Carlsson and Horrigan (1983).

Another dimension was added to this discussion when studies of multiple spells of unemployment appeared on the scene. Akerlof and Main (1980) claimed that statistics on average unemployment duration of completed spells seriously underestimate the unemployment experience of all groups they considered. Persons with single spells of unemployment were found to have relatively long spells and hence a total unemployment longer than the average spell. For persons with multiple spells each spell was shorter than the average but the sum of the spells exceeded by a good margin the length of an average spell.

The Swedish Case

The general view of unemployment emerging from these studies based on U.S. data is supported in Swedish studies. Björklund (1981) used the first duration measure above. On the basis of this he claimed that the average durations of unemployment had increased from the 1960's to the 1970's. More recent results by Björklund (1983) indicate further increases in the early 1980's. In the same article, a sequence for the second measure of duration mentioned above is also published. Measured this way the spells of unemployment appear to be at least twice as long on the average. There is also an increasing trend during the period studied (1965-1982). The latter finding is in accordance with the results in Chapter 2, where it was noted that the probabilities of becoming unemployed for those employed had decreased together with a decrease in the re-employment probabilities of those who were unemployed.

The studies in Chapters 2 and 5 can shed some additional light on the questions brought up in the U.S. studies. It is obvious in both chapters that the flow rate from unemployment out of the labour force is much higher than the rate of withdrawals from employment. It is difficult to explain why it would be so if it is not a result of discouragement or of measurement problems. In either case a substantial share of the individuals who have withdrawn are likely to be in a situation not too different from unemployment.

It was also noted in Chapter 5 that approximately 34 per cent of the individuals who leave unemployment during the first two quarters have been unemployed again by the fifth quarter. This indicates the existence of multiple spells of unemployment.

Implications for Theory

An interesting question is whether any firm conclusions regarding labour economic theory can be drawn from these findings. Clark and Summers used their results from the U.S. for a frontal attack on the new dynamic labour market theories. They claimed that the observed pattern of unemployment was inconsistent with the new theories. This conclusion appears, however, to be too strong. One could conceive of a labour market consisting of several different categories of workers. Some of these are for some reason rarely unemployed and, when they are, they leave unemployment rapidly. Others are often unemployed, perhaps remaining unemployed for long periods. Both groups could well behave according to a search model and we would still observe an unemployment pattern of the kind that appears to hold for the U.S. or Sweden.

The strategic question is why some individuals stay unemployed for a long time or have multiple spells of unemployment. Search theory could perhaps be useful in answering this question. This would involve specifying not only the opportunity set (which might be influenced by demand policies), but also the incentives for the individuals to pursue alternative strategies. A simple example of this approach is the study of the effects of membership in unemployment compensation funds presented in Chapter 5. For a problem of this kind search theory appears to be useful.

There are, however, substantial variations in the unemployment rates between periods and regions with different labour market demands. This seems to imply that demand factors are of significant importance for the observed unemployment rates. Thus there certainly are important questions regarding unemployment that can be answered by assuming a labour supply

which is more or less constant. Furthermore, search theory is naturally of minor interest if unemployment is involuntary, in the sense that workers when re-employed receive a wage which is considerably higher than their reservation wage.

Aggregate Labour Market Behaviour

Against this background it is not difficult to suggest projects for further research. What comes first to mind are studies based on aggregate data from the Swedish labour market. Several U.S. studies can serve as models.

The study based on aggregate flows in the Swedish labour market included in Chapter 2 was inspired by Marston (1976). It demonstrates that our knowledge about the Swedish labour market can be broadened with the Labour Force Surveys. The effect of different "participation patterns" on the unemployment rates of various demographic groups is revealed. In addition, the analysis based on flows indicates that policy changes can have powerful effects on open unemployment.

It is not difficult to think of ways in which this kind of study could be further developed. More than three labour market states can be distinguished (e.g. studies, sick leave etc.) to increase our knowledge about various "participation patterns". Separate computations could be made for sex and age groups combined. The analysis could be made for various regions. It is possible to distinguish other demographic characteristics, such as non-Swedish citizenship, and make separate analyses.

The study by Clark and Summers previously cited can also serve as a model. It is based primarily on aggregate flow data obtained from the U.S. counterpart to the Labour Force Surveys (the Current Population Survey). Hence, much of their empirical analysis can be repeated on Swedish data.

Clark and Summers (1982) have recently published an article in which youth unemployment is analyzed using mainly aggregate data from the Current Population Survey. Substantial parts of this study are also well worth repeating on data from the Labour Force Surveys.

The problem of multiple spells of unemployment, mentioned above, can also be penetrated using the Labour Force Surveys, since individual employment histories consisting of eight quarterly observations during two years can be computed. A drawback for a study of this kind is the lack of information on what occurs between interviews. One way to get a better picture is to "match" the regular information with answers to the questions regarding labour force status during the whole previous year, asked in February each year, thus to a third of all individuals in the survey.

Individual Mobility

The individual employment histories could be used in several other contexts. The mobility between labour market states noted in Chapter 5 lends itself to different interpretations. The pattern could primarily be a supply-side phenomenon, in which youths choose to try out different jobs although permanent jobs are available. In that case the welfare consequences of the observed unemployment might not be negative. On the other hand, if individuals are being constrained to move between temporary jobs and unemployment, the welfare consequences could be severe. The policy conclusions might also be quite different. In the first case there is little need for government intervention. In the second case one might want to change the laws which are causing disincentives to hire youths in permanent positions or to increase aggregate demand. It may also be advantageous to have programs improving the skills of those receiving only temporary jobs.

This suggests that studies similar in approach to the one in Chapter 5, focusing in particular on youths, might be useful. If they are made for different time periods or for regions with varying demand, it might be possible to determine which one of the above interpretations is most likely.

It is possible that the mobility observed in Chapter 5 reflects transitions in and out of labour market programs. The

Labour Force Surveys do not distinguish for example between participants in labour market training and other students or between regular and relief workers. This is an obvious difficulty for an analysis of "unemployment patterns". In addition, it severely limits the potential for using the Surveys to evaluate labour market policy. If it had been possible to identify various labour market programs one could have studied the subsequent labour market experience, trying to identify effects of the programs. In particular, changes in the "effects" of various programs over time could have been observed. This suggests that it would be useful to broaden the survey questions regarding labour force status, to include various programs.

The Labour Force Surveys can also be used to shed light on questions central to the present theoretical discussion in labour economics. The Surveys could, due to their size, be used for the kind of non-parametric test of the effect of duration on labour market transitions suggested by Heckman and Singer (1982). (This point is further developed in Chapter 4.)

Migration and Labour Force Status

Individuals do not only adjust to changes in the labour market by moving between labour market states. Another option is migration. An interesting conclusion from Chapter 6 is that women's relatively high rates of unemployment, withdrawal and participation in labour market programs appear to be a consequence not so much of smaller probabilities of receiving a local job as of lower propensities to migrate. This is a good topic for further research. Migration theory, where households maximize income, provides plausible reasons for the findings in Chapter 6 [Mincer (1978)]. If men earn more money than women, the labour market situation of the man will, according to this theory, dominate in the migration decision.

The Labour Force Surveys are, in some ways, extremely useful for analysis of the relations between migration and labour market behaviour. What is unique is the large number of individuals for whom migration, as well as labour force status, can

be observed.[1] It is possible to look at both the effect of migration on future labour market prospects and at the effect of labour force status of origin on the migration decision. Studies of changes in geographical mobility over time can also be made. There are two major drawbacks with the Labour Force Surveys as a data source for the analysis of migration: nothing is known about either incomes or the labour market states of the spouse. The latter information could easily be gained in the future if the Labour Force Surveys are enlarged with one more question, relevant not only for migrational behaviour but for labour market behaviour in general.

There are certainly many important questions regarding the functioning of the labour market, and the effects of different policies, that we know little about. What is hopeful from the point of view of Swedish research in this field is that we have data sources which already are good by international standards and can be made better with relatively small means. At the same time there is, mainly in the U.S., a rapid development of theories and statistical techniques in this field that can be applied to Swedish data. Swedish labour market research should try to benefit from this.

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[1] Compare for example with the data used in two recent studies by da Vanzo (1978) and Schlottman and Herzog (1981).

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2. Labour Market Mobility and Unemployment in the Seventies

2.1 INTRODUCTION

The seventies brought notable changes to the Swedish labour market. Growth in the economy was lower than during the preceding decades. This was particularly true for the manufacturing sector, where the number of employed decreased. At the same time the public sector expanded, thus avoiding a reduction in the total number of employed. With the help of an ambitious labour market policy, rates of open unemployment were kept at a relatively low level.

This development might not seem alarming if the discussion is limited to labour market issues. However, behind the aggregate unemployment figures unpleasant facts are hidden. In Chapter 1 it was mentioned that the relative effect of duration, as compared to inflow, on the unemployment rates increased between the sixties and seventies for all age groups: fewer individuals were unemployed in the seventies, but for longer periods. Other signs of increased segmentation were mentioned as well. Among these was a deterioration in the situation for youth.

In this study the labour market is treated as an integrated system, where individuals move between *three* labour market states: employment, unemployment and not in the labour force. In the studies of duration referred to in Chapter 1, unemployment rates for different demographic groups have been divided into two components: duration and inflow. These analyses are based on a world with only two labour market states, unemployed and not unemployed. This can lead to misinterpretations of the results. The latter

state includes individuals in two very different situations, employed and not in the labour force.

Probabilities of transition between the three labour market states can be computed from the Labour Force Surveys. Under certain conditions (i.e. steady state) the probabilities determine the number of people in each labour market state. In the following, transition probabilities by sex and age group (16-24, 25-54 and 55-64 years of age), computed for four years (1971, 1974, 1977 and 1980), are presented and commented on. Utilizing these flows, steady state unemployment rates are determined for the same groups and years. In the main section (2.5) the effect of the transition probabilities *vis-à-vis* the steady state unemployment rates of the various demographic groups and years is discussed.

The analysis has more than intrinsic interest. It may indicate why the unemployment rates differ between various demographic groups. It may also demonstrate how the labour market behaviour of different subgroups has been affected by cyclical and structural changes in the labour market. In addition, it might increase our understanding of how labour market policies have affected various demographic groups.

2.2 THE ANALYTICAL FRAMEWORK[1]

Individuals in a labour market can be identified with respect to different labour market states. In the following analysis three states will be considered: employed, unemployed and not in the labour force. There are two reasons for this particular choice of labour market states: It demonstrates aspects of the labour market not visible in a framework with two states. Furthermore, since several foreign studies have used analytical

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[1] This section draws on Marston (1976).

frameworks based on these same three states, the potential for comparisons is increased.[1]

Studies of the kind mentioned in Chapter 1, focusing upon the duration of unemployment spells, are in effect based on a two state world. They fail to distinguish between an unemployed worker finding a job and labour force exit. Consequently, the often cited result that some demographic groups, like women or teenagers, suffer higher unemployment rates primarily because of more frequent spells, rather than longer spells, may be misleading. It is possible that these groups do not find new jobs. The frequent spells might reflect their tendency to give up job search and drop out of the labour force. It is also possible that a transition is observed, although no real change in labour market behaviour has taken place. Clark and Summers (1979) claim that this is common in U.S. data and there are studies for the Labour Force Surveys pointing in the same direction (see the Appendix to this chapter).

With three states, data from nine flows are involved in describing the labour market. This is depicted in the following table, where E is employed, U is unemployed and N is not in the labour force. The symbols in each cell stand for the number of workers who move from the indicated state in the previous period to a given state in the current one. The number of people in a flow divided by the number of people in the original state can be interpreted as an estimate of the probability of making the transition. For example, the probability that an unemployed worker will become employed is UE/U. This probability will be written P_{ue}.

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[1] From many points of view a framework with more than three states would be valuable. It would, for example, be of great interest to be able to distinguish individuals benefitting from different labour market programs, like labour market training and relief work.

Labour force status in previous quarter	Labour force status in current quarter		
	E_t	U_t	N_t
E_{t-1}	EE	EU	EN
U_{t-1}	UE	UU	UN
N_{t-1}	NE	NU	NN

Describing the system does not require information on all of the nine flows in the figure above. The proportion of people remaining in any one state is equal to one minus the proportion that leaves to enter the other two states. Therefore only two of the probabilities in each row must be known.

The six independent transition probabilities can be transformed in many different ways depending on the purpose of the analysis. In the above context the two flows NU and NE are separate and distinct. This suggests that there are some individuals who enter the labour force in order to become unemployed (represented by NU) and that there are other individuals who enter to become employed (represented by NE). In reality, however, individuals with few exceptions enter the labour force to become employed. Some are successful, resulting in an NE flow. For others all that is observed is an increase in search intensity. Hence an NU flow will be recorded. For some analytical purposes the probability of successful labour force entry is a useful measure:

$$(2.1) \qquad P_{ns} = P_{ne}/(P_{ne} + P_{nu})$$

Given the initial distribution, the transition probabilities determine the relative number of people in each labour market state. If the same transition probabilities are valid for a long time, the influence of the original distribution is diminished and will in the end vanish completely. Since the unemployment rate u is the number of unemployed workers expressed as a fraction of the labour force, its value in the limit will be determined by the transition probabilities. In this steady state the number of individuals in each labour market state

is constant ($\dot{U} = \dot{E} = \dot{N} = 0$).[1] This implies that the flows into employment are equal to the flows out of it:

$$(2.2) \qquad P_{ue}U + P_{ne}N = (P_{eu} + P_{en})E.$$

The same is true of the flows in and out of unemployment:

$$(2.3) \qquad P_{eu}E + P_{nu}N = (P_{ue} + P_{un})U.$$

If N is eliminated from these two equations,

$$(2.4) \qquad \left[P_{eu} + (1 - P_{ns})P_{en}\right]E = \left[P_{ue} + P_{ns}\ P_{un}\right]U.$$

The unemployment rate, defined as U/U+E, can now be written as:

$$(2.5) \qquad u = \frac{P_{eu} + (1 - P_{ns})P_{en}}{P_{eu} + (1 - P_{ns})P_{en} + P_{ue} + (P_{ns})(P_{un})}$$

To compute the steady state unemployment rate in this relatively simple way, it is necessary to make Markovian assumptions.[2] Among other things, this means that individuals' transition decisions do not depend on how long they have been in the original state. This assumption has been examined in earlier work and will, in fact, be studied in Chapter 4. The results are mixed. Econometric identification of state dependence is extremely difficult.

2.3 THE DATA

It is possible to estimate flow rates from any longitudinal survey by computing the fraction of respondents in one state who are found in the same or other states in the next period. The Swedish Labour

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[1] A meaningful steady state is ensured if the probability matrix is a regular (contains only non-zero elements), n×n stochastic matrix [Read (1972)].

[2] Markovian assumptions are commonly made in studies of this kind. The consequences for accuracy cannot be easily assessed.

Force Surveys have been designed mainly to give *levels* of unemployment. However, since any individual sampled will be interviewed eight times during two years (i.e. once every quarter) the survey can be treated as a longitudinal data base.

In this and some of the following studies, three labour market states are distinguished. Those individuals who worked at least one hour or were employed during the reference week (generally located in the middle of each month) but were not at the job for some reason (other than temporary layoff or waiting for a new job to begin within 30 days) were treated as employed in the Labour Force Surveys. Unemployed is defined as not working at all during the week and having searched for a job. Search requires some activity: for example, visiting the employment office or contacting employers some time during the last 60 days. Individuals temporarily laid off or waiting for a new job to begin within 30 days are also classified as unemployed. Other respondents are classified as not in the labour force.

There is no way of knowing from the surveys whether an individual is participating in a labour market program. Those in relief work or sheltered work are, for example, classified as employed while respondents in labour market training would generally be considered as not in the labour force.

In this chapter all gross flows registered in the Labour Force Surveys beginning in 1971, 1974, 1977 and 1980 are used to compute transition probabilities.[1] These flow rates should, in principle, reflect dynamic behaviour in the Swedish labour market since the Labour Force Surveys are based on a representative sample of the Swedish population. It is, however, a drawback that each individual is interviewed only once every quarter and that the labour market activity between interviews is unknown.

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[1] The Appendix gives some basic facts about the Labour Force Surveys, presents the methodology applied to derive the figures used in this and the next chapter, and discusses some problems with the obtained data.

The sample used by Statistics Sweden (formerly National Central Bureau of Statistics) is stratified according to county (län), sex, age and marital status.[1] The flows are weighted to adjust for differences in sampling probabilities between the strata. The weights used are the inverted sampling probabilities used regularly by Statistics Sweden. The flows are also weighted to compensate for missing observations. This weight is the ratio between the actual population in the strata and the population obtained from the strata after the first weighting procedure.[2]

The accuracy of the data used can be challenged on several grounds besides missing data. One problem is misclassification of labour market states. In studies of aggregate unemployment levels this might not be too troublesome, since the mistakes can cancel out. The problem should not be overlooked in studies using flow data. Mobility, particularly between unemployment and not in the labour force, tends to be overestimated [Thorslund, Kristiansson and Bergman (1981)].

2.4 OBSERVED LABOUR MARKET TRANSITIONS

The Period as a Whole

The first transition rates presented are the average values for the four years studied. They are shown in order to provide a "snap-shot" of the Swedish labour market during the seventies and early eighties. Comparisons can, for example, be made between the flow rates of the two sexes or the three age groups. This might reveal differences in labour market behaviour between the various demographic groups. Later, figures will be given for the four years separately. It will then be obvious that the labour market has changed a great deal during the period. Using transition rates which are averages of the four years to draw conclusions about the future would thus be inappropriate.

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1 From 1977 the sample is also stratified according to citizenship (Swedish/Non-Swedish).

2 The definition of the actual population raises some problems when flow data are used. In this study it includes only those individuals who, at both the beginning and the end of each year, were between 16 and 64 years of age and lived in the country.

The average flow rates for the four years 1971, 1974, 1977 and 1980 are given in Table 2.1 for all individuals, the two sexes and three age groups (16-24, 25-54 and 55-64 years of age).[1] Most of the relations fit with the representation of the labour market given in Chapter 1.

Table 2.1 Quarterly gross flow rates between labour market states by sex and age. Averages from four years: 1971, 1974, 1977 and 1980. (Probabilities of an individual in original state being in destination state one quarter later and probabilities of successful labour force entry)[1)]

	P_{eu}	P_{en}	P_{ue}	P_{un}	P_{ne}	P_{nu}	P_{ns}
All	0.0087	0.0344	0.4744	0.1910	0.1210	0.0188	0.8656
Males	0.0089	0.0225	0.5128	0.1487	0.1490	0.0254	0.8546
Females	0.0085	0.0502	0.4365	0.2287	0.1101	0.0163	0.8707
Age 16-24	0.0208	0.0871	0.5235	0.2006	0.2094	0.0330	0.8640
Age 24-54	0.0062	0.0205	0.4797	0.1924	0.1260	0.0205	0.8601
Age 55-64	0.0072	0.0385	0.3186	0.1681	0.0377	0.0042	0.8993

Source: Derived from the Labour Force Surveys, Statistics Sweden.

1) P_{eu} = from employment to unemployment
P_{en} = from employment to not in the labour force
P_{ue} = from unemployment to employment
P_{un} = from unemployment to not in the labour force
P_{ne} = from not in the labour force to employment
P_{nu} = from not in the labour force to unemployment
P_{ns} = of successful labour force entry (see expression 2.1).

Men and women have almost the same probabilities of going from employment to unemployment (P_{eu}). The probabilities of becoming employed (P_{ue} and P_{ne}) differ more between the sexes. For example, unemployed men have a 51 percent chance of becoming employed. The same figure for women is 44 percent. Moreover, men have higher probabilities of going from not in the labour force to being employed.

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[1] To improve the clarity of Tables 2.1, 2.3 and 2.4 no standard errors are presented. A comparison with tables in the Appendices to this chapter and Chapter 3 gives one some idea of the standard errors.

Women have a stronger tendency to withdraw from the labour force (P_{en} and P_{un}). This is true regardless of whether they are employed or unemployed.

The transition probabilities differ substantially between age groups. The probabilities of going from employment to unemployment (P_{eu}) are more than three times as high for youth as for the prime-age group (between 25 and 54 years of age). Moreover, youth have high probabilities not only of withdrawal (P_{en} and P_{un}), but also of going from not in the labour force to employment (P_{ne}).

The transition pattern of older workers differs from that of the prime-age group. Withdrawal is high among the older employed (P_{en}). Few of those outside the labour force become either employed or unemployed (P_{ne} and P_{nu}). The probability of going from unemployment to employment (P_{ue}) is low.

Table 2.2 gives the "steady state" unemployment rates calculated according to expression (2.5) and actual rates taken from published stock data [Statistics Sweden (1981)]. In addition, measures of duration and frequency calculated from the flow data used in this chapter and by Björklund from stock data are presented. The idea is to compare the figures obtained with flow data and the earlier available ones. If they are similar, the data used and the methodology applied in Section 2.5 seem more reliable.

In a "steady state" the flows into unemployment are equal to the flows out of unemployment. Thus, the frequency (F) of unemployment spells can be written

$$F = \frac{U(P_{ue} + P_{un})}{L} \qquad (2.6)$$

Since U/L is the unemployment rate u and $P_{ue} + P_{un}$ the reciprocal of the expected duration

$$(2.7) \qquad F = u \cdot \frac{1}{D}$$

This is obviously the familiar

$$(2.8) \qquad u = F \cdot D$$

Based on these relationships, it is possible to compute frequencies and durations for spells of unemployment. In principle, any unit of time (weeks, months, quarters, etc.) could be used. The figures in Table 2.2 are given in weeks, in order to facilitate comparison with Björklund (1981).[1]

Table 2.2 Unemployment rates and frequency and duration of spells of unemployment. Averages from four years: 1971, 1974, 1977 and 1980.

	Unemployment rate		Unemployment spells			
			Frequency (per cent of labour force per week)		Duration (weeks)	
	Calculated from flow data (steady state solution)	Actual stock data	Calculated from flow data	Calculated from stock data (Björklund)	Calculated from flow data	Calculated from stock data (Björklund)
All	2.05	2.03	0.16	0.18	12.42	11.28
Males	1.87	1.78	0.15	0.14	12.45	12.92
Females	2.31	2.42	0.19	0.24	12.34	10.35
Age 16-24	4.48	4.60	0.42	0.51	10.60	9.02
Age 25-54	1.38	1.45	0.11	0.12	12.25	12.37
Age 55-64	2.30	1.82	0.11	0.08	20.51	25.55

Sources: Own calculations and Björklund (1981).

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[1] He uses the actual unemployment rates as they are published by the Labour Force Surveys. The weekly flow into unemployment is defined as those who in the survey state that they have been unemployed for a week or less.

Transforming the quarterly transition rates from the Labour Force Surveys into weekly figures is not trivial. A method for this has been suggested by Barron (1975) and is applied by Björklund (1981). It relies on the rather strong assumption that the weekly probability of remaining unemployed (survival rate) is constant during the whole spell of unemployment. Duration measured in weeks can then be written

$$(2.9) \qquad D = \frac{1}{1 - (P_{uu})^{\frac{1}{13}}}$$

recalling that P_{uu} refers to a quarter (= 13 weeks).

The weekly inflow rate (F) is obtained by computing duration according to (2.9) and inserting it into equation (2.8).

The figures for duration in Table 2.2, obtained via two different methods of computation, are similar. For the group as a whole duration is somewhat higher when it is calculated with quarterly flow data. A closer look at the figures shows that two subgroups have higher durations: women and youth. Using quarterly data there is the obvious risk that transitions can occur between the interviews without being recorded. If this is the case, P_{uu} will be overestimated. In turn, this will result in overestimated values for duration (see expression 2.9). It is especially likely that duration computed on the basis of quarterly data will be overestimated for women and youths since their labour market behaviour is characterized by relatively frequent changes.

The computed "steady state" unemployment rates and the actual ones are relatively similar. In addition, the durations calculated from flow data and by Björklund (from stock data) are not too far apart. Furthermore, differences that exist can be explained. This is reassuring for the analyses based on "steady state" unemployment rates in Section 2.5.

Comparisons Between Years

Transition rates by sex and age group for the four years (1971, 1974, 1977 and 1980) will be presented below. The years have been selected to represent the seventies and the early eighties. Two years (1974 and 1980) with good and two (1971 and 1977) with poor business conditions are studied. Table 2.3 gives the values for 1971 and 1974. The improvement reflected in the figures is that expected given more favourable business conditions. For both sexes, youth and the prime-age group, the flow rate from unemployment to employment (P_{ue}) is higher in 1974 than in 1971. A higher probability of successful labour force entry (P_{ns}) is recorded for all groups. On the other hand, the flow rate from employment to unemployment (P_{eu}) decreases. The same is true for the rates of transition out of the labour force (P_{en} and P_{un}) with the exception of P_{un} for the older group.

The employment prospects for unemployed men and women (P_{ue}) seem to have improved by approximately the same amount (around four percentage points). Such is not the case with respect to withdrawal from the labour force. The withdrawal of women appears to be more sensitive to demand. An examination of this result demonstrates why an analysis based on three labour market states can be useful. Persson-Tanimura (1980) claims that during 1965-1978 male unemployment was more sensitive to decreases in demand than female unemployment. She found this to be mainly an effect of duration increasing more for men. From this it would be possible to draw the conclusion that in business downturns labour market prospects for unemployed men are worse than for women. What happens instead is, as Persson-Tanimura in fact guessed, that men stay unemployed while women "drop out" of the labour force.

The probability that someone employed becomes unemployed (P_{eu}) decreases substantially for all age groups between 1971 and 1974. However, since this probability is much higher for youth, the decrease, measured in percentage points, is greater. Furthermore, the probability that a young person entering the labour force (P_{ns}) becomes employed increases substantially with aggregate demand.

Table 2.3 Quarterly gross flow rates between labour market states by sex and age 1971 and 1974. (Probabilities of an individual in original state being in destination state one quarter later and probabilities of successful labour force entry)[1)]

		P_{eu}	P_{en}	P_{ue}	P_{un}	P_{ne}	P_{nu}	P_{ns}
All	1971	0.0126	0.0452	0.4958	0.2076	0.1245	0.0200	0.8613
	1974	0.0069	0.0349	0.5288	0.1754	0.1262	0.0156	0.8897
Males	1971	0.0138	0.0255	0.5566	0.1465	0.1564	0.0299	0.8393
	1974	0.0064	0.0222	0.5966	0.1204	0.1697	0.0214	0.8878
Females	1971	0.0107	0.0743	0.4236	0.2778	0.1139	0.0167	0.8724
	1974	0.0077	0.0525	0.4641	0.2231	0.1107	0.0136	0.8907
Age 16-24	1971	0.0261	0.0987	0.5294	0.2206	0.1840	0.0344	0.8424
	1974	0.0156	0.0862	0.5929	0.1643	0.2299	0.0304	0.8832
Age 25-54	1971	0.0092	0.0307	0.4923	0.2252	0.1294	0.0196	0.8682
	1974	0.0049	0.0216	0.5516	0.1829	0.1243	0.0152	0.8909
Age 55-64	1971	0.0123	0.0487	0.4305	0.1192	0.0549	0.0059	0.9032
	1974	0.0064	0.0375	0.3203	0.1797	0.0399	0.0039	0.9114

1) See Table 2.1 for further explanation.

Withdrawal (P_{en} and P_{un}) decreased among youth as well as among prime-age workers. At the same time, the probability that someone in these age groups who was unemployed found a job (P_{ue}) increased substantially. This was not true for the older unemployed. They did not seem to benefit from the good business conditions. Instead, their withdrawal (P_{un}) increased by more than six percentage points. This development was encouraged by several changes in the laws governing the disability pension system. For example, from 1972 it became possible to grant disability pensions solely on the grounds of labour market conditions. Furthermore, the age limit for this option was lowered to 60 years of age.[1]

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[1] Wadensjö (1983 b) notes that both unemployment insurance benefits and, even more, cash unemployment allowances often yield lower benefits than disability pensions.

These conclusions regarding the effect of demand, drawn on the basis of a comparison between the figures for 1971 and 1974, are open to an obvious criticism. The structural changes over time in the labour market, mentioned in Chapter 1 and in the beginning of this chapter, might well dominate the effect of a shift in demand. A good example is the observation that the re-employment probability of an unemployed older worker decreases with demand. This is hard to explain as a business cycle phenomenon. It is more reasonable to believe that it is a consequence of a weaker competitive position combined with changes in the laws and regulations governing the labour market.

Structural changes in the Swedish labour market during the seventies are apparent from Table 2.4. Going from a year with low economic activity (1977) to a year with somewhat higher activity (1980), the probability that someone with a job would lose it or give it up (P_{eu}) increases for all demographic groups. Moreover, there is a decrease in the probability of successful labour force entry (P_{ns}).

Table 2.4 Quarterly gross flow rates between labour market states by sex and age 1977 and 1980. (Probabilities of an individual in original state being in destination state one quarter later and probabilities of successful labour force entry.) [1)]

		P_{eu}	P_{en}	P_{ue}	P_{un}	P_{ne}	P_{nu}	P_{ns}
All	1977	0.0072	0.0299	0.4316	0.2037	0.1163	0.0186	0.8622
	1980	0.0086	0.0288	0.4330	0.1747	0.1153	0.0213	0.8441
Males	1977	0.0072	0.0200	0.4399	0.1772	0.1422	0.0256	0.8476
	1980	0.0085	0.0225	0.4347	0.1573	0.1279	0.0236	0.8443
Females	1977	0.0072	0.0425	0.4249	0.2254	0.1055	0.0157	0.8706
	1980	0.0087	0.0364	0.4338	0.1895	0.1089	0.0201	0.8440
Age 16-24	1977	0.0196	0.0751	0.4983	0.2169	0.2206	0.0330	0.8699
	1980	0.0219	0.0889	0.4778	0.1944	0.2089	0.0342	0.8593
Age 25-54	1977	0.0048	0.0173	0.4149	0.1950	0.1222	0.0223	0.8459
	1980	0.0061	0.0138	0.4530	0.1519	0.1281	0.0281	0.8201
Age 55-64	1977	0.0045	0.0372	0.2619	0.1905	0.0279	0.0030	0.9018
	1980	0.0052	0.0306	0.1868	0.1868	0.0276	0.0041	0.8716

1) See Table 2.1 for further explanation.

During an economic recovery one expects the probability of dropping out of the labour force to decrease for all demographic subgroups of the unemployed. This did indeed occur. One would expect the opposite correlation between changes in aggregate demand and the probability to become employed (P_{ue}). In this case, however, males, youth and older workers exhibit decreased re-employment probabilities.

Two differences between the sexes are worth noting. While men enter the labour force (P_{ne} and P_{nu}) at a lower rate in 1980 than in 1977, the opposite is true for women. Secondly, the probability of dropping out of the labour force from an employed state (P_{en}) increases for men but not for women between 1977 and 1980. Apparently, labour force participation among women is dominated by the positive trend mentioned in Chapter 1.

When comparisons are made between Tables 2.3 and 2.4, some of the trends in the Swedish labour market during the seventies appear even more striking. The probability that someone employed would become unemployed (P_{eu}) was much lower in 1977 than in 1971, while both were years with low economic activity. This suggests that the policies in effect during 1977, aimed toward keeping individuals in their jobs, were successful despite the business downturn.

For the older employed, the probability of becoming unemployed (P_{eu}) has decreased substantially. However, this probability has not decreased for all age groups. For the young employed, the probability of becoming unemployed is much higher in 1980 than in 1974. This *could* be the other side of the same coin: while the "job security" laws strengthen the position of the old, the young may be offered only temporary jobs.

On the whole, the probabilities of becoming employed for unemployed individuals (P_{ue}) are lower in 1977 and 1980 than in the early 1970's. The pattern is particularly clear for older workers. For them withdrawals from unemployment (P_{un}) are also higher, although the main increase in this probability occurred between 1971 and 1974.

It is worth noting that women have suffered a smaller deterioration than men in re-employment probabilities in 1977 and 1980. There is no obvious explanation for this. It *could* be a consequence of the relatively high growth in sectors employing many women (e.g. the public services). It *could* also be related to the fact that unemployed women originally had much lower employment probabilities. Given the new "participation pattern", women have been gaining more work experience, thus tending to close the gap between men and women.

2.5 THE EFFECT OF DIFFERENT FLOWS ON THE RATE OF UNEMPLOYMENT

The rate of unemployment has in other studies, as well as in the preceding analysis, been divided into flow and duration components. From the discussion in Section 2.4 it is obvious that this gives only part of the picture. Underlying the unemployment rate (as well as the rates of employment and non-participation in the labour force) are flows between all three labour market states.

Transition rates between three labour market states were presented in the previous section. The flows affect the number of individuals in each state, but it is difficult to get an exact picture of this impact, particularly since these numbers in turn affect the transition rates.

The relationship between the unemployment rate and the rates of transition was given in expression (2.5). It is possible to compute the contribution of different flow rates to the unemployment rate from the total differential of expression (2.5):

$$(2.10) \qquad d\,u = \sum_{ij} \frac{\partial u}{\partial P_{ij}}\, d\,P_{ij},$$

where u, as before, is the unemployment rate, and P_{ij} is the flow rate from state i to state j. Equipped with this formula it is relatively straightforward to compare the role played by different flow rates for the unemployment rates observed for various demographic groups or time periods. The idea is to break the total difference between the unemployment rates of two groups into the sum of partial differences $(\partial u/\partial P_{ij})\Delta P_{ij}$. This is done by multiplying the differences in flow rates by the partial

derivatives calculated from expression (2.5). The ij'th partial difference represents the amount by which the unemployment rates of the two groups would differ if all the flow rates except the ij'th were the same in the two groups.[1]

Differences Between Demographic Groups

Table 2.5 contains the results of a comparison between the two sexes. Moreover, youth and older workers have been compared with the prime-age group. All comparisons are based on figures from the four years studied earlier (1971, 1974, 1977 and 1980). The average partial and total differences have been computed.

The average unemployment rate for the four years was 0.43 per cent units higher for women than men. This difference is mainly a consequence of higher withdrawals among employed women (P_{en}) and lower employment probabilities for unemployed women (P_{ue}). The difference in unemployment rates between the sexes would have been even larger if unemployed women had not withdrawn as much as they had (P_{un}).

The important relationship between labour force withdrawal and unemployment for women can be given two different interpretations. It is possible that women leave the labour force for so-called non-economic reasons, i.e. to take care of homes and children. It is also possible that women lose or leave their jobs for reasons similar to those for men such as layoffs, but that a larger fraction of the women become discouraged and drop out of the labour force before they have been observed as unemployed in the Labour Force Surveys. The observed P_{eu} would then be understated and P_{en} overstated. In the latter scenario, the "participation instability" of women (the relatively high P_{en}) does, in fact, contribute to a smaller difference in unemployment rates between women and men, since it reduces P_{eu}.[2]

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[1] Marston (1976) describes the procedure used in an appendix. Essentially, the idea is to compute a weighted average of the partial derivatives ($\partial u/\partial P_{ij}$) evaluated at the two endpoints corresponding to values of P_{ij} for the two groups that are compared.

[2] To settle the issue is not easy. However, the fact that P_{en} increases when demand is low (see Tables 2.3 and 2.4) supports the second interpretation.

The strong impact of a flow which does not directly affect the number of unemployed, but reduces only the participation, might seem surprising.[1] This strengthens the argument for an analytical approach where all transitions between labour market states are considered. To understand why P_{en} is so important, it is necessary to look at the flows from not in the labour force. A share of those employed who had dropped out reenter the labour force unsuccessfully and end up unemployed. This share is apparently large enough relative to the direct flow from employment to unemployment.

Table 2.5 Partial differences in unemployment rates attributable to gross flow rates between labour market states by sex and age (percentage points of unemployment rate)[1)]

Probability of moving from one labour market state to another in one quarter					Total difference
P_{eu} (+)	P_{en} (+)	P_{ue} (-)	P_{un} (-)	P_{ns} (-)	
Partial differences: Females minus males					
-0.06	0.58	0.22	-0.22	-0.10	0.43
Partial differences: 16-24 years old minus 25-54 years old					
2.07	1.34	-0.20	-0.05	-0.06	3.10
Partial differences: 55-64 years old minus 25-54 years old					
0.18	0.38	0.53	0.07	-0.24	0.92

1) Signs within parentheses give signs of partial derivatives of unemployment with respect to transition probabilities (i.e. $\partial u/\partial P_{ue}$ etc.).

Both the young and the old group are compared with those between 25 and 54 years. The difference in the average unemployment rate for the four years between youth and the prime-age group is as large as 3.10. The flow rate from employment to unemployment (P_{eu}) appears to be most important for this difference:

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[1] In one sense, it is not surprising that withdrawals from employment have a positive effect on the unemployment rate. They simply decrease the denominator in the expression for the unemployment rate,

$$\frac{U}{U+E}.$$

employed youths have much higher probabilities of losing or leaving their jobs. This was already observed in the last section. Less obvious is the importance of the rate of flow from employment to not in the labour force (P_{en}), particularly since the probability of successful labour force entry (P_{ns}) in Table 2.1 is higher for youth. The reason must be that the flow from employment out of the labour force is *much* larger for the young.[1] Despite the relatively high probability of successful labour force entry, many young persons try to reenter without success. This unsuccessful group is sufficiently large to play a major role for the unemployment rate.

The unemployment rate for the older group is 0.92 percentage units higher than for the prime-age group. This appears to be mainly the result of the lower employment probabilities for the older unemployed (P_{ue}). The relatively high withdrawals from employment (P_{en}) are also important. The probability of successful labour force entry (P_{ns}) is higher for older workers. This in itself decreases unemployment and contributes to a smaller difference between the rate of unemployment for the prime-age group and the older group. In the early seventies older employed workers had higher probabilities of unemployment (P_{eu}). This pattern changed, as can be seen from a comparison between Table 2.3 and Table 2.4. However, for the period as a whole the P_{eu} for the older group is relatively high and contributes to the high unemployment rate of the old.

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[1] Whether this is due to a direct flow from employment to not in the labour force (caused, for example, by flows between temporary jobs and education) or is a consequence of two flows; first from employment to unemployment and later out of the labour force, is not obvious. The issue is not resolved by looking at P_{en} for years with different demand levels.

Differences Between 1971 and 1974

In the following, 1971 will be compared with three different years: 1974, 1977 and 1980. In Table 2.6 the partial differences between 1971 and 1974 are studied. Clearly, the unemployment rate was lower in 1974 for all demographic groups. Moreover, these decreases in unemployment rates were primarily a consequence of decreased probabilities of becoming unemployed (P_{eu}). For the older group the change in this probability is large enough to account for the entire difference in unemployment rates.

Also worth noting is the negative effect of withdrawals among the unemployed (P_{un}) on the total difference in unemployment between 1971 and 1974 for each age and sex group except the older one. This indicates significant discouragement in 1971, particularly strong for females and youth. Older workers had much higher withdrawals from unemployment in 1974. Previously, it was mentioned that this *could* be a consequence of changes in labour market policy (e.g. in disability pension schemes). Whether this is the reason for the higher withdrawals or not, the withdrawals contributed to lower unemployment in 1974 and thus to a larger difference in unemployment rates between 1971 and 1974.

For all groups, except older workers, an increase in the employment probabilities for those unemployed (P_{ue}) was observed. This seems to have been of particular importance for the youth unemployment rate: their gains from the business upturn were the highest. For the older unemployed, an opposite pattern can be observed. P_{ue} has decreased despite the improved business conditions. This is surprising, but could perhaps be explained as an effect of a combination of the more generous pension schemes and a structural trend, with worsening prospects for older unemployed.

The flow rate from employment out of the labour force (P_{en}) was higher for all groups in 1971 (see Table 2.3). For some groups, particularly women, these differences in flow rates were important for the differences in unemployment rates between 1971 and 1974. This lends some support to one of the interpretations

of this flow rate given on page 57, i.e. that P_{en} actually consists of two flows, an initial flow into unemployment and a subsequent flow out of the labour force.

Table 2.6 Partial differences in unemployment rates between 1971 and 1974 attributable to gross flow rates between labour market states by sex and age (percentage points of unemployment rate)[1)]

	Probability of moving from one labour market state to another in one quarter					total difference
	P_{eu} (+)	P_{en} (+)	P_{ue} (-)	P_{un} (-)	P_{ns} (-)	
Partial differences: 1971 minus 1974						
All	0.80	0.18	0.10	-0.09	0.18	1.18
Males	1.03	0.06	0.11	-0.06	0.18	1.32
Females	0.43	0.38	0.16	-0.18	0.19	0.97
16-24	1.32	0.21	0.37	-0.28	0.52	2.14
25-54	0.60	0.15	0.12	-0.08	0.09	0.89
55-64	1.09	0.19	-0.53	0.26	0.07	1.09

1) Signs within parentheses give signs of partial derivatives of unemployment with respect to transition probabilities (i.e. $\partial u/\partial P_{ue}$ etc.).

The effect of the probability of successful labour force entry (P_{ns}) on the unemployment rate is most important for youth. This reflects the fact that a greater proportion of young individuals are outside the labour force, but it is also an indication of relatively drastic changes in employment possibilities for young persons when demand changes. One could look at older workers as a contrast. For them the probability of successful labour force entry hardly plays any role. What is important is the probability of losing the job when demand decreases (P_{eu}).

Differences Between 1971 and 1977

A comparison of the figures for 1971 and 1977, both years with relatively low economic activity, might reveal some of the structural changes that have characterized the period. From Table 2.7 it is clear that all demographic groups had lower unemployment rates in 1977 relative to those in 1971. It is striking to what

extent this difference is due to a decrease in the probabilities that employed individuals become unemployed (P_{eu}). For the prime-age group, the older group and for males, the decrease in this probability alone could account for more than the whole change in unemployment rates. Both these findings are in accordance with the facts mentioned in Chapter 1: the battle against unemployment during the business downturn 1976-1978 was mainly fought with measures to "hold back" layoffs. Subsidies of different kinds were introduced together with laws strengthening the position of older workers. Judging from the drop in P_{eu}, particularly for the older group these policies were successful, at least in some narrow sense.

A different perspective on this development, however, leads to more troublesome conclusions. The drop in P_{eu} is an effect not only of a decrease in layoffs and dismissals. The quit rate has dropped as well [Holmlund (1982)]. In turn, quits depend partly on the probabilities of becoming employed again. It is apparent from Tables 2.3 and 2.4 that the flow rates from unemployment into employment (P_{ue}) for all groups except females has decreased between 1971 and 1977. In Table 2.7 this is reflected in negative partial differences for P_{ue}.

Table 2.7 Partial differences in unemployment rates between 1971 and 1977 attributable to gross flow rates between labour market states by sex and age (percentage points of unemployment rate) [1)]

Probability of moving from one labour market state to another in one quarter						total difference
	P_{eu} (+)	P_{en} (+)	P_{ue} (-)	P_{un} (-)	P_{ns} (-)	
Partial differences: 1971 minus 1977						
All	0.80	0.31	-0.22	-0.01	0.01	0.89
Males	1.00	0.13	-0.38	0.08	0.03	0.87
Females	0.52	0.61	0.00	-0.17	-0.02	0.95
16-24	0.85	0.43	-0.19	-0.02	0.33	1.40
25-54	0.67	0.29	-0.19	-0.06	-0.09	0.62
55-64	1.51	0.22	-0.84	0.32	-0.01	1.20

1) Signs within parentheses give signs of partial derivatives of unemployment with respect to transition probabilities (i.e. $\partial u/\partial P_{ue}$ etc.).

Another difference between the two "recession" years is the significance of labour force withdrawal among the employed (P_{en}). The rate of withdrawal across demographic groups was much higher in 1971. For women especially this flow contributes to the difference in unemployment rates. The new "participation pattern" seems to imply lower unemployment rates.

Differences Between 1971 and 1980

According to most indicators, economic activity was higher in 1980 than in 1977. Nevertheless, open unemployment increased. This increase is apparent when Tables 2.7 and 2.8 are compared. The total difference in unemployment rates between 1971 and 1980 is lower than that between 1971 and 1977 for all demographic groups.

It was noted above that the decrease in the probability that an employed person becomes unemployed (P_{eu}) was a major factor contributing to the lower unemployment in 1977. This is true for 1980 as well. For all demographic subgroups, except females, the lower level of this probability in 1980 is enough to explain the whole difference in unemployment rates. In fact, the total improvement in the older group's unemployment rate, between 1971 and 1980, is only about one third of the positive partial effect caused by the decrease in P_{eu}.

The changes in probabilities of withdrawal by the employed (P_{en}) are also important. From Tables 2.3 and 2.4 it is apparent that these rates have decreased a great deal compared with 1971 and also, for some groups, compared with 1977. This might be explained by the worsening prospects in the labour market as well as the premium in "work security" given by the new laws to those with long tenure. The decrease in withdrawals contributes to lower rates of unemployment for all demographic groups in 1980 relative to 1971. For women, the decrease in withdrawal among those with jobs is the single most important factor behind the lower unemployment rate in 1980.

Table 2.8 Partial differences in unemployment rates between 1971 and 1980 attributable to gross flow rates between labour market states by sex and age (percentage points of unemployment rate)[1)]

Probability of moving from one labour market state to another in one quarter	P_{eu} (+)	P_{en} (+)	P_{ue} (-)	P_{un} (-)	P_{ns} (-)	total difference
Partial differences: 1971 minus 1980						
All	0.60	0.36	-0.24	-0.11	-0.11	0.51
Males	0.82	0.07	-0.44	0.03	0.02	0.50
Females	0.30	0.81	0.04	-0.31	-0.26	0.58
16-24	0.54	0.19	-0.38	-0.16	0.24	0.43
25-54	0.47	0.41	-0.10	-0.16	-0.19	0.43
55-64	1.51	0.43	-1.49	0.37	-0.30	0.52

1) Signs within parentheses give signs of partial derivatives of unemployment with respect to transition probabilities (i.e. $\partial u/\partial P_{ue}$ etc.).

In Chapter 1, as well as earlier in this chapter, it has been noted that the unemployed in the late seventies have had a harder time finding employment. This is evident from the signs on the partial derivatives of P_{ue} in Table 2.8 for all groups except women. For men, youths and older workers, the decrease in this flow rate plays a major role for unemployment rates in 1980. The effect of P_{ue} on unemployment rates in 1977 and 1980 for these subgroups can be compared in Tables 2.7 and 2.8. Apparently, the decrease in the probability of becoming employed (P_{ue}) for men, youths and older workers is a major reason underlying the increase in unemployment rates between 1977 and 1980.

2.6 CONCLUDING COMMENTS

The results in this chapter fit well with the picture of the Swedish labour market during the 1970's presented in Section 1.2. Females have been found to have higher unemployment rates than men. This difference is partly due to lower probabilities of becoming employed for women who are unemployed (P_{ue}). Even more important is the different "participation pattern" that characterizes the labour market behaviour of women. In particular, the higher withdrawal probability for employed women (P_{en}) is largely responsible for the difference in unemployment rates between the sexes. It is interesting to note that the size of P_{en} decreases substantially during the seventies. This seems to imply that women have established themselves in the labour force. In turn this might mean a decrease in the difference between unemployment rates for men and women in the future.

The effects of various labour market flows on the unemployment *rates* differed between the age groups studied. Youth unemployment rates were much higher than the unemployment rates of the prime-age group primarily because employed youths became unemployed to a relatively large extent. For older workers the higher rates of unemployment were mainly due to lower probabilities of becoming employed when they are unemployed (P_{ue}).

Differences between the four years 1971, 1974, 1977 and 1980 have also been studied. Between 1971 and 1974 unemployment decreased for all demographic groups. Most important for all groups (but for the old in particular) was the "drop" in P_{eu}. This is an expected effect of a general economic recovery.

When the differences in unemployment rates between 1971 and 1977 are decomposed into the effects of various labour market flows, some of the structural trend changes in the Swedish labour market during the seventies are demonstrated. Even though 1977 was a year with low economic activity, open unemployment was much lower than in 1971. This was mainly a consequence of a sharp fall in the probability of becoming unemployed for the employed (P_{eu}). In Chapter 1, the introduction of several policy

measures aimed at decreasing P_{eu} was mentioned. They appear to have been successful. However, at the same time the probabilities that the unemployed obtain employment (P_{ue}) have decreased substantially. For older workers a parallel strong increase in P_{un} can be noted. This can be a consequence of more generous pension schemes.

The same structural changes can be noted when 1971 is compared to 1980. In fact, the "drop" in P_{eu} is, for all demographic subgroups except women, large enough to explain the whole difference in unemployment rates between 1971 and 1980. A sharp decrease in P_{ue} can also be noted. This flow is especially important for the unemployment rates of youths who have just entered the labour market, and for the older age groups. For females the decrease in withdrawals from employment (P_{en}) is large enough to explain the whole difference in unemployment rates between 1971 and 1980.

The results in this study indicate that it is important to look at all transitions when the unemployment rate is studied. However, the findings do not establish the reasons underlying the differences in unemployment rates. These are hidden behind the flows.

APPENDIX

THE LABOUR FORCE SURVEYS - METHODOLOGY USED IN CHAPTERS 2 AND 3

Statistics Sweden has, since 1961, regularly published studies of the Swedish labour market, the so-called Labour Force Surveys.[1] These studies are based on a representative sample of the Swedish population. They have been designed mainly to estimate the *levels* of labour force participation, employment and unemployment for the population at large, but also for different subgroups.

During most of the 1960's, 12,000 individuals were interviewed quarterly. Since 1970, 18,000-24,000 individuals have been interviewed each month.

An individual is in the sample for two years and is interviewed eight times during this period (i.e. once every quarter). Of the 22,000 individuals interviewed each month, 1/8 are new entrants into the sample, 1/8 are interviewed for the second time, and so on. As a consequence of this scheme each individual can be observed at eight occasions during two years, i.e. longitudinal analysis for two-year periods can be made.

The analysis in Chapter 2 is based on individual transitions between labour market states observed in the Labour Force Surveys during four different years, 1971, 1974, 1977 and 1980. In Chapter 3, data are disaggregated further. Transitions are studied not only between labour market states but also between three regions.

The method used for computing the transition rates is described on pages 44 and 94. If the number of individuals moving between two labour market states (and regions) is divided by the number in the initial state in the previous quarter, relative frequencies are obtained. These frequencies can be interpreted as transition probabilities.

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[1] A description of the Labour Force Surveys is available in Jos (1977).

All quarterly transitions beginning in each of the four years are used in computing the relative frequencies. Two examples may be used for illustration: for an individual entering the sample in January 1971, observations of present state and former state during that year are available four times; in April, July and October 1971 and in January 1972. For an individual interviewed the first time in August 1970, there will be four observations of present and former states from May, August and November 1971 and February 1972.

Including all quarterly transitions beginning in a specific year has an obvious advantage: the calculated transition probabilities are based on all recorded transitions. However, there is a "cost" connected with this procedure. There could be a systematic dependence between different quarterly flows from the same individual [Lindström (1982)].

In Tables A.2.1 and A.2.2 transition probabilities (and standard errors) for the four years together are given.[1] The transition probabilities in the first table are based on all transitions initiated during each of the years. In the second table only one observed transition - that between the first and the second time of interview - for each individual entering the Labour Force Surveys in 1971, 1974, 1977 or 1980, has been used as a basis for the computations of transition probabilities.

These computations were made in order to shed some light on the importance of the assumption of independence between transitions for the same individual in different quarters. In addition, the standard errors give an idea of the increase in precision obtained when the maximum amount of flows is used.

In both tables the observations have been weighted to take account of differences in sampling probabilities and missing data. The sample used in the Labour Force Surveys is stratified according to county (län), sex, age and marital status. When

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[1] The standard errors are computed as $\sqrt{\frac{p(1-p)}{n}}$ where p is the estimated probability given in the tables and n is the number of observations that each row is based on.

Statistics Sweden estimates monthly figures for the population at large, the inverted sampling probabilities are used to compensate for differences in the probability of being sampled. The same procedure has been used here

Table A.2.1 Transition probabilities (and standard errors) between labour market states. Based on maximum amount of registered transitions during four years (1971, 1974, 1977 and 1980)

	Employed	Unemployed	Not in the labour force
Employed	0.9568 (0.0003)	0.0087 (0.0001)	0.0344 (0.0003)
Unemployed	0.4744 (0.0051)	0.3358 (0.0048)	0.1910 (0.0040)
Not in the labour force	0.1210 (0.0009)	0.0188 (0.0004)	0.8601 (0.0009)

Table A.2.2 Transition probabilities (and standard errors) between labour market states. Based on one quarterly observation per individual entering the Labour Force Surveys 1971, 1974, 1977 or 1980

	Employed	Unemployed	Not in the labour force
Employed	0.9587 (0.0007)	0.0077 (0.0003)	0.0336 (0.0007)
Unemployed	0.5300 (0.0141)	0.2782 (0.0127)	0.1903 (0.0111)
Not in the labour force	0.1482 (0.0025)	0.0216 (0.0010)	0.8303 (0.0026)

Moreover, the figures in this appendix, as well as in Chapters 2 and 3, have been corrected for missing data. The population in each stratum, calculated from other sources, is compared with the population obtained for the strata after the first weighting procedure described above. The quota thus derived for each stratum is inverted and multiplied with the earlier computed population figure for the stratum.

The definition of the actual population in a stratum raises some problems when flow data are used. In this study the population includes only those individuals who, at the beginning and the end of each year, were between 16 and 64 years and lived in the country.

Studies made by Statistics Sweden indicate that missing data is a problem that cannot be overlooked.[1] In the sample as a whole, approximately seven per cent of the observations were missing in the end of the 1970's. For some demographic groups, such as unmarried young men in the big cities, the response rate is much lower [Kristiansson (1980)]. The response rate also varies across interviews (e.g. it is lower in the first of the eight interviews) [Johansson (1980)]. This implies that missing data is a relatively greater problem in Table A.2.2, since this table is based only on flows between the first and the second time of interview.

A dependence between labour force status and missing data has also been found. In particular, individuals without employment are less likely to be found by the interviewers [Gellerstedt and Kristiansson (1979)]. This could be a problem. The weights used are based on the assumption that missing data are independent of the labour market state.[2]

One other problem is misclassification of labour force status. According to one study, seven per cent of those classified as employed, unemployed or not in the labour force, did in fact belong to another labour market state [Bergman and Thorslund (1980)]. For those unemployed or not in the labour force this figure is higher, 10-20 per cent. This might not be an important problem when aggregate figures are computed if the misclassifications cancel out. It is a problem which is not easily solved for flow analysis. Not enough is known about the pattern of misclassifications.

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[1] Thorslund, Kristiansson and Bergman (1981) survey several studies discussing the quality of the data in the Labour Force Surveys.

[2] There are methods to compensate for this. They all require independent information regarding the structure of missing data [Little (1982)].

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3. The Effects of Changing Employment Levels on Regional Labour Markets

3.1 INTRODUCTION

This chapter is motivated by an interest in the effects of plant closures on local labour markets. During the 1970's, many plants in Sweden which had previously dominated local labour markets were shut down. Considerable pressure was brought to bear upon public officials to ameliorate the subsequent employment problems. A central issue in the debate over proposed policies was the local labour market effects the various policies would have.

The impact of a change in the number of jobs available in a labour market extends beyond those affected directly, such as laid off workers. People who are in the process of searching for work may face altered employment opportunities. This may affect the rates of entrance and withdrawal from the local labour force. It may even influence migration in and out of the region and hence the labour market in other regions. In addition, these changes in the labour market will have an induced effect on the regional distribution of expenditures. More specifically, unemployment and out-migration following upon a plant closure are likely to decrease local demand for goods and services, further aggravating the unemployment situation.

A number of studies of plant closures were made in the sixties and seventies. Most common were case studies analyzing the employment consequences for those directly laid off. Some

studies included a description of the wider effects on the local labour market, such as out-migration, but to my knowledge none of the studies contained a formal model which could be used for quantitative analysis.

In another group of studies cost benefit analyses of plant closures were attempted. These studies relied on forecasts of the labour market consequences. It is primarily the impact on those directly laid off that has been forecasted, but some *ad hoc* discussion regarding the effects for other individuals in the local labour market is also common.[1] The forecasts made have frequently been complemented by computations of future employment based on multipliers.[2,3]

Underlying most studies of plant closures appears to be the idea that a new equilibrium is reached in the local labour market, which is assumed to yield a lower level of employment. In some cases it is considered possible that a new equilibrium will not be reached until there are no more local jobs.

For some purposes (e.g. cost benefit studies) the adjustment process leading to a new equilibrium is more interesting than the equilibrium in itself. Many of the social costs of plant closures occur in this adjustment process.

The purpose of this study is to analyze the adjustment process following a plant closure and to identify factors strategic to this process. The models, one theoretical and one for simulations, are developed to deal with direct and

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[1] Greenwood and Pearson (1977) develop a conceptual framework in which to discuss the broader labour market consequences of plant closures, which is, however, too general to form a basis for quantitative analysis.

[2] Johansson, P.-O. (1978) contains an analysis of various kinds of employment multipliers. Brand et al. (1979) and Jungenfelt et al. (1981) are examples of cost benefit studies of plant closures where employment multipliers are utilized.

[3] Mossfeldt (1983) is a recent survey of Swedish studies of plant closures addressing the various types mentioned here.

indirect effects on the labour market of plant closures. They do not, however, include the so-called induced effects via changes in local expenditures. The intention has been to formulate a framework which could be used for empirical analysis. In particular the aim has been a model which could be used as a foundation for cost benefit studies.

In neither one of the models are prices or wages allowed to change. This simplifies the analysis. On the other hand it implies that both models have only short run applicability.

A brief description of the overall framework used in the present study is found in the following section.[1] The theoretical model is developed and discussed in Section 3.3. One who is primarily interested in empirical applications may choose to pass over this section and continue reading in the following (3.4) where simulation results are presented.

3.2 THE BASIC FRAMEWORK

In the following a framework will be developed for the analysis of the effects of changes in the number of jobs in one region on the distribution of individuals over labour market states within the region as well as in the rest of the country. The framework should allow both theoretical and empirical analyses.

A diagrammatic presentation of the structure underlying the theoretical part of this study is seen in Figure 3.1. There are *two regions* in the model. The focus is on the local labour market. Individuals in this local labour market are characterized as employed or not employed. Allowance is made for flows between these *two labour market states*. The individuals can also migrate into or out of another region, called other labour markets. Within this region no distinction between

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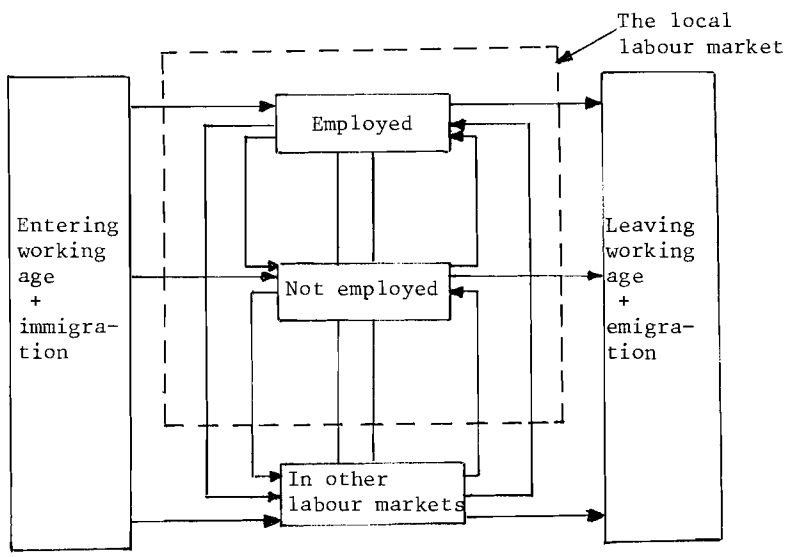
[1] The main purpose of this study is very different from that of Chapter 2. Nevertheless, there are two similarities; the framework used is Markovian and the data (from the Labour Force Surveys) are the same.

different labour market states is made. The *flow rates* between the labour market states in the local labour market, as well as between the two regions, are *functions only of the labour market demand in the local labour market.*

Figure 3.1 Stocks and flows in a model with two regional labour markets



The main simulation model presented in Section 3.4 differs from the theoretical model in three primary respects. *Three regions* used frequently in regional studies in Sweden are distinguished: the big cities, the forest counties and the rest of the country. In these regions individuals are distributed over the *three labour market states* described in Chapter 2: employed, unemployed and not in the labour force. Moreover, the flow rates between labour market states within or out of each of the regions are *functions of the labour market demand in the respective region.*

In reality youth and immigrants will enter the working age population while older workers will retire and emigrants leave the country. When the properties of the theoretical model are analyzed, as well as in the simulations, the flows into and out of the working age population are assumed to cancel out.

3.3 A THEORETICAL MODEL

Structure

In the preceding chapter three employment states were identified. In order to facilitate the formal analysis in this section, the model used incorporates only two of these: employed and not employed. A third state, "in other labour markets", is added to allow for migration.

Individuals make transitions within the region, between the two states, according to conditions in only the local labour market. Migration in and out of the local labour market is also prompted by conditions in the local labour market. Finally, the number of work places is given exogenously.

The theoretical arguments underlying the model as formulated are made below. First, however, the basic equations are presented. Equations (3.1) to (3.3) give the change in the number of individuals employed (E), not employed (U) and in other labour markets (M) as functions (P) of the number of individuals in these states. In view of (3.8) and (3.9) two of these equations imply the third one.

$$(3.1) \qquad \dot{E} = -P_{eu}E - P_{em}E + P_{ue}U + P_{me}M \; ; \qquad P_{eu} + P_{em} \leq 1$$

$$(3.2) \qquad \dot{U} = -P_{ue}U - P_{um}U + P_{eu}E + P_{mu}M \; ; \qquad P_{ue} + P_{um} \leq 1$$

$$(3.3) \qquad \dot{M} = -P_{me}M - P_{mu}M + P_{em}E + P_{um}U \; ; \qquad P_{me} + P_{mu} \leq 1$$

If the labour market behaviour of individual workers is assumed to be identical, in the sense that it can be described by the same transition probabilities, and satisfies the Markovian assumptions, the P's can be interpreted as transition probabilities. Judging from the empirical study of the effect of duration on movements out of labour market states appearing in Chapter 4, the appropriateness of the Markovian assumptions is questionable. They are made here, as in Chapter 2, in order to simplify the theoretical analysis and to make the empirical application possible.

The transition probabilities of going from employed to not employed and *vice versa* (P_{eu} and P_{ue}) are given below as functions of the relative local excess demand for labour, that is, the difference between the number of vacancies (V) and the number of not employed (U) divided by the total working age population (L).

$$(3.4) \qquad P_{eu} = f_{eu}\left(\frac{V-U}{L}\right) \quad ; \quad P_{ue} = f_{ue}\left(\frac{V-U}{L}\right)$$

The probabilities for transitions into (P_{me} and P_{mu}) and out of (P_{em} and P_{um}) the region can also be written as functions of the relative excess demand $\left(\frac{V-U}{L}\right)$.

$$(3.5) \qquad P_{me} = f_{me}\left(\frac{V-U}{L}\right) \quad ; \quad P_{mu} = f_{mu}\left(\frac{V-U}{L}\right)$$

$$P_{em} = f_{em}\left(\frac{V-U}{L}\right) \quad ; \quad P_{um} = f_{um}\left(\frac{V-U}{L}\right)$$

It was mentioned previously that the model was created to study changes in the distribution of individuals across regions and labour market states following a change in the local demand for labour. The number of employment opportunities within the local labour market (W), vacancies plus employed, is assumed to be exogenous.

(3.6) $W = \overline{W}$

Three identities may now be stated

(3.7) $W \equiv E + V$

(3.8) $L \equiv E + U$

(3.9) $R \equiv L + M$

According to (3.7), the number of jobs is equal to the number of employed plus the number of vacancies. The second identity (3.8) equates the size of the local working age population with the number of employed plus not employed. Finally, the working age population for the whole country (R) is given as the sum of the working age populations of the two regions.

A change in the number of individuals in one state (E, U or M) always "spills over" into another as long as R is constant (i.e. $\dot{E}+\dot{U} \equiv -\dot{M}$). Equation (3.3) is thus redundant and we have a system of two non-linear differential equations. Substituting $\frac{W-E-U}{E+U}$ for $\frac{V-U}{L}$ (see (3.7) and (3.8)) and (R-E-U) for M (see (3.9)) the system can be solved for E and U.[1] The other two arguments R and W are both exogenous and assumed to be constant.

It should be observed that there are no prices or wages in the model. An increase or decrease in labour market demand affects only quantities (i.e. the transition probabilities). Thus, the model is characterized by sticky prices.
In the Swedish context where wages are settled via nationwide collective bargaining, a significant drop in relative wages within a local labour market resulting from a plant closure is highly unlikely. This is not to say that there are no changes in prices which could affect local employment. As an example of a partially compensating effect, a decrease in the price of housing could encourage migration into the region, in turn creating new jobs in the service sector.

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[1] These substitutions have been made in (3.10).

A mechanism having the opposite, i.e. a magnifying effect on employment consequences, was mentioned in the introduction. A decrease in the population or in the number of employed will depress local demand for goods and services and thus the derived demand for labour.

This is an effect which this model does not take account of since the number of work places is given exogenously. For these reasons it is obvious that the model can be defended only in the case of short run analysis.

The comparative statics of the model will be studied below. An exogenous shift in the number of work places occurs in the local labour market. The consequences of this for the number of employed (E), not employed (U) and in other labour markets (M), will be traced.

Before turning to the comparative statics a section will be devoted to expressions (3.4) and (3.5) (the probabilities of transition within the local labour market as well as between the local labour market and other labour markets as functions of the conditions in the local labour market) and to discuss how the transition rates are affected by changes in demand in the local labour market (the signs of f').

How Are the Flow Rates Affected by Changes in Demand?

Modelling approaches to some of the labour market flows were offered in Chapter 1. In particular, a search model was presented to analyze flows from unemployment to employment. Thus, the discussion in this chapter will be brief. Merely a few comments directly relevant to the signs of the derivatives of the f-functions need to be made.

Basic to the decision of the firm to lay someone off is a comparison between the labour employed at present and forecasted future needs. In a business downturn one would expect future labour needs to be low relative to the present work force. This would lead to either direct or lagged layoffs,

depending on adjustment costs. There is another reason to expect this relationship to exist between business conditions and the rate of layoffs: the tighter the market for labour, the more reluctant firms will be to lay employees off, since an unexpected upturn can lead to recruitment problems.

Quits also depend to a great extent on the labour market situation.[1] Within a search model, it can be argued that employees are more likely to quit a job and search for a new one when the labour market is tight [Holmlund (1980)].[2]

Since the effect of labour market demand on the quit rate is likely to be positive, while the opposite is true of layoffs, the sign of the derivative of f_{eu} is not *a priori* unambiguous. The net result depends on the relative sizes of the two flows. Empirical findings indicate that the total number of quits is larger than the number of layoffs [Holmlund (1982)]. This would in itself make the chance of observing a positive f'_{eu} more likely. However, in the data used in the later sections of this chapter, individuals are observed with an interval of as much as three months. This means that many of the quits will not be observed, since they have been followed by new employment within three months. Layoffs might then dominate the *observed* P_{eu} resulting in a negative f'_{eu}.

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[1] Quits can, of course, be made for "non-economic" reasons.

[2] Given that an individual searches for a new job, the quit probability depends on the likelihood of encountering a job opening, the probability that this contact results in a concrete job offer and the probability that this offer is accepted. The likelihood of finding a job increases with the number of vacancies, while the chance of getting a job offer is better the higher the economic activity and the fewer the job competitors, i.e. the fewer the unemployed. On the other hand, the probability that an offer is accepted is likely to be lower when there are many vacancies and few unemployed. Thus, the labour market indicators do play an ambiguous role. However, it seems reasonable to expect the first effect to be the stronger one and to draw the conclusion that the number of quits increases when the labour market improves.

Consider the flow rate of not employed to employed (P_{eu}). It seems likely that it will be larger when the level of economic activity in the region is higher, since firms in this situation will want to employ more individuals. This primary effect implying more job offers is likely to outweigh the possible decrease in acceptance probabilities following an improvement of the labour market situation (see the discussion about the search model in Section 1.3). Therefore it will be assumed that f'_{ue} is positive.

Next, the flows in and out of the local labour market should be explained. In the standard migration model [Sjaastad (1962)], individuals are assumed to base their choice of labour market on a present value calculation of future incomes in different regions. Individuals migrate when the discounted life-time income at some destination, net of moving costs, exceeds expected income at the current location.

This formulation overlooks the fact that non-monetary factors may play a decisive role for the choice of region in which to live. It also has an underlying premise of perfect information. Thus it ignores imperfection in the information about both the distribution of wage offers and actual offers, given a certain distribution.[1]

It is reasonable to argue that the job offer probability is important in the migration decision. Since the wage distribution, at least in present day Sweden, is not likely to vary much for an individual across regions, it is primarily the probability of getting a job that is decisive for future

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[1] These aspects could be included in search-theoretic frameworks. David (1974) assumes that individuals choose between different labour markets on the basis of the distribution of wages, while the search for a specific job does not begin until after the migration has taken place. In Holmlund (1982), the individual can choose between pre- or post--migration search. Whether migration will take place or not depends on factors such as search costs, job offer probabilities, wage distributions and moving costs.

income. In addition, costs for moving and searching influence the propensity to migrate.[1]

In the model presented there are four different flows involving migration: from employed and not employed into other labour markets and *vice versa*. The four flow rates are all functions of demand in the local labour market. Given an improvement in this market, one would expect a decrease in emigration of employed as well as unemployed, that is $f'_{em} < 0$ and $f'_{um} < 0$. Moreover, it is reasonable to assume that immigration into employment would increase, that is $f'_{me} > 0$. However, the effect on immigration into unemployment (f'_{mu}) is not obvious.[2]

Finally, a few words should be said about the demand measure. Its definition is open to dispute. Some of the flows discussed are likely to be determined mainly by the level of vacancies or unemployment. Migration has, in the literature, been assumed to be a function of the number of employed divided by the total local labour force [Harris and Todaro (1970)] or the change in the number of local job openings divided by the number of unemployed [Todaro (1969)]. In the present study a single measure, $\frac{V-U}{L}$, is assumed to be decisive for all the flows in (3.4) and (3.5). This assumption is made to simplify the following analysis.

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[1] In another approach migration between two regions is treated as a function of the potentials for interaction. Interaction is assumed to be an increasing function of the populations and a decreasing function of distance between the regions. In empirical applications, where gross migration between regions is studied, variables like these are often entered together with measures of the demand situation on the labour markets [Axelsson and Löfgren (1978)].

[2] A positive derivative (f'_{mu}) is obtained by Harris and Todaro (1970). In their model immigration is a function of expected earnings in the labour market. In turn, expected earnings depend on the wage rate and the probability of getting employed (P). This probability is assumed to be E/L. From this it follows that $dL/dE = 1/P$ or, in other words, that the creation of one job in the region results in an immigration of 1/P workers.

Characteristics of the Model

In this section the comparative statics and the stability properties of the model will be analyzed. This is done to gain some insight into the adjustment process following a change in the number of work places.

The effects of an exogenous shift in the number of work places within the local labour market (W) on the change in the number of employed and not employed will be studied. As noted previously, a change in one state always "spills over" into another. Equation (3.3) is thus redundant.

Using this, and substituting $\frac{W-E-U}{E+U}$ for $\frac{V-U}{L}$ (see (3.7) and (3.8)), and (R-E-U) for M (see (3.9)), the following system of non-linear differential equations is obtained.

$$\dot{E} = -f_{eu}\left[\frac{W-E-U}{E+U}\right] \cdot E - f_{em}\left[\frac{W-E-U}{E+U}\right] \cdot E + f_{ue}\left[\frac{W-E-U}{E+U}\right] \cdot U + \\ + f_{me}\left[\frac{W-E-U}{E+U}\right] (R-E-U)$$

(3.10)

$$\dot{U} = -f_{ue}\left[\frac{W-E-U}{E+U}\right] \cdot U - f_{um}\left[\frac{W-E-U}{E+U}\right] \cdot U + f_{eu}\left[\frac{W-E-U}{E+U}\right] \cdot E + \\ + f_{mu}\left[\frac{W-E-U}{E+U}\right] (R-E-U)$$

We can take derivatives with respect to W

$$\frac{d\dot{E}}{dW} = b \cdot k$$

(3.11)

$$\frac{d\dot{U}}{dW} = b \cdot q$$

where

$$b = \frac{1}{E+U} \quad , \tag{3.12}$$

$$k = -(f'_{eu} + f'_{em})E + f'_{ue}U + f'_{me}(R-E-U) \quad \text{and} \tag{3.13}$$

$$q = (f'_{eu})E - (f'_{ue} + f'_{um})U + f'_{mu}(R-E-U) \tag{3.14}$$

We have now specified enough to explore the directions of change in employment and unemployment when the number of work places changes. This "short-run" effect is not without interest in a model constructed to study the immediate adjustments in the labour market following a shift in demand.

Obviously, b is positive. The signs on k and q are not as easy to discern. In the previous discussion regarding the effects of demand in the local labour market on the various flow rates, the following signs on the derivatives with respect to an increase in the local labour market demand were deduced.

$$\begin{aligned} &f'_{eu} < 0 \quad , \quad f'_{em} < 0, \\ &f'_{ue} > 0 \quad , \quad f'_{me} > 0, \\ &f'_{um} < 0 \quad , \quad f'_{mu} \quad ? \end{aligned} \tag{3.15}$$

Based on these presumptions it is clear that k will be positive, since all three terms in (3.13) are positive. Hence, an increase in the number of work places implies that employment will increase ($d\dot{E}/dW > 0$).

The sign of q is ambiguous. The first term; the effect of a change in local labour market demand on the flow rate from employment to non-employment (f_{eu}), is clearly negative. The sign on the middle term is indeterminate: an increase in the number of local jobs has a positive effect on the rate of flow of not employed

into employed (f_{ue}), but at the same time the flow rate of not employed to other labour markets (f_{um}) will decrease. The last term, showing the effect on the flow rate from other labour markets to the not employed (f_{mu}) is indeterminate as well.

Whether q is positive or negative depends not only on the derivatives (f'), but also on the relative sizes of E, U and M. In industrialized countries one would expect E to be larger than U. The size of the population in other labour markets (M) relative to the population in the local labour market (E+U), obviously depends on how the regions are defined. The effects of plant closures are usually studied in the setting of a limited local labour market, implying that M would be relatively large. Given this the probability of getting a positive q should be higher.

Chances of obtaining a positive q, when the local labour market is relatively small, further increase when one considers the derivatives. If individuals are heterogeneous with respect to the kind of jobs they can get, a deteriorarion in the average local labour market situation is likely to encourage more migration out of a smaller region. In addition, it is easier to get a good general view of the options available in the local labour market if it is small. Hence the unemployed will need to search in the local labour market for a shorter period before they migrate.

So far, we have seen that a positive q can appear and that it is more probable when the local labour market is small relative to the other labour markets. This does, however, not imply that a positive q is the more likely result. Judging from the empirically estimated transition probabilities in the Appendix, f'_{eu} and f'_{ue} dominate f'_{um} and f'_{mu}. Moreover, f'_{mu} is negative.

It appears reasonable to conclude that q in the context relevant in this study usually will be negative. If the local labour market is relaively large, the effect of a local demand change on the internal

flows in and out of employment will numerically dominate the effect of the migration flows. If this condition should not be satisfied a negative f'_{mu} could lead to a negative q. In turn, this implies that $d\dot{U}/dW$ is negative; an increase in the number of work places has an immediate negative effect on the change in the number of not employed.[1]

Let us now focus on the "long-run" effects of a change in local demand for labour on the number of employed and not employed. In a steady state there is no change in the number of individuals in each state. Hence, $\dot{E}$ and $\dot{U}$ in equations (3.10) are zero. If this system is differentiated with respect to a change in W, the total differential in simplified matrix form is

$$(3.16)\qquad \begin{bmatrix} -a \cdot k - f_{eu} - f_{em} - f_{me} & -a \cdot k + f_{ue} - f_{me} \\ -a \cdot q + f_{eu} - f_{mu} & -a \cdot q - f_{ue} - f_{um} - f_{mu} \end{bmatrix} \times \begin{bmatrix} dE^* \\ dU^* \end{bmatrix} = \begin{bmatrix} -b \cdot k \\ -b \cdot q \end{bmatrix} \times dW$$

where E^* and U^* are the numbers of employed and not employed in steady-state and b, k, q and the f_{ij} are evaluated at E^* and U^* while

$$(3.17)\qquad a = \frac{W}{(E^*+U^*)^2}$$

By rearranging (3.16) one obtains expressions for the effects of a change in the exogenous number of work places on employment and unemployment.

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[1] In note 2 on page 83 the Harris-Todaro model was mentioned. It was developed to explain migration into the big cities of Africa. The central mechanism is the connection between the employment opportunities in the cities and migration from the countryside. When jobs are created in the cities migration is encouraged to such an extent that unemployment in the big cities increases as well. This is one situation where a positive $d\dot{U}/dW$ might be observed.

(3.18)

$$\frac{dE^*}{dW} = \frac{b\left[f_{ue}(k+q) + k(f_{um}+f_{mu}) - qf_{me}\right]}{a\left[kf_{um} + qf_{em} + (k+q)(f_{eu}+f_{ue})\right] + f_{eu}(f_{um}+f_{me}+f_{mu}) + f_{em}(f_{ue}+f_{um}+f_{mu}) + f_{me}(f_{ue}+f_{um}) + f_{ue}f_{mu}}$$

(3.19)

$$\frac{dU^*}{dW} = \frac{b\left[f_{eu}(k+q) + q(f_{em} + f_{me}) - kf_{mu}\right]}{a\left[kf_{um} + qf_{em} + (k+q)(f_{eu}+f_{ue})\right] + f_{eu}(f_{um}+f_{me}+f_{mu}) + f_{em}(f_{ue}+f_{um}+f_{mu}) + f_{me}(f_{ue}+f_{um}) + f_{ue}f_{mu}}$$

Stability of the system obtained by linearizing (3.10) around a steady state requires that the denominators in (3.18) and (3.19) are positive.[1] The f_{ij} are all positive. The same is true of a and b. Again, it is q, k and (k+q) that raise problems. Taking account of (3.15) k is positive. k and q summarize the effects of a change in W on $\dot{E}$ and $\dot{U}$. Hence, (k+q) is the total effect on the change in the local labour force. This effect is positive, as can be seen from (3.20).

(3.20) $$(k+q) = \underbrace{f'_{em}E^*}_{+} - \underbrace{f'_{um}U^*}_{+} + \underbrace{(f'_{me} + f'_{mu})(R-E^*-U^*)}_{+} > 0$$

[1] It is also required that either of the diagonal elements in the left hand matrix of (3.16) is negative. This holds, given that k is positive.

If $q > 0$ the denominators in (3.18) and (3.19) are positive. However, it was earlier concluded that a negative q was more probable. In that case a sufficient condition for the denominator to be positive is $[-q\, f_{em} < k\, f_{um} + (k+q)(f_{eu} + f_{ue})]$.[1] This seems likely. From (3.20) it is obvious that (k+q) is positive. This implies that the last term in the expression is positive. Hence, a sufficient condition for a positive denominator is $-q\, f_{em} < k\, f_{um}$. If (k+q) is positive and q is negative it is obvious that k is greater than the absolute value of q. Given this we can conclude that the denominator is positive if $f_{em} < f_{um}$. While not certain, it seems likely that migration is larger among unemployed than employed.[2]

The conclusion from this is that stability can not be ascertained on theoretical grounds. However, with reasonable assumptions regarding the sizes of various flow rates (f) and the derivatives of the flow rates with respect to demand changes (f'), stability is probable.[3]

Finally, a few words should be said about the signs on dE^*/dW and dU^*/dW ((3.18) and (3.19)), the "long-run" effects on the number of employed and not employed in the local labour market when the number of work places changes.

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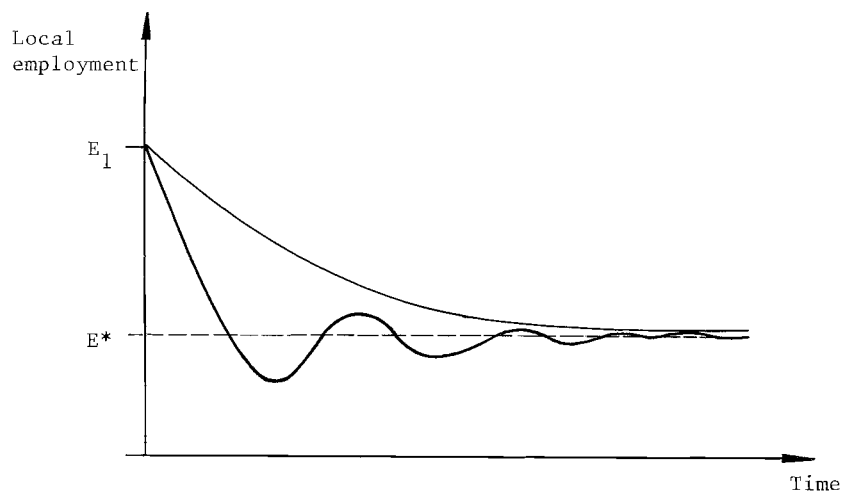
[1] Even if this requirement does not hold, the denominator will be positive if the sum above, multiplied by a, is smaller than the sum of the transition probabilities following in the denominator.

[2] This presumption is supported by inspection of the tables in the Appendix.

[3] It should be stressed that the stability discussion relates to a linearization around a particular steady state. By inspection of the non-linear system (3.10) it is clear, however, that a solution path starting from positive values on E or U will never lead to E or U being negative. This would have required that either $\dot{E} < 0$ or $\dot{U} < 0$ evaluated at E, U and/or M is equal to zero.

If $q < 0$ it is undisputable that the numerator in (3.18) is positive. This together with the earlier assumed positive denominator, gives us the expected result for dE^*/dW; an increase in the number of work places increases local employment in the long run. The other side of the coin is the notion behind previous studies of plant closures: a decrease in the number of work places from a level implying an employment equal to E_1 leads to a new equilibrium in the local labour market at a lower level of employment E*. This new equilibrium level can be reached via various paths, depending on the actual values of the arguments in the expression (3.18).[1]



To deduce a sign of dU^*/dW is more complicated. If $q < 0$, earlier assumed to be reasonable, it is more likely that the numerator is negative. In that case dU^*/dW is negative, which is what we would expect.

The conclusion from this theoretical analysis is that stability cannot be ascertained even in a relatively simple model, where no account is taken of price effects. It is, however, likely that the development will be stable. The

[1] According to note 3 on page 89 it can be determined that no paths will lead to negative E or U.

generally held notion that a new labour market equilibrium will be established at a lower level of employment after a plant closure is also supported.

In the next section a model similar to the one presented here will be simulated. For that model the transition probabilities as well as their derivatives have been estimated on Swedish data from the 1970's.

3.4 SOME SIMULATIONS

In this section, a model will be developed to simulate the labour market consequences of demand shifts in a region.[1] This model differs in some respects from the theoretical model presented in the previous section. It includes three instead of two regions. Individuals who are not employed can be either unemployed or outside the labour force (i.e. the same three state framework as that presented in Chapter 2). Finally, the rates of flow within and out of each region are functions only of the labour market demand in the respective regions.

Before presenting and reporting on this model, the results from two simpler exercises will be put forward. They are primarily intended to bridge the gap between Chapter 2 and this chapter and to introduce the data and methodology used.

A Model with Fixed Probabilities and No Distinction Between Regions

In the first simulation transition matrices from 1971, 1974, 1977 and 1980 are used. These matrices include movements between

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[1] I have seen two studies of somewhat similar character in the literature. One of them, which uses a model structure resembling this one, analyzes the effects of changes in general demand on the labour market situation of different age, sex and race groups [Smith (1977)]. The other study was also developed to analyze changes in macro policies. It uses a framework less similar to this but is applied to Swedish data [Holmlund (1980)].

three labour market states: employment, unemployment and not in the labour force. They are computed as described in Chapter 2 (see, in particular, the figure on page 44).

The initial conditions for the simulation are the numbers of individuals in each labour market state in 1971. This distribution is multiplied by the transition matrix from the same year. An estimate is thereby obtained for the distribution over labour market states one quarter later. If this computation is made twelve times using the 1971 transition matrix, estimates of the distribution over labour market states for 1972, 1973, and 1974 are obtained.

In Figure 3.2, the simulated numbers of individuals employed ($\hat{E}$), unemployed ($\hat{U}$) and not in the labour force ($\hat{N}$) have been related to the starting values (from 1971). Until 1974, unemployment projections increase substantially. A small increase in employment can be noted while the number of individuals not in the labour force has decreased.

The dotted lines in the diagram connect the actual number of employed, unemployed and not in the labour force 1974, 1977, and 1980 with the 1971 values.[1] Clearly, the simulation strongly overestimates unemployment in 1974. At the same time, estimated employment is much lower, and the number of individuals not in the labour force much higher than actual. The reason for this should be obvious. The year 1971 was characterized by low economic activity, which shaped the 1971 matrix.

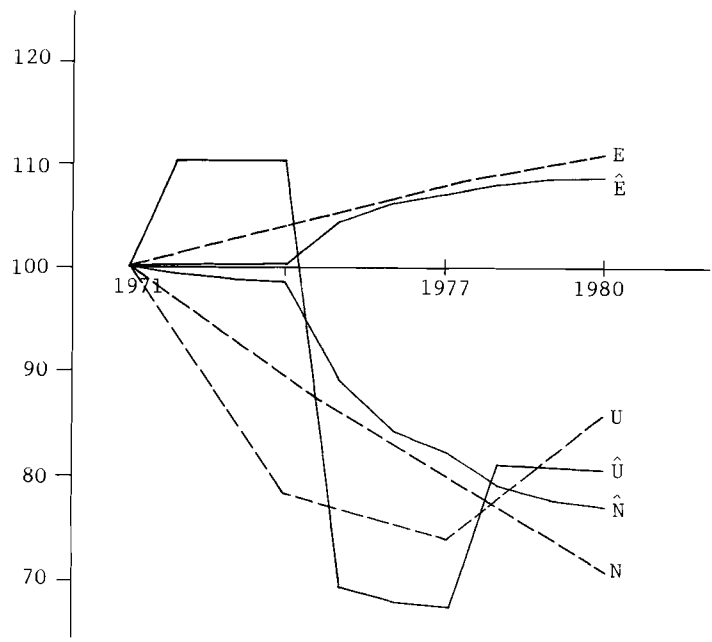
The simulation is continued to 1977 using the transition matrix from 1974. Starting values for 1974 are obtained from the earlier simulation. Utilizing the same technique the 1977 matrix is used in estimating the last three years of the 1970's.

Again, unemployment is badly estimated. The matrix of 1974, a year with good business conditions, leads to an underestimation of unemployment in 1977. Perhaps more interesting is the underestimation of the unemployment figure for 1980. Since a matrix from a year with low economic activity (1977) was used to

[1] The total number of individuals is held constant at the level of 1971. Hence, it is really the change in the share of individuals employed, unemployed and not in the labour force that is given by the dotted lines.

estimate unemployment in a year with better business conditions (1980), an overestimation would have been more natural. The result obtained is an indication of the structural changes in the labour market noted in Chapter 2, leading to an increase in unemployment in 1980 despite better business conditions.

Figure 3.2 Distribution on labour market states 1971 to 1980. Simulated and actual (dotted) figures. (Index 1971 = 100).



The figures on employment and individuals not in the labour force have been more successfully simulated. However, the marked decrease over the period in the number of individuals outside the labour force and the increase in employment has not been fully reflected in the simulations.

A Model with Fixed Probabilities and Three Regions

The purpose of simulation model two is to introduce a regional dimension. The 3×3 matrix used so far is replaced by a 9×9 matrix. The individuals are distributed over three regions: big cities, forest counties and rest of the country.[1] In either region they can be employed (E), unemployed(U), or not in the labour force (N).

Region and labour force status in previous quarter	Region and labour force status in current quarter								
	Big cities			Forest counties			Rest of the country		
Big cities	E_B	U_B	N_B	E_F	U_F	N_F	E_R	U_R	N_R
E_B	$E_B E_B$	$E_B U_B$	$E_B N_B$	$E_B E_F$	$E_B U_F$	$E_B N_F$	$E_B E_R$	$E_B U_R$	$E_B N_R$
U_B	$U_B E_B$	·	·	·	·	·	·	·	·
N_B	$N_B E_B$	·	·	·	·	·	·	·	·
Forest counties									
E_F	$E_F E_B$	·	·	·	·	·	·	·	·
U_F	$U_F E_B$	·	·	·	·	·	·	·	·
N_F	$N_F E_B$	·	·	·	·	·	·	·	·
Rest of the country									
E_R	$E_R E_B$	·	·	·	·	·	·	·	$E_R N_R$
U_R	$U_R E_B$	·	·	·	·	·	·	·	$U_R N_R$
N_R	$N_R E_B$	·	·	·	·	·	$N_R E_R$	$N_R U_R$	$N_R N_R$

[1] This particular regional division facilitates comparisons between other studies of regional labour market problems, since it has been common in many studies during the 1960's and 1970's. During the 1960's, the forest counties - Värmland, Kopparberg, Gävleborg, Västernorrland, Jämtland, Västerbotten and Norrbotten - had a rapidly declining agricultural and forestry sector and a substantial out-migration. The big city counties - Stockholm, Malmöhus, Göteborg and Bohus - had, on the other hand, rapid growth and substantial in-migration. In the rest of the country both tendencies were discernible.

This matrix is computed like the previous 3×3 matrix. For example, the probability that an employed individual in the big cities will become unemployed in the forest counties one quarter later is $E_B U_F / E_B$.

Table 3.1 presents the results of four simulations. In all of these, the distribution in 1980 of individuals across different labour markets is used as a starting point. Presented in the second, third, fourth and fifth columns are the projected distributions for the tenth year following 1980, from simulations based on the transition matrices for 1971, 1974, 1977 and 1980.[1]

Table 3.1 Population (persons 16-64 years of age) in different regions and labour market states. Actual starting values and simulated values ten years later (thousands)

	Starting values (1980)	Ten years later Matrix of 1971	Matrix of 1974	Matrix of 1977	Matrix of 1980
Big cities					
Employed	1,576	1,561	1,539	1,520	1,572
Unemployed	22	35	18	23	24
Not in the labour force	324	505	365	337	319
	1,922	2,101	1,922	1,880	1,915
Forest counties					
Employed	847	772	836	851	854
Unemployed	26	32	21	24	30
Not in the labour force	233	314	271	250	256
	1,106	1,118	1,128	1,125	1,140
Rest of the country					
Employed	1,756	1,448	1,693	1,736	1,701
Unemployed	34	39	24	29	39
Not in the labour force	396	507	443	442	418
	2,186	1,994	2,160	2,207	2,158

[1] The four transition matrices are available in the appendix.

The matrices are influenced by cyclical as well as trend changes in the labour market. This makes the simulations sensitive to both types of change. For example, using the matrix of 1974 (a year with good business conditions) results in lower unemployment and less individuals outside the labour force than the 1971 matrix. On the other hand, using the matrix from 1980 (also a year with good business conditions) results in an increase in unemployment.

Of particular interest in this table is the regional development. Total population in the three regions differs a great deal depending on which matrix is used. It is evident that the matrix of 1971 (a year when economic activity was low) implies high rates of migration into the big cities. The highest population in the forest counties is obtained when the 1980 matrix is used. The rest of the country receives its highest population in the simulation based on the matrix from 1977. This indicates substantial changes in the pattern of migration during the 1970's.

Both simulation models used above are based on a simplified view of the labour market. There is no allowance made for changes in the total population or differences in the age structure between regions at the start of the experiments. Even more disturbing is, of course, the fact that there is no interaction between demand and supply in the labour market.

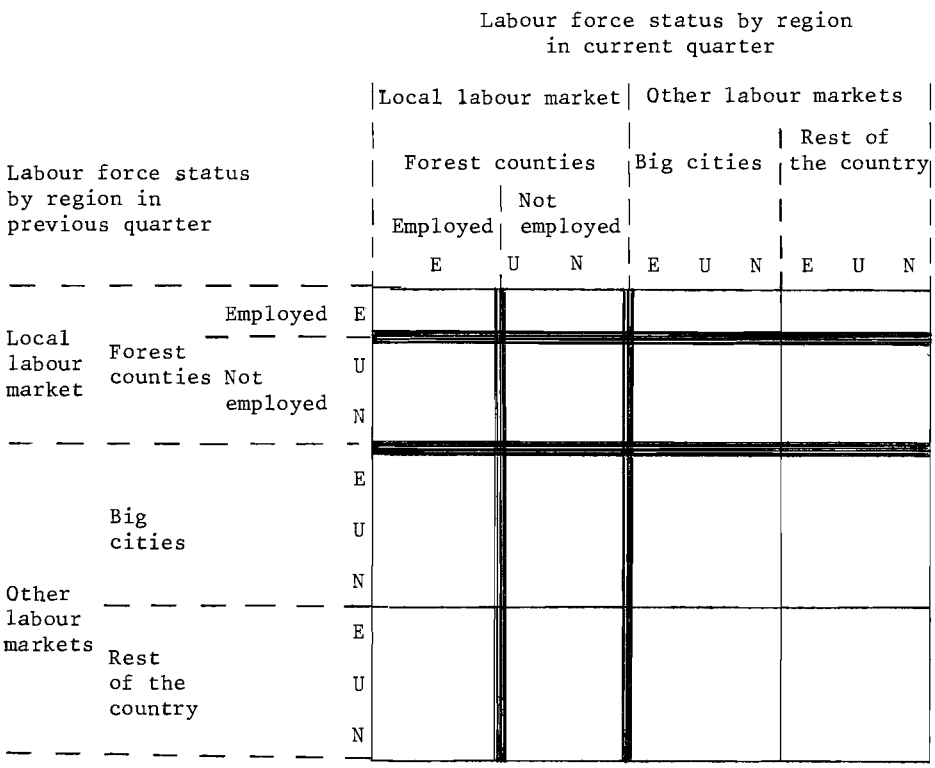
A Model with Variable Probabilities and Three Regions

This simulation model resembles the theoretical model of Section 3.3. It includes functional relationships between the transition probabilities and relative excess demand in regional labour markets. However, in the theoretical model all flow rates were functions of excess demand in the local labour market while the rates of flow within and out of regions in the simulation model depend on labour market conditions in each region.

In a model constructed primarily to study the effects of demand shifts on a relatively small labour market, it seems defensible not to distinguish flows between labour market

states in other labour markets. This implies that there is less need to include, explicitly, a measure of labour market demand in other labour markets. It is, however, conceivable that flows in and out of the local labour market could depend on the labour market conditions in the other labour markets. This possibility was not explicitly treated in the theoretical model.

In the simulation model three regions, big cities, forest counties and the rest of the country, and three labour market states, employed, unemployed and not in the labour force, are included. Having three regions and three labour market states in the model facilitates comparisons with other studies of regional labour market development. In principle it is not difficult to aggregate over regions or states. The following chart demonstrates how the theoretical model and this simulation model differ with respect to aggregation. The full matrix describes the framework used in this simulation model. The states included in the theoretical model are separated by heavy lines.



Using the same mechanism to model flow rates in this simulation model as in the theoretical model would imply that flows within as well as between three labour markets were all functions of labour market demand in only one of the regions. This is obviously unreasonable. Therefore, in this context the rates of flow within each region, as well as out of each region, will be functions of labour market demand in the relevant regions.

The distribution of workers over regions and labour market states in 1980 will be the starting point. Figures on employment (E), unemployment (U) and total population (L) in each region are available. Unemployment and total population in each region can be directly "plugged" into the relative excess demand measures $\left(\frac{V-U}{L}\right)$. The number of vacancies (V) is computed as the exogenously given number of work places (W) minus the number of employed (E) (see expression (3.7)). The excess demand measures thereby obtained are entered, region by region, into the functional relationships between the transition probabilities and the excess demand measures.

To guarantee that $0 \leq P \leq 1$, the relationships between the transition probabilities and the excess demand measure (expressions (3.4) and (3.5)) have been estimated on a logit transform of the dependent variable;

$$(3.21) \qquad \log\left(\frac{P}{1-P}\right) = \alpha + \beta\left(\frac{V-U}{L}\right)$$

The results from the 81 regressions are presented in the appendix. In most cases, the intercepts and coefficients are far from significant. An obvious reason for this is that each estimate is based on only twelve observations.[1] Consequently the results from the simulations should be interpreted with care.

[1] Transition probabilities are available for three age groups (16-24, 25-54 and 55-64 years) and four years (1971, 1974, 1977 and 1980). For each region the relationship is estimated with twelve observations (age groups × years). The dependent variable, the excess demand measures, does not change between the age groups. This estimation procedure presumes that the relation between the transition flows and excess demand is independent of age.

When the excess demand measures are entered into the estimated relationships a new transition matrix is obtained. The rows in this matrix must sum to unity since *all* individuals in one state must stay or go to another state in the next quarter. To meet this restriction, each of the probabilities obtained is divided by the sum of the probabilities in the respective row.

The new matrix is used to compute the distribution over labour market states after one quarter. On the basis of the resulting figures for U, E and L, new excess demand measures are calculated, using the same procedure as before. The simulation can continue for as many quarters as desired.

The results from three simulations will be commented on. The first will be called the base case. The initial conditions are the distribution over labour market states and the number of vacancies in 1980.[1] The transition matrix of 1980 is used. The exogenously given number of work places is set equal to the number of employed plus the number of vacancies in 1980. No particular policy changes are made.[2]

In the second simulation, the initial number of work places in the forest counties is decreased by 5,000. This would be equivalent to a closure of, say, five to ten pulp and paper mills. The issue is how the numbers of individuals employed, unemployed and not in the labour force in the forest counties and in the other two regions are affected during the following years. The opposite case, an increase in the number of work places with 5,000, is tried in the third simulation.

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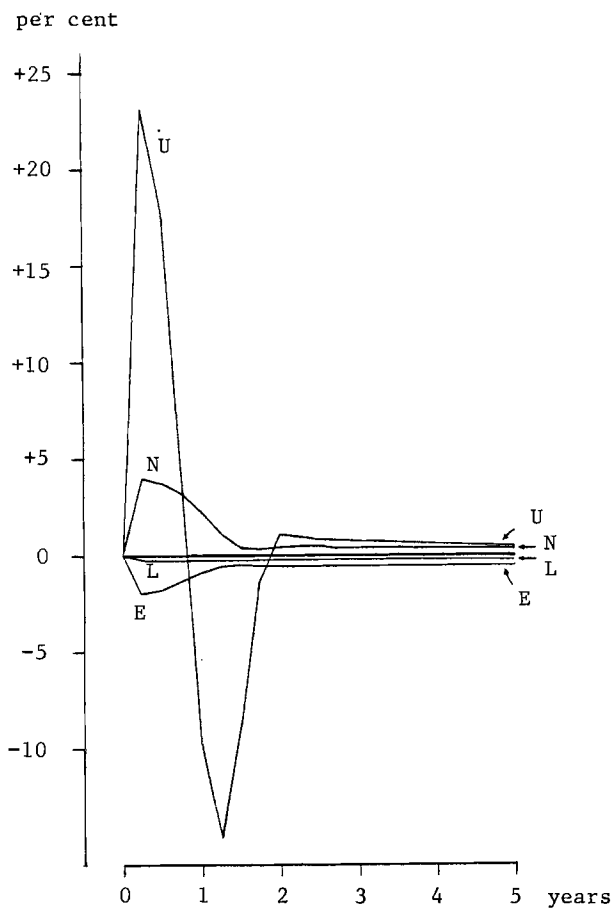
[1] The measure of vacancies used is vacancies registered at the National Labour Market Board at the end of the month, yearly average [National Labour Market Board (1982)].

[2] This case has been simulated for a ten year period. Figures comparable to those obtained with a model where the transition probabilities from 1980 are used unchanged (appearing in the right column of Table 3.1) are then obtained. The main difference appeared in the figures for the unemployed. They were substantially larger in the simulation with fixed transition probabilities. Considering that there was a sharp increase in unemployment in 1980, most likely reflected in the fixed matrix, this is not surprising.

In Figure 3.3 the number of employed (E), unemployed (U) and not in the labour force (N), as well as the total population (L = E+U+N) in the forest counties, computed from the simulation with a decrease in the number of work places is compared with the figures obtained from the base case. The divergences from the base case, expressed as per cent of the respective base case values are plotted for five years (or twenty quarters).

Figure 3.3 Comparison between simulations with a decrease in the number of work places in the forest counties and the base case. Per cent divergence from base case values



Initially, unemployment increases substantially (the first quarter with 23 per cent compared with the base case). This is the effect one would expect on *a priori* grounds. It is also in accordance with the short run effect ($d\dot{U}/dW$) observed in the theoretical model of Section 3.3. However, by the fifth quarter unemployment is lower than in the base case. A divergence as large as this does not seem realistic although plausible mechanisms underlying the result can be found: withdrawal from the labour force and migration out of the region.[1]

After two years the development appears to be relatively stable. The number of individuals unemployed and outside the labour force is slightly higher than before the decrease in the number of work places, while employment and total population in the forest counties have decreased. It thus seems as if $dU^*/dW < 0$. This result could not be ascertained in the theoretical model but it seemed likely, given that the local labour market was relatively large compared to the rest of the country.

Figure 3.4 compares the results of the other policy experiment, an increase in the number of work places, with the base case. On the whole a pattern opposite to that in Figure 3.3 can be observed. The number of unemployed initially deviates substantially from the base case. Within a year unemployment is back at a level which in fact is higher than that of the base case, but soon unemployment decreases again, and for the rest of the five year period it stays at a level one to two per cent lower than that of the base case. Employment as well as total population in the forest counties increases, while the number of individuals outside the labour force decreases.

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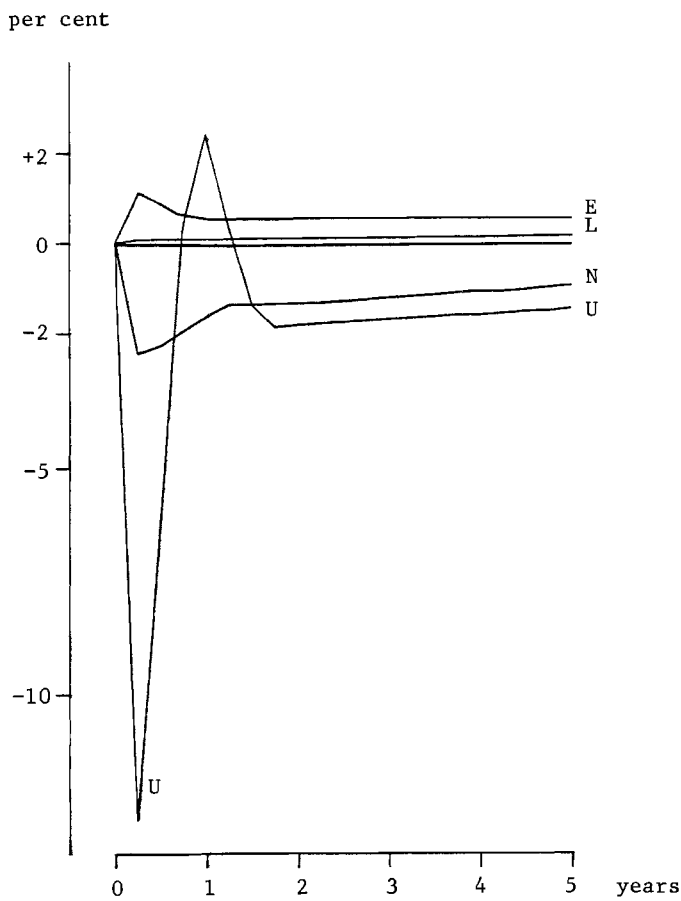
[1] In systems of difference equations marked oscillations of this kind are not uncommon.

Figure 3.4 Comparison between simulations with an increase in the number of work places in the forest counties and the base case. Per cent divergence from base case values



The developments are in all three simulations relatively stable.[1] This is perhaps not surprising, since the number of work places in each region after the exogenous shock is kept constant. Clearly, this is not acceptable for any model used to predict the distribution over labour market states more than a few years after a shift in labour market demand.

[1] This was also true for a simulation based on the distribution on labour market states and the transition matrix of 1971.

3.5 CONCLUDING COMMENTS

Labour market prospects for individuals laid off have been analyzed in several studies in Sweden and abroad. In this chapter a wider perspective has been taken. What happens to the local labour market as whole? A need for models of this kind exists partially since they are a necessary input in cost-benefit analyses of policy alternatives in cases of plant closure.

A model with three regions, the big cities, the forest counties and the rest of the country, and three labour market states, employed, unemployed and not in the labour force, was simulated. In this model flows within and out of each region are functions of labour market conditions in the respective regions.

Three cases based on actual figures for labour market flows during the seventies and the labour market demand levels in the three regions in 1980 were studied. In one case, the base case, demand was that of 1980. In the other two cases, the number of jobs in the forest counties (the local labour market) was increased and decreased by 5,000. The results from these exercises appeared reasonable. A decrease in the number of jobs after a few years led to higher withdrawals and unemployment. Similarly, the number of employed has gone down and migration out of the regions resulted in a lower population. An increase in the number of jobs, on the other hand, leads to a larger population in the forest counties and to higher employment. The number of individuals unemployed, as well as outside the labour force, has gone down.

The simulation model developed ought to be improved before it is used for the analysis of different alternatives in situations when big plants are on the verge of closing down. The definition of the local labour market in the simulations, the forest counties, is too wide. What is needed for a meaningful analysis of the effects of the closure of a plant is data from a much smaller region, perhaps a municipality. To find data for

the estimation of relations between flow rates in the labour market and demand for labour on a level that disaggregated is not possible. However, one could select all municipalities which, according to some criteria, have declining industry, and estimate the relations on this group.[1]

Theoretically, the most important improvement would be to include some mechanism whereby changes in consumer demand are allowed to affect the local demand for labour. One would also want to have wages which were allowed to adjust when labour market demand decreases or some other framework where firms are stimulated to move into a region where there is excess supply of labour.

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[1] A selection of this kind including 70 municipalities was made for 1980. It demonstrated a flow pattern which was quite different from that of the forest counties. Among other things out-migration was much more rapid.

Table A.3.1 Transition probabilities and standard errors[1] *(within parentheses) 1971*

	Big cities			Forest counties			Rest of the country		
	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed
Big cities									
Not in the labour force	0.8409 (0.0034)	0.1284 (0.0031)	0.0185 (0.0013)	0.0025 (0.0005)	0.0011 (0.0003)	0.0002 (0.0001)	0.0061 (0.0007)	0.0020 (0.0004)	0.0002 (0.0001)
Employed	0.0423 (0.0011)	0.9397 (0.0013)	0.0104 (0.0005)	0.0003 (0.0001)	0.0014 (0.0002)	0.0001 (0.0001)	0.0007 (0.0001)	0.0048 (0.0004)	0.0002 (0.0001)
Unemployed	0.2397 (0.0159)	0.4975 (0.0186)	0.2505 (0.0161)	0.0004 (0.0007)	0.0004 (0.0007)	0.0004 (0.0007)	0.0036 (0.0022)	0.0073 (0.0032)	0.0004 (0.0007)
Forest counties									
Not in the labour force	0.0022 (0.0005)	0.0019 (0.0005)	0.0000 (0.0001)	0.8519 (0.0039)	0.1161 (0.0035)	0.0216 (0.0016)	0.0038 (0.0007)	0.0019 (0.0005)	0.0006 (0.0003)
Employed	0.0009 (0.0002)	0.0021 (0.0003)	0.0000 (0.0000)	0.0485 (0.0015)	0.9277 (0.0018)	0.0172 (0.0009)	0.0007 (0.0002)	0.0025 (0.0004)	0.0003 (0.0001)
Unemployed	0.0004 (0.0007)	0.0075 (0.0033)	0.0004 (0.0007)	0.1871 (0.0147)	0.4454 (0.0188)	0.3406 (0.0179)	0.0037 (0.0023)	0.0112 (0.0040)	0.0037 (0.0023)
Rest of the country									
Not in the labour force	0.0076 (0.0007)	0.0026 (0.0004)	0.0004 (0.0002)	0.0025 (0.0004)	0.0012 (0.0003)	0.0004 (0.0002)	0.8486 (0.0029)	0.1178 (0.0026)	0.0190 (0.0011)
Employed	0.0009 (0.0001)	0.0068 (0.0004)	0.0001 (0.0001)	0.0001 (0.0001)	0.0012 (0.0002)	0.0001 (0.0000)	0.0433 (0.0010)	0.9360 (0.0012)	0.0115 (0.0005)
Unemployed	0.0050 (0.0022)	0.0150 (0.0038)	0.0025 (0.0015)	0.0025 (0.0015)	0.0075 (0.0027)	0.0025 (0.0015)	0.1830 (0.0119)	0.4887 (0.0154)	0.2932 (0.0141)

1) The standard errors are computed as $\sqrt{\frac{p(1-p)}{n}}$ where p is the probability given in the tables and n is the number of observations that each row is based on.

Table A.3.2 Transition probabilities and standard errors[1] (within parentheses) 1974

	Big cities			Forest counties			Rest of the country		
	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed
Big cities									
Not in the labour force	0.8436 (0.0034)	0.1307 (0.0031)	0.0142 (0.0011)	0.0018 (0.0004)	0.0008 (0.0003)	0.0000 (0.0000)	0.0066 (0.0008)	0.0020 (0.0004)	0.0003 (0.0001)
Employed	0.0325 (0.0009)	0.9560 (0.0010)	0.0053 (0.0004)	0.0001 (0.0000)	0.0014 (0.0002)	0.0001 (0.0001)	0.0004 (0.0001)	0.0041 (0.0003)	0.0001 (0.0001)
Unemployed	0.1908 (0.0153)	0.5501 (0.0194)	0.2440 (0.0168)	0.0004 (0.0008)	0.0089 (0.0037)	0.0004 (0.0008)	0.0004 (0.0008)	0.0004 (0.0008)	0.0044 (0.0026)
Forest counties									
Not in the labour force	0.0014 (0.0004)	0.0010 (0.0004)	0.0000 (0.0001)	0.8623 (0.0038)	0.1131 (0.0035)	0.0180 (0.0014)	0.0031 (0.0006)	0.0010 (0.0004)	0.0000 (0.0001)
Employed	0.0003 (0.0001)	0.0019 (0.0003)	0.0001 (0.0001)	0.0389 (0.0013)	0.9455 (0.0015)	0.0105 (0.0007)	0.0005 (0.0002)	0.0022 (0.0003)	0.0001 (0.0001)
Unemployed	0.0004 (0.0007)	0.0199 (0.0052)	0.0004 (0.0007)	0.1393 (0.0128)	0.4895 (0.0185)	0.3422 (0.0175)	0.0040 (0.0023)	0.0040 (0.0023)	0.0004 (0.0007)
Rest of the country									
Not in the labour force	0.0047 (0.0006)	0.0018 (0.0003)	0.0002 (0.0001)	0.0022 (0.0004)	0.0010 (0.0003)	0.0002 (0.0001)	0.8511 (0.0029)	0.1242 (0.0027)	0.0146 (0.0010)
Employed	0.0005 (0.0001)	0.0038 (0.0003)	0.0002 (0.0001)	0.0001 (0.0001)	0.0011 (0.0002)	0.0001 (0.0000)	0.0337 (0.0008)	0.9545 (0.0010)	0.0061 (0.0004)
Unemployed	0.0037 (0.0021)	0.0147 (0.0043)	0.0004 (0.0007)	0.0004 (0.0007)	0.0037 (0.0021)	0.0004 (0.0007)	0.1873 (0.0139)	0.5031 (0.0178)	0.2864 (0.0161)

1) The standard errors are computed as $\sqrt{\frac{p(1-p)}{n}}$ where p is the probability given in the tables and n is the number of observations that each row is based on.

Table A.3.3 Transition probabilities and standard errors[1] (within parentheses) 1977

	Big cities			Forest counties			Rest of the country		
	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed
Big cities									
Not in the labour force	0.8484 (0.0031)	0.1228 (0.0028)	0.0201 (0.0012)	0.0011 (0.0003)	0.0008 (0.0002)	0.0000 (0.0000)	0.0052 (0.0006)	0.0016 (0.0003)	0.0000 (0.0000)
Employed	0.0286 (0.0007)	0.9612 (0.0008)	0.0051 (0.0003)	0.0003 (0.0001)	0.0011 (0.0001)	0.0001 (0.0000)	0.0005 (0.0001)	0.0031 (0.0002)	0.0001 (0.0000)
Unemployed	0.2016 (0.0145)	0.4277 (0.0179)	0.3589 (0.0174)	0.0005 (0.0008)	0.0049 (0.0025)	0.0005 (0.0008)	0.0005 (0.0008)	0.0049 (0.0025)	0.0005 (0.0008)
Forest counties									
Not in the labour force	0.0015 (0.0004)	0.0008 (0.0003)	0.0000 (0.0001)	0.8671 (0.0034)	0.1056 (0.0031)	0.0211 (0.0015)	0.0031 (0.0006)	0.0008 (0.0003)	0.0000 (0.0001)
Employed	0.0001 (0.0001)	0.0020 (0.0003)	0.0000 (0.0000)	0.0318 (0.0010)	0.9535 (0.0012)	0.0109 (0.0006)	0.0002 (0.0001)	0.0014 (0.0002)	0.0001 (0.0001)
Unemployed	0.0005 (0.0007)	0.0045 (0.0023)	0.0005 (0.0007)	0.1987 (0.0139)	0.4065 (0.0171)	0.3839 (0.0169)	0.0005 (0.0007)	0.0045 (0.0023)	0.0005 (0.0007)
Rest of the country									
Not in the labour force	0.0032 (0.0004)	0.0014 (0.0003)	0.0000 (0.0000)	0.0011 (0.0003)	0.0002 (0.0001)	0.0000 (0.0000)	0.8661 (0.0027)	0.1123 (0.0025)	0.0156 (0.0010)
Employed	0.0005 (0.0001)	0.0024 (0.0002)	0.0001 (0.0000)	0.0001 (0.0000)	0.0009 (0.0001)	0.0001 (0.0000)	0.0286 (0.0007)	0.9604 (0.0008)	0.0070 (0.0003)
Unemployed	0.0004 (0.0006)	0.0073 (0.0027)	0.0036 (0.0019)	0.0004 (0.0006)	0.0004 (0.0006)	0.0004 (0.0006)	0.2077 (0.0126)	0.4337 (0.0155)	0.3462 (0.0148)

1) The standard errors are computed as $\sqrt{\frac{p(1-p)}{n}}$ where p is the probability given in the tables and n is the number of observations that each row is based on.

Table A.3.4 Transition probabilities and standard errors[1] (within parentheses) 1980

	Big cities			Forest counties			Rest of the country		
	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed
Big cities									
Not in the labour force	0.8457 (0.0037)	0.1268 (0.0034)	0.0204 (0.0015)	0.0015 (0.0004)	0.0006 (0.0003)	0.0000 (0.0001)	0.0031 (0.006)	0.0015 (0.0004)	0.0003 (0.0002)
Employed	0.0277 (0.0008)	0.9627 (0.0009)	0.0056 (0.0004)	0.0001 (0.0001)	0.0008 (0.0001)	0.0002 (0.0001)	0.0004 (0.0001)	0.0023 (0.0002)	0.0001 (0.0000)
Unemployed	0.1687 (0.0148)	0.4697 (0.0198)	0.3420 (0.0188)	0.0005 (0.0008)	0.0046 (0.0027)	0.0005 (0.0008)	0.0005 (0.0008)	0.0091 (0.0038)	0.0046 (0.0027)
Forest counties									
Not in the labour force	0.0004 (0.0003)	0.0004 (0.0003)	0.0000 (0.0001)	0.8776 (0.0040)	0.1013 (0.0037)	0.0180 (0.0016)	0.0013 (0.0004)	0.0009 (0.0004)	0.0000 (0.0001)
Employed	0.0001 (0.0001)	0.0017 (0.0003)	0.0000 (0.0000)	0.0289 (0.0011)	0.9524 (0.0014)	0.0151 (0.0008)	0.0002 (0.0001)	0.0015 (0.0002)	0.0000 (0.0000)
Unemployed	0.0004 (0.0007)	0.0039 (0.0023)	0.0004 (0.0007)	0.1858 (0.0142)	0.4063 (0.0179)	0.3986 (0.0179)	0.0004 (0.0007)	0.0039 (0.0023)	0.0004 (0.0007)
Rest of the country									
Not in the labour force	0.0018 (0.0004)	0.0015 (0.0004)	0.0003 (0.0001)	0.0013 (0.0003)	0.0005 (0.0002)	0.0000 (0.0000)	0.8618 (0.0032)	0.1096 (0.0029)	0.0232 (0.0014)
Employed	0.0003 (0.0001)	0.0025 (0.0002)	0.0002 (0.0001)	0.0000 (0.0000)	0.0007 (0.0001)	0.0001 (0.0000)	0.0287 (0.0007)	0.9599 (0.0009)	0.0076 (0.0004)
Unemployed	0.0030 (0.0017)	0.0060 (0.0025)	0.0003 (0.0006)	0.0003 (0.0006)	0.0030 (0.0017)	0.0003 (0.0006)	0.1670 (0.0119)	0.4086 (0.0157)	0.4116 (0.0158)

1) The standard errors are computed as $\sqrt{\frac{p(1-p)}{n}}$ where p is the probability given in the tables and n is the number of observations that each row is based on.

Table A.3.5 The effect of excess demand in three regions on transition probabilities between the regions and three labour market states. Intercepts and standard errors (within parentheses).

Intercepts	Big cities			Forest counties			Rest of the country		
	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed
Big cities									
Not in the labour force	1.9823 (0.4573)	-2.2160 (0.4508)	-4.3286 (0.4492)	-6.6853 (0.2273)	-7.8024 (0.5674)	-9.2806 (0.0958)	-5.5770 (0.3073)	-6.7099 (0.6366)	-8.7223 (0.4929)
Employed	-3.4419 (0.3469)	3.1720 (0.3237)	-5.4331 (0.3723)	-9.6261 (0.6717)	-6.8398 (0.5129)	-9.1673 (0.5422)	-8.1063 (0.5880)	-6.1889 (0.3498)	-9.3033 (0.4607)
Unemployed	-1.4984 (0.1430)	-0.4029 (0.2756)	-0.5418 (0.2826)	-6.2919 (0.3500)	-6.0011 (0.4137)	-6.4844 (0.4169)	-6.1931 (0.4504)	-5.5421 (0.4610)	-6.0008 (0.4375)
Forest counties									
Not in the labour force	-12.1599 (3.5717)	-11.1028 (4.1565)	-8.8979 (0.1034)	2.9827 (2.3679)	-3.0467 (2.1836)	-5.1993 (2.6763)	-8.3223 (2.8711)	-8.6293 (3.9855)	-9.4346 (2.5190)
Employed	-17.2067 (3.2254)	-8.5926 (3.5880)	-9.4316 (1.8882)	-4.5714 (1.7299)	4.1075 (1.6192)	-5.4726 (1.4737)	-9.8624 (3.1265)	-6.4732 (3.9420)	-11.9637 (2.5935)
Unemployed	-6.0063 (1.2946)	-4.9964 (3.2883)	-4.6229 (1.9664)	-1.5649 (0.8419)	-1.3539 (0.8804)	-0.7489 (1.1348)	-10.4584 (2.0270)	-9.8499 (2.5941)	-8.5460 (1.6068)
Rest of the country									
Not in the labour force	-6.2134 (0.5645)	-7.2293 (0.8781)	-8.5658 (0.7223)	-6.7161 (0.4178)	-8.0107 (0.8278)	-9.1146 (0.5986)	2.0308 (0.5170)	-2.2308 (0.4882)	-4.3985 (0.5561)
Employed	-7.0667 (1.0781)	-6.9093 (0.9089)	-8.6437 (0.5525)	-10.3448 (0.6083)	-7.6699 (0.9403)	-10.5295 (0.6519)	-3.7763 (0.7671)	3.4378 (0.5427)	-5.2442 (0.3725)
Unemployed	-6.5301 (0.5982)	-5.0863 (0.5394)	-6.0827 (0.5659)	-6.9077 (0.4126)	-6.5303 (0.6026)	-6.9077 (0.4126)	-1.4671 (0.1355)	-0.5176 (0.3533)	-0.3933 (0.3586)

Table A.3.6 The effect of excess demand in three regions on transition probabilities between the regions and three labour market states. Coefficients and standard errors (within parentheses).

Coefficients	Big cities			Forest counties			Rest of the country		
	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed	Not in the labour force	Employed	Unemployed
Big cities									
Not in the labour force	14.1990 (119.9200)	-12.9699 (118.2091)	-16.9843 (117.7946)	-63.9641 (59.6104)	-111.6072 (148.7746)	41.8726 (25.1329)	-47.7296 (80.5700)	45.3489 (166.9426)	35.9818 (129.2551)
Employed	-70.2288 (90.9694)	80.3998 (84.8795)	-119.6616 (97.6297)	-333.9305 (176.1255)	87.7085 (134.4922)	97.8275 (142.1697)	-99.6748 (154.1807)	-94.4597 (91.7277)	-62.5375 (120.8111)
Unemployed	-24.4463 (37.4990)	-40.2207 (72.2754)	48.5519 (74.1171)	47.6227 (91.7775)	80.6159 (108.4751)	-81.8345 (109.3097)	-48.6602 (118.1016)	-24.1160 (120.8748)	80.6459 (114.7121)
Forest counties									
Not in the labour force	-315.7319 (221.2926)	-203.5508 (257.5280)	13.7803 (6.4070)	58.7865 (146.7101)	-48.2954 (135.2942)	-61.6640 (165.8161)	-132.2453 (177.8903)	-74.0956 (246.9348)	-45.7799 (156.0741)
Employed	-540.5058 (199.8388)	-117.6445 (222.3064)	19.0007 (116.9860)	-93.2361 (107.1794)	90.0353 (100.3253)	-81.7818 (91.3074)	-102.5469 (193.7089)	28.9734 (244.2363)	-150.9859 (160.6879)
Unemployed	37.5790 (80.2130)	29.4999 (203.7376)	111.8797 (121.8331)	5.1616 (52.1638)	-63.0148 (54.5485)	73.7002 (70.3087)	-276.3012 (125.5862)	-254.0239 (160.7224)	-132.9167 (99.5531)
Rest of the country									
Not in the labour force	-77.3462 (87.1724)	-64.8025 (135.6077)	40.1713 (111.5451)	-23.1206 (64.5116)	-43.0030 (127.8287)	-45.3740 (92.4412)	12.5465 (79.8340)	-6.6323 (75.3931)	-21.8393 (85.8832)
Employed	53.7917 (166.4859)	-138.9353 (140.3576)	93.2805 (85.3137)	-122.2689 (93.9362)	-3.2040 (145.2051)	-110.6313 (100.6682)	-60.5925 (118.4660)	129.7368 (83.8109)	-81.9540 (57.5290)
Unemployed	-95.6295 (92.3816)	-16.7295 (83.3004)	29.6044 (87.3838)	-49.3244 (63.7161)	-95.6587 (93.0615)	-49.3244 (63.7161)	10.2455 (20.9253)	-26.8350 (54.5637)	20.4881 (55.3843)

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4. The Effect of Duration on Labour Market Transitions

4.1 INTRODUCTION

This study and the two that follow are primarily concerned with the future labour market prospects of unemployed individuals. The studies cover different aspects of this problem and are based on different data.

The focus in this chapter is on the effects of duration on the probabilities of remaining unemployed, becoming employed or leaving the labour force. In studies based on aggregate data it has been noted that the probability of leaving unemployment is a declining function of the length of the current spell of unemployment. Aggregate figures computed by Björklund from the Labour Force Surveys indicate that this relation holds in the case of Sweden.

Table 4.1 Relation between unemployment duration and the probability of leaving unemployment

	Probability per week of leaving unemployment			
	1979	1980	1981	1982
Unemployed 1-4 weeks	0.13	0.12	0.09	0.08
Unemployed 14-26 weeks	0.07	0.07	0.08	0.07
Unemployed 27-39 weeks	0.01	0.01	0.02	0.02

Source: Björklund (1983).

This finding is open to two interpretations.[1] According to the first the relation between time in unemployment and the probability of leaving unemployment is essentially spurious. It simply reflects the level of aggregation of the data. To illustrate this phenomenon assume that the only important characteristic differentiating unemployed workers is education. Educated workers looking for a job tend to find one faster due to relatively better job opportunities. Consequently, at any specific time the educated unemployed will tend to have low duration of unemployment and high probability of leaving unemployment compared to unemployed with less education. Aggregating across groups with different educational backgrounds will then generate the observed relationship between unemployment duration and the probability of leaving unemployment.

According to the second interpretation there is, in fact, a causal link between duration and the probability of leaving unemployment. A causal relation of this kind can be explained by supply side factors. Prolonged periods of unemployment may result in depression leading to mental and/or physical illness. Attitudes might also change, for example making the unemployed indifferent toward work. In addition, unemployed may become discouraged by their lack of success in finding work and search less intensively.[2]

On the demand side,other reasons for the negative relationship between duration and the probability of leaving unemployment can be found. Employers may regard a long period of unemployment as an indication of the individual's capability. Hiring standards might in that case discriminate against unemployed with long durations.

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[1] See for example Heckman and Borjas (1980).

[2] McGregor (1978) gives a few references to studies of this kind of effects from unemployment from Great Britain and the U.S. while some Swedish studies are surveyed by Björklund (1983).

It is extremely difficult to empirically distinguish the first cause of the observed duration pattern, referred to as heterogeneity in the statistical literature, from the second, which could be called true time dependence.[1,2] Consequently, the ambitions in this study will be somewhat lower. The aim is to investigate whether individuals with long spells of unemployment appear to have lower re-employment probabilities, after correcting for the influence of some relevant variables available in the Labour Force Surveys. In addition, the effect of duration on the probability of leaving the labour force will be discussed.

It is not difficult to motivate a study of the effects of duration. If the latter interpretation is supported, and true time dependence is found to exist, labour market programs to get recently unemployed back to work at once could be motivated. If, on the other hand, the observed durational pattern is a consequence of different re-employment probabilities depending on skill levels,

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[1] For a discussion of this problem see Nickell (1979).

[2] Heckman and Singer (1982) discuss various procedures which have been used to test for state dependence. They argue that these methods can result in false conclusions primarily because they rely on arbitrary assumptions regarding the structural probability distribution describing the effect of various independent variables on the probability of re-employment. Using a continuous time framework they suggest two alternative methods. One of these is tested by Trussel and Richards (1983), who nevertheless question the viability of the approach.

The other method uses raw duration data and a minimal set of assumptions to infer qualitative features of the underlying structural distribution. No arbitrary parametric assumptions are necessary in this case. The main drawback with this method is the data required to use it. The data base probably has to be very large in order to provide representation in combinations of re-employment probabilities, various durations and a sufficient set of other independent variables correcting for heterogeneity. One year of the Labour Force Surveys does not provide enough observations.

The econometric techniques suggested by Heckman and Singer appear to be of great interest. It is, however, not yet clear how much one gains by using them. In addition, they are computationally extremely costly. Hence, logit models will be used in this chapter.

then labour market programs should be directed towards training and education.[1]

This study is primarily concerned with the effect of the length of a spell of unemployment on the probability of leaving unemployment.[2] However, it also analyzes how duration in employment and outside the labour force affects the probabilities of remaining in or leaving these states. This question has not been given much attention in the literature, probably because it is of less obvious interest for labour market policy. However, there are theories of quit- and layoff behaviour which rely on duration of employment as one explanatory factor.[3] It could also be of interest from the policy makers' point of view to see how the probabilities of becoming unemployed are affected by time in employment or how time outside the labour force affects the probability of entering the labour force in order to become employed.

The next section includes possible explanations for flows out of the three labour market states. The discussion is based to a large extent on the labour market theories presented in Chapter 1. The empirical analysis in the rest of the chapter uses a sample from the Swedish Labour Force Surveys including all individuals who entered the survey in 1979. In contrast to the two previous chapters, where aggregate flow rates were used, the analysis in this chapter will be based on individual labour

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[1] Wadensjö (1978) has to my knowledge written the only Swedish study of this problem. He uses statistics on individuals registered at the public employment services. The share of individuals who remain searching increases with time registered even after controlling for a set of independent variables such as sex, age, citizenship, education, region, occupation and possible work handicap.

[2] It should perhaps be mentioned for completeness that this is only one of several kinds of possible relationships between the labour market history of an unemployed worker and the probability of leaving unemployment. For example, it is equally possible that total time spent unemployed or the number of unemployment spells is important for the re-employment probability.

[3] References to studies of the determinants of layoffs were given in Chapter 1. Holmlund (1982) includes an analysis of quits, based on Swedish data.

market histories.[1] More detailed information about the sample used is given in Section 4.3.[2]

In Sections 4.4 and 4.5, the effect of duration in the Swedish labour market will be discussed. The results in Section 4.4 indicate that duration is of great importance for transitions out of employment and unemployment as well as into the labour force. This conclusion is somewhat qualified in Section 4.5, where logit analysis is used to study the labour force transitions. The interaction between duration and other individual characteristics as sex, age, marital status, children and education can then be taken account of.

4.2 ANALYTICAL FRAMEWORKS

Some recent theories of labour market behaviour were introduced in Section 1.3. In particular, a search model was presented and some extensions to it discussed. Models that could be used to analyze flows out of employment or into the labour force were also treated briefly.

This section will draw on earlier chapters, especially Chapter 1. Frameworks that can be used to study flows out of the three labour market states unemployed, employed and not in the labour force will be discussed. Particular emphasis will be given to the effect of duration for flows out of the various labour market states.

Flows out of Unemployment

Transition rates from unemployment to employment (P_{ue}) and from unemployment to not in the labour force (P_{un}) have been differentiated in the previous chapters. The first of these, P_{ue}, has been given a great deal of attention in the literature and serves

[1] The analysis in the two preceding chapters relied on Markov assumptions. They imply that time spent in a certain state does not influence the rate of exit from that state. Obviously, this assumption will not be made in this chapter since the intention is, precisely, to study the effect of duration for the rate of escape out of a labour market state.

[2] The Appendix to Chapter 2 gives a brief overview of the Labour Force Surveys.

as the focus of most search models (see, for example, the model in Section 1.3). However, using a search model developed by Burdett (1979 b), it is possible to analyze both the re-employment flow and the flow out of the labour force.

The workers in Burdett's model are assumed to face a labour market similar to that utilized in most studies of job search (see Section 1.3). There are two major differences. First, the workers are assumed to maximize expected life time utility, which is "a function of leisure time and income earned" in each period. Furthermore, a worker can influence the probability of receiving a job offer in each period by sacrificing leisure. The greater the proportion of a period spent looking for a job, the greater the probability that a job offer is received.[1] Finally, workers are assumed to receive unemployment compensation, which expires after a certain time in unemployment.

As in the standard search model in Section 1.3, the unemployed individual chooses a reservation wage that equates the marginal benefits of additional unemployment and the marginal costs, such as foregone earnings. Furthermore, the worker will select a search time in each period such that the marginal utility of leisure equates the marginal expected gain to search time.

In this framework the effect of the length of an unemployment spell on the flows out of unemployment can be studied. It is particularly useful that the unemployed are allowed to substitute time in search for leisure. If one assumes that individuals who rarely search, but spend most of their time on leisure, can be classified as not in the labour force, Burdett's model permits an analysis of individual choice between unemployment (search) and not in the labour force (leisure).[2]

In the standard search model presented in Chapter 1, the reservation wage is constant over successive periods of search.

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[1] The rate of increase in the probability of receiving a job offer declines as the proportion of available time spent on search increases.

[2] The definitions of unemployment and not in the labour force utilized in the empirical analysis are available in Chapter 2.

This is no longer true if unemployment benefits are paid out for a limited period. Burdett demonstrates that both the optimal reservation wage and leisure choice decline continuously during the period when the worker is eligible for unemployment compensation. *Ceteris paribus*, this should imply that P_{ue} increases and P_{un} decreases until the benefits are exhausted. After this point reservation wage and search intensity remain constant.

Since the Swedish system of unemployment benefits resembles that in Burdett's model, it is reasonable to assume that the unemployment compensation system affects P_{ue} in the way suggested. Such is not the case with P_{un}. Since search is a prerequisite for receiving benefits, and the benefits for most individuals are high compared to other sources of non-employment income, withdrawals (P_{un}) can be expected to be constant and low until benefits are exhausted.

In the introductory section some reasons were mentioned why a negative relationship between the length of a spell of unemployment and the probability of leaving unemployment might exist. First, it is possible that health deteriorates with unemployment. This would be expected to have a negative effect on the probability of receiving job offers. This probability might also decrease due to the loss of work skills. In addition, employers might, regardless of whether or not a long spell of unemployment has a negative effect on productivity, treat it as a signal of lower capacity, and discriminate in their hiring standards against those with long durations.[1]

Burdett does not treat the case of changing offer probabilities. One would, however, expect that the primary effect of lower offer probabilities is a decrease in the probability of employment (P_{ue}).[2] This effect could be partially counteracted by a decrease in the reservation wage.

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[1] According to Nickell (1979) it is known, for Britain, that long-term unemployed receive fewer job offers. This is likely to be the case in Sweden as well, but I am unaware of any similar documented evidence.

[2] It might be noted that the factors leading to lower job offer probabilities could equally well shift the wage distribution. Given a certain reservation wage a decrease in the wages offered would lead to lower probabilities of becoming employed.

It is also possible that search activity will be influenced. One could envision a situation where individuals try to compensate lower offer probabilities with more intensive search. Alternatively, the unemployed workers might become discouraged when the offer probabilities decrease and refrain from search. In the latter case more individuals would be classified as not in the labour force.

To summarize this discussion, the probability of re-employment (P_{ue}) is likely to decrease with time, due to lower job offer probabilities. The opposite time pattern can be expected for the probability of withdrawal (P_{un}), primarily because search is less profitable when fewer offers are received. Although the existing compensation scheme might have the effect suggested by Burdett on this pattern, it is not likely to change it in any substantial way.

Flows out of Employment

An individual can leave unemployment for a myriad of different reasons. The literature has given most attention to quits and layoffs.[1] An individual can quit a job and become unemployed due to an interest in finding a better job. A quit may also occur because it is regarded more favourable to be outside the labour force than employed. Layoffs are determined by employers. It can be assumed that they are normally followed by at least a short period of unemployment, withdrawals not occurring immediately.

The flows out of unemployment have been analyzed using search theory. Search models could be used to explain quits as well.[2] However, the present discussion of factors behind the

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[1] Models for quits and layoffs were briefly discussed in Chapters 1 and 3. There it was pointed out that several other reasons for unemployment are given in, for example, the Labour Force Surveys. For many of these it is difficult to ascertain who instigated the job separation, employer or employee.

[2] See Holmlund (1982) for one example and further references.

flows out of employment will to a large extent rely on logical extensions of contract theory.

It is plausible to assume that time in employment results in on-the-job training. Part of the increased productivity is likely to accrue to the workers themselves in the form of higher wages. This should decrease *quits*. But increased work experience can, of course, also result in more job offers and higher wages in alternative work. This factor causes the frequency of quits to increase with time in employment. The relative merits of remaining with the present employer would be likely to more than compensate for the latter effect. In addition, the employer has incentives to establish a contract which makes it profitable for the employee to remain in the firm after having obtained on-the-job training.

The same conclusion - that is, there should be a fall in the quit probability with increasing time in employment - can be drawn from some search models, including Wilde (1979). In his model, a person accepting a job knows little about the non-wage characteristics of the job. During the first period in the new job most knowledge about non-wage characteristics is gained. Hence, quits will be highest.

The relation between *layoffs* and duration should also be briefly discussed. In Chapter 3 layoffs were assumed to occur when the number of employed in a firm is higher than present or forecasted needs. In this situation, a profit maximizing firm wants to keep those with highest productivity. If productivity increases with time in employment, layoffs will decrease with duration.

In addition to these factors the institutional structure plays an important role in the expected relationship between time spent in employment and the flow rates out of employment.[1]

[1] The literature on layoffs in the U.S. has focused on the role of the institutional setting for the number of layoffs and the durations of unemployment. See Feldstein (1976).

Seniority rules regulate dismissals and layoffs, hence P_{eu} tends to decrease with duration. On the other hand, during the last few years firms which have had to reduce their number of employees have negotiated settlements with the labour unions, forcing older workers to leave. The argument used by the employers has been that the older workers are eligible for unemployment compensation for a longer period. In addition, disability pensions are more easily available for this group.

The above discussion applies less to time in employment than tenure. However, there is probably a strong correlation between the duration of employment and tenure. Therefore, the direction of the effect of duration of employment on P_{eu} or P_{en} should not change. Nevertheless, the strength of the arguments presented might be less than if data on tenure had been available.

Finally, it should be observed that returns to search or to being outside the labour force differ a great deal between individuals in various phases of their life. This has an effect on the flows out of employment and might influence the relationship between time spent in employment and the flow rates out of employment. It is sufficient here to suggest that young individuals who have necessarily limited time in employment have relatively more to gain from both search and education.

Flows into the Labour Force

There are two flows into the labour force, one to employment and one to unemployment, but they are hardly motivated by separate decisions. Individuals can be assumed to enter the labour force to obtain jobs. In the end, some are not successful.

Time outside the labour force can increase the probability of employment if it is used for relevant education, but it is equally possible that knowledge deteriorates outside the labour force or that the employers believe this to be the case. It is likely that a relatively large share of the younger entrants have recently completed an educational program. For the older

and prime-age groups the "deterioration or signalling argument" seems more important. For these groups the rate of flow into employment may be assumed to decrease with duration.

4.3 THE DATA

The problem at hand is to study the effects of time in a certain labour market state on the probabilities of being in each state in the following period. The Labour Force Surveys, consisting of employment experiences of a representative sample of the Swedish population, will be used. Data on labour force status has been collected for each individual once every quarter during a period of two years (i.e. eight quarters). Approximately 35,000 individuals enter the Labour Force Surveys each year. The analysis in this chapter will be based on a data set including all those who entered in 1979.

For a study of the effects of time spent in a labour market state on the labour market transitions it is obviously interesting to know as much as possible about the pre-transition work history. The transition analyzed is the one between the seventh and eighth quarters. Thus, each individual can be observed seven quarters before the transition. When it is required that all eight observations are available for each individual, the sample is reduced to 17,531 individuals.[1]

In Section 4.4 the transitions observed are weighted to get figures as representative as possible for the actual population. For this purpose the inverted sampling probabilities used by Statistics Sweden in the regular production of the Labour Force Surveys have been utilized.

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[1] In April 1980 the employees at Statistics Sweden were subject to a lockout by the Swedish Government. No interviews were done that month. This reduced the size of the sample by one third.

4.4 THE EFFECT OF DURATION IN THE SWEDISH LABOUR MARKET

In this section the effect of duration on transitions out of unemployment and employment as well as into the labour force will be studied. The following table shows how the probabilities of transition for employed individuals have been computed for different employment durations.

	Transition probabilities			
Duration in employment	P_{ee}	P_{eu}	P_{en}	$\sum_j P_{ej}$
one quarter	$(EE)_1/E_1$	$(EU)_1/E_1$	$(EN)_1/E_1$	1
four quarters	$(EE)_4/E_4$	$(EU)_4/E_4$	$(EN)_4/E_4$	1
seven quarters	$(EE)_7/E_7$	$(EU)_7/E_7$	$(EN)_7/E_7$	1

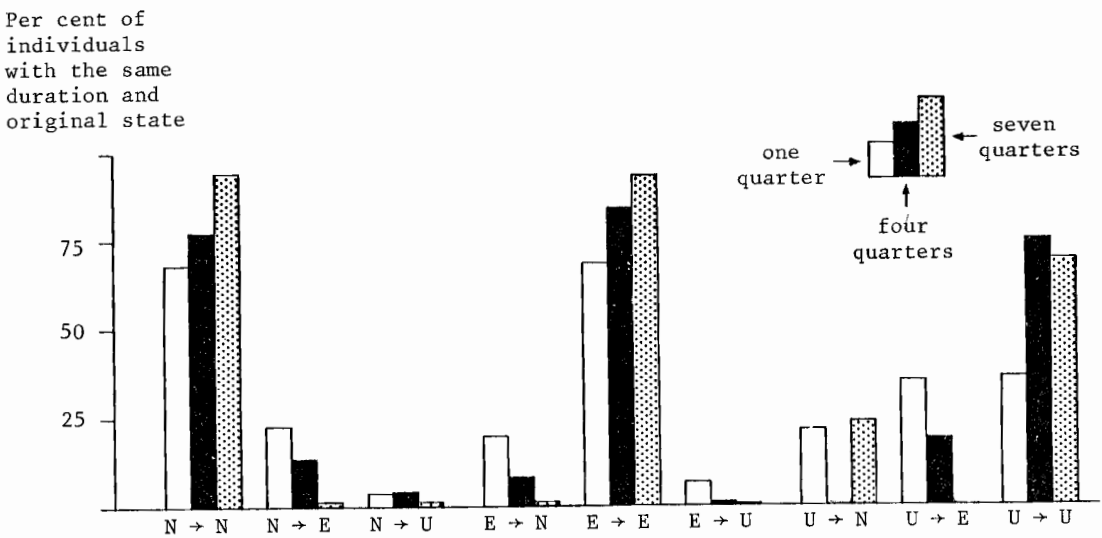
The total number of individuals who have been employed one quarter is E_1, four quarters E_4, etc. Among those employed one quarter $(EU)_1$ individuals have become unemployed by the next quarter. The probability that an individual who has been employed one quarter will become unemployed by the next quarter is $(EU)_1/E_1$. These statistics have been computed for all individuals in the sample and separately by sex and age group. They are presented in Figures 4.1 and 4.2 and in Tables A.4.1 and A.4.2.[1]

The Total Sample

In Figure 4.1 the effect of duration in each state on the probabilities that a person in that state will be in the same or in one of the other states one quarter later is shown. The pattern is striking. The probability of staying in a state increases with time in the respective state (with the exception of unemployed between the fourth and seventh quarters).

[1] The hypothesis that the observed transition probabilities are independent of duration is tested on the 3×3 tables presented in Tables A.4.1 and A.4.2. For this test Pearson's coefficient of mean square contingency has been used [Bishop, Feinberg and Holland (1975)]. This is a test of the effect of duration on the transition probabilities, not relying on arbitrary assumptions of the kind questioned by Heckman and Singer (1982) (see note 2 on page 115). A major drawback with this test is that it requires observations in each of the cells in the table to which it is applied.

Figure 4.1 The effect of duration on transitions into the labour force and out of employment and unemployment[1)]



1) After four quarters no U→N and after seven quarters no U→E transitions were recorded.

The share of the *unemployed* getting a new job decreases substantially with the time in unemployment. The share of the unemployed staying unemployed increases between one and four quarters. Among those unemployed seven quarters or more, a slight fall in the probability of continued unemployment can be noted. The mirror image of this appears to be increased withdrawal.

The tendency to stay outside the labour force or employed is strong regardless of duration, but it clearly increases with time in the state. For those *employed* the probability of withdrawal and unemployment is much lower after both four and seven quarters.

Among those *not in the labour force*, there is a strong fall in the probability of becoming employed as the quarters spent out of the labour force increase. A small share enters the labour force for unemployment after one quarter. This proportion rises somewhat after four quarters, but after seven quarters the figure is very low.

Disaggregation by Sex and Age

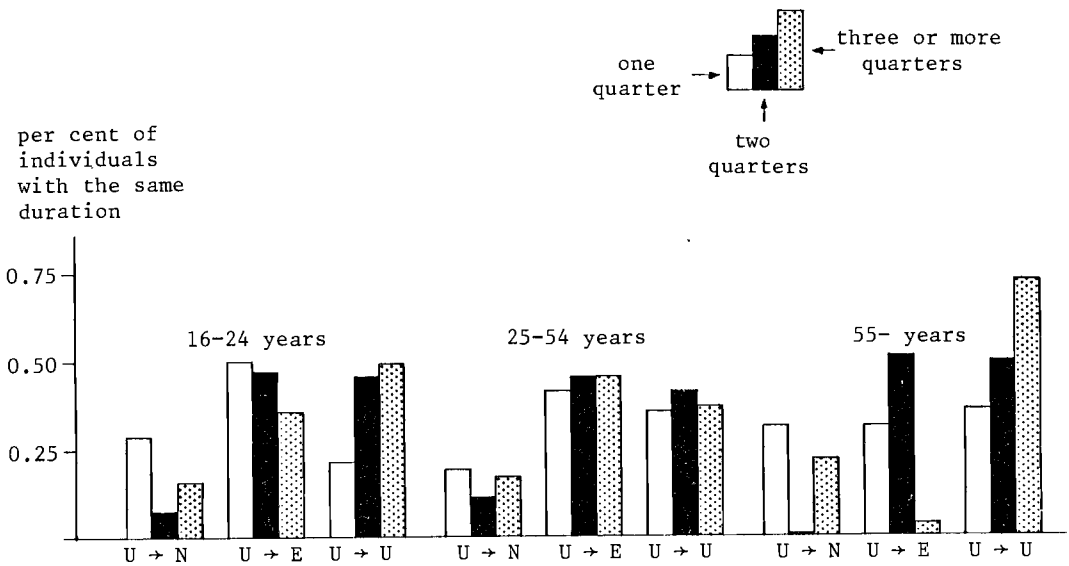
To see whether the pattern observed for the total sample will remain after correcting for age and sex, the relationship between time spent in the various labour market states and the transitions of men and women and three different age groups (16-24 years, 25-54 years and 55 years or older) will be demonstrated in the following.

Table A.4.1 gives the duration related patterns separately for *men and women*. On the whole, the transitions of men and women seem to be similar. One minor difference is worth mentioning. Although more women are outside the labour force, the tendency among those outside to remain there is higher for men. This is true regardless of duration, but the difference is larger when the probabilities for those with short durations are compared.

In Table A.4.2 it is shown how time spent in the three labour market states affects labour market transitions for various *age groups*.

The transitions out of *unemployment* are of particular interest. In Figure 4.2 the transition probabilities are shown for three age groups. For the prime-age group the probability of staying unemployed does not seem to be dependent on duration. For youth and older workers the situation is different: The probability of staying unemployed appears to increase with duration. Compared to older workers, the young long-term unemployed have high probabilities of employment, while the probability of withdrawal is relatively high for those older workers who have been unemployed more than two quarters.

Figure 4.2 The effect of duration on transitions out of unemployment. Different age categories 1)2)



1) After two quarters no U→N transitions were recorded for those 55 years or older.

2) Few individuals were observed as unemployed for four or seven quarters. Thus, the lengths of unemployment spells studied in this figure are one, two and three or more quarters. In addition, all transitions in the data base out of unemployment preceded by three quarters for which labour force status is observed are used.

Judging from Table A.4.2 the duration-transition pattern for those *employed* is less dependent on age. Regardless of age group the probability of staying employed increases substantially with duration, although this tendency is more marked for youth and older workers.

The observed labour market behaviour of young individuals *not in the labour force* appears to be relatively less dependent on duration. For the prime-age group the duration pattern is more pronounced. A longer time outside the labour force seems to imply a substantial decrease in employment opportunities. The labour market prospects for an older individual seem to

deteriorate rapidly after only one quarter not in the labour force. Few older individuals reenter after four or seven quarters or more outside the labour force.

4.5 IS DURATION REALLY IMPORTANT?

Section 4.4 leaves the impression that time spent in a labour market state is important for flows out of that state. The purpose of this section is to see if this conclusion holds when other independent variables are included in the analysis, together with duration. The discussion will be based on estimated multinomial logit models.

The Models

The probability that an individual in labour market state i will move to labour market state j is

$$P_{ij} = f_{ij}(z) \; ; \quad i,j = n, e \text{ and } u, \tag{4.1}$$

where z is a vector of characteristics of individuals (including duration). To ensure that $\sum_j P_{ij} = 1$ and $0 \leq P_{ij} \leq 1$, the multinomial logit model

$$P_{ij} = \frac{e^{\beta_{ij}z}}{\sum_{k=1}^{k} e^{\beta_{ik}z}} \tag{4.2}$$

will be used, where i, j and k can take on the values n, e and u.[1,2] The $\beta_{ij}z$:s can be interpreted as values of an index of the propensity to move to one of the three labour market states given an original state.

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[1] See Amemiya (1981) for a survey of qualitative response models.

[2] The program used for the estimations in this and the following chapters is QUAIL [Berkman and Brownstone (1979)].

In the models presented dummy variables are included measuring whether the individual has been in the original state for a certain number of quarters. Several variables are entered to control for heterogeneity.[1] One of these variables is *sex*, which has obvious relevance for the labour market behaviour. It will be entered additively and squared, since there are reasons to believe that the probability of becoming unemployed is relatively high for both youth and older workers. Traditionally, *marital status* has been particularly important for the labour market behaviour of women. Hence it has, along with a dummy variable for *children*, been included in the estimations.[2]

The demand for labour can affect labour market transitions in various ways. An index of *aggregate demand*, from the quarter when the transition took place, will be entered in the equations.[3] Moreover, a measure of relative excess demand in the different counties, from July 1980 to June 1981, will be included to account for *regional demand* differences.[4]

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[1] Some variables like membership in unemployment compensation funds, search method and occupational category are not available in this particular sample from the Labour Force Surveys. In principle they are available, and in Chapter 5 based on another sample they will be included in some of the estimations.

[2] Marital status is a dummy variable with two alternatives; married or not married. The latter group includes formerly married and cohabitating couples.

[3] The index is a weighted combination of per cent of firms having full capacity utilization and per cent of firms lacking skilled workers and technicians [National Economic Research Institute (1980 and 1981)].

[4] The excess demand measure is the difference between vacancies at the end of the month and the number of unemployed in the county. This difference is divided by the number of individuals in the labour force of the county. The number of unemployed and individuals in the labour force has been taken from Statistics Sweden (1980 and 1981). The vacancies registered at the end of the month come from National Labour Market Board (1981). The latter figures have been corrected to take the introduction of compulsory registration of vacancies into account. In each county, the figures from the months before compulsory registration have been increased by 30 per cent. See National Labour Market Board (1978 and 1979) for further information about the effect of compulsory registration on the number of vacancies.

Education is a variable of obvious interest. Three educational levels (9 years and less, 10-12 years, and 13 years or more) will be entered as dummy variables in the models estimated in this section.

Finally, *original employment sector* will be included among the control variables. The individuals will be divided into five sectors: agriculture, industry, construction, private services and public services.[1]

Judging from earlier studies in this field, and taking account of the limits set by this sample from the Labour Force Surveys, these are the variables which would be meaningful to include to control for important differences between individuals in the sample. However, it is certainly not difficult to think of additional variables one would want to use in a complete model. Incomes in the respective states would seem to be a natural candidate. Sociological studies have stressed the importance of factors such as motivation for labour market behaviour.

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[1] The five sectors used in the analysis are made up from a more disaggregated classification scheme (SNR). These are the sector codes used: Agriculture: 1100 and 1200. Industry: 3111 to 3900. Construction: 5010 and 5020. Private services: 6100 to 6300, 7113 to 7190, 8100, 8310 and 8320, 9410, 9511 to 9999. Public services: 4000, 7111 and 7112, 7200, 8200, 9101 to 9350 and 9420.

Flows out of Unemployment

Table A.4.3 presents the results from two logit models explaining the flows out of unemployment.[1,2] There are minor differences between the models. In the first, sectoral background is not included as a control variable while in the second model the original sector is among the explanatory variables but education has been removed.[3]

---

[1] Three more models were estimated to study flows out of unemployment. Separate estimations for men and women were made with the first model in Table A.4.3. In addition, the first model with one alteration, duration measured as a continuous variable and not with dummies, was estimated for the total sample of unemployed. To the extent that these estimations reveal new information they are commented on, but the results are not presented. They are available from the author upon request.

[2] The fit statistics in Table A.4.3 will not be commented on primarily because focus in this analysis is on testing hypotheses regarding duration. In addition, there are no well established goodness of fit measures for logit models.

Loosely stated, the likelihood is the probability to have obtained the data used from the model estimated. In the tables in this and the following two chapters log likelihoods are given. Ideally they should take on values as close as possible to zero. Since the probability of being in a certain labour market state is unity or less, the log likelihoods are never positive.

The tables also give the degrees of freedom. In QUAIL, they are set to

$$\left[\begin{pmatrix}\text{number of}\\ \text{alternatives}\end{pmatrix} - 1\right] \times \begin{pmatrix}\text{number of}\\ \text{observations}\end{pmatrix} - \begin{pmatrix}\text{number of}\\ \text{free parameters}\end{pmatrix}$$

In this and the following chapter all models have three alternatives. Hence, the degrees of freedom will be somewhat lower than twice the number of observations.

Log likelihood at zero is the log likelihood when all parameter coefficients (including dummies) are zero. A comparison between the log likelihoods at convergence and at zero indicates how much of the variation the model explains. A measure of this is the likelihood ratio statistic. It is the difference between the log likelihoods at convergence and zero multiplied by two. It is the standard statistic for a test of the hypothesis that all parameters are zero. Under the null hypothesis it is asymptotically χ^2 distributed with the number of degrees of freedom equal to the number of parameters estimated.

Finally, the likelihood ratio index,

$$1 - \frac{\text{log likelihood at convergence}}{\text{log likelihood at zero}},$$

is presented. It is intended for comparisons between different models. The closer it is to unity the higher is the explanatory value of the models.

[3] In the models for flows out of employment and into the labour force, seven dummy variables for duration are used. In this case only three duration dummies are used because very few individuals in the sample are observed unemployed for more than three quarters.

The number of unemployed for whom all control variables can be observed is relatively small. Thus the estimates of coefficients are not very precise. Moreover, for some formulations of the model it was difficult to obtain any estimates of the coefficients since the model did not converge.[1] For this reason the number of control variables was decreased. When education was removed from the model, the sample size was almost doubled.[2]

The transition probabilities given in Table 4.2 have been computed from the two models in Table A.4.3 with and without educational level as an independent variable. Separate computations have been made for individuals who have been unemployed for three or more quarters and for one quarter. The first row for each level of duration presents the "reference" case, with attributes as described in the note to the table. In the following rows new probabilities are presented. They are computed by changing the values of some of the independent variables, one at a time.[3]

Judging from the model without education, duration is important for the probability that an unemployed individual continues to be unemployed (P_{uu}). A 40 year old reference individual who has been unemployed for three or more quarters has a 0.71 probability of remaining unemployed, while an individual with the same traits who has been unemployed for only one quarter

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[1] Failure to converge in these cases is probably caused by collinearity. The relatively small sample size also contributes to the problem. Later, when models for individuals employed and not in the labour force are estimated, the sample size is much larger. Nevertheless, convergence was not obtained for some of these models, most likely due to the small number of observations in one of the three labour market alternatives analyzed.

[2] The model without education is estimated on 237 individuals. The inclusion of education limits the observations used to 123 individuals.

[3] The probabilities in this and the following similar tables are subject to "rounding off errors". They have been computed on the basis of logit coefficients with four decimals. Hence, conclusions should not be drawn on the basis of minor differences in probabilities between groups.

has a 0.47 probability of continued unemployment. From Table A.4.3 it is apparent that having short durations - one or two quarters of unemployment - in this model decreases the probability of further unemployment to a significant extent.[1,2]

This study, contrary to other studies of duration, distinguishes between withdrawals from the labour force and transitions into employment. The effect observed for time in unemployment on the probability of becoming employed (P_{ue}) seems to be negative but a closer look at Table A.4.3 shows that the coefficients are not significant. According to Table 4.2 the effect of duration on withdrawals among the unemployed (P_{un}) also appears to be negative at least in the model without education.[3] However, the coefficients are in this case even less precise.

Table 4.2 also indicates how duration affects different age groups. Youth have relatively low probabilities of continued unemployment. Older workers show the opposite pattern. Both youth and the older group withdraw to a larger extent than the 40 year old.

The separate estimations for men and women of the model without education suggest that the effect of duration differs between sexes, but the duration dummies are not significant. The probability of becoming employed seems to decrease with time in unemployment for both men and women. For men the pattern appears to be withdrawal after an appreciable time in

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[1] The coefficients obtained for the duration dummy variables in the tables should be evaluated against the alternative not explicitly given in the tables. In this case a negative sign on the coefficient for a duration of one quarter implies that an individual with this time in unemployment has a lower probability of continued unemployment than someone with three or more quarters of unemployment.

[2] Two tail tests have been used for the coefficients. The level of significance is ten per cent.

[3] According to the model where duration is measured with a continuous variable, withdrawals increase with time in unemployment but the estimated coefficient is not significant.

unemployment. Thus a long duration of unemployment increases the probability of withdrawal. The reverse is true for women, those with short durations have higher probabilities of withdrawal. Consequently, the probability of remaining unemployed for women increases with duration. For men duration has hardly any effect on the probability of continued unemployment.

Table 4.2 Labour market transitions for individuals unemployed for one and three or more quarters. Computations based on two logit estimations, with and without education as an independent variable (Table A.4.3)

	Model without education			Model with education		
	P_{un}	P_{ue}	P_{uu}	P_{un}	P_{ue}	P_{uu}
Unemployed for three quarters or more						
Reference individual[1)]						
40 years old	0.09	0.21	0.71	0.08	0.28	0.65
20 years old	0.13	0.25	0.62	0.20	0.34	0.47
60 years old	0.12	0.13	0.76	0.11	0.17	0.72
high school education	-	-	-	0.08	0.37	0.56
Unemployed for one quarter						
Reference individual[1)]						
40 years old	0.11	0.42	0.47	0.06	0.37	0.57
20 years old	0.16	0.46	0.38	0.15	0.45	0.41
60 years old	0.17	0.28	0.55	0.09	0.25	0.67
high school education	-	-	-	0.05	0.47	0.47

1) A "reference" individual is a male, 40 years old, not married, without children, working in industry. In the model with education the reference individual has education for nine years or less. In addition, the reference individual made the transition at the time when the business cycle index was equal to the average for the period analyzed (July 1980 to June 1981) and lived in a county with an excess demand value on the labour market equal to the average for the counties. The characteristics in each row are the only ones that differ from those of the reference individual.

This pattern can be explained using the analytical framework from Section 4.2. Both men and women have probabilities of re-employment that appear to decrease with duration. This is likely to be a consequence of fewer or lower wage offers being given to those who have been unemployed for some time. The fact that a short spell of unemployment increases withdrawals among women could be a consequence of a high value placed on time not in the labour force or low expectations with respect to potential job offers. Men who recently became unemployed might have high probabilities of receiving job offers. Hence, they find continued search worthwhile. When the job offer probabilities decrease with time in unemployment, they withdraw.

So far the discussion has been based on the model without education as an explanatory variable. Looking at the model with education, one starts to question the role of duration. There are still differences in the transition probabilities presented in Table 4.2 between the unemployed for one quarter and those who have durations of three quarters or more. The overall pattern observed is the same as in the model without education. However, the coefficients in Table A.4.3, measuring the effect of duration on the transition probabilities, are now all insignificant. This suggests that *the relationship referred to between time in unemployment and future labour market prospects of an unemployed worker could be spurious.* What is observed in the model without education is, at least to some extent, that individuals with less education remain unemployed for longer periods and also have lower probabilities to leave unemployment, while better educated workers have short durations and higher probabilities of re-employment. This effect of education can be observed in Table 4.2.[1]

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[1] The coefficients for education given in Table A.4.3 are far from significant despite the fact that including education in the model greatly affects the role of duration. Most likely, this is a consequence of a dependence between education and some of the other explanatory variables.

Flows out of Employment

In this section the effect of time spent in employment on the flow rates out of employment will be studied. The results from two estimations, for men and women separately, of a model for employed individuals are presented in Table A.4.4. The sample size in this case is much larger than it was when the flows out of unemployment were studied. Therefore, there is no need to drop education or any other control variable. Time in employment will be measured with six dummy variables.

In Figure 4.3, the logit coefficients for the probability of remaining employed (P_{ee}) are given for various durations. The size of the coefficients should be compared with the alternative not explicitly included in the estimated model: a duration of seven quarters or more. Most coefficients are negative, which implies that a time in employment shorter than seven quarters decreases the probability of continued employment.[1] It is also interesting to note that the negative effect on the probability of remaining employed is strongest for the shortest durations (i.e. the curves in Figure 4.3 approach zero for longer durations).[2]

These results are well in accordance with the analytical framework in Section 4.2. On-the-job training was assumed to decrease quits and layoffs. Quits were also said to fall off at some level of tenure, when knowledge about non-wage characteristics had been gained. In combination with these model-based predictions, institutional factors such as seniority rules could lead to P_{ee}'s increasing with duration.

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[1] None of the positive coefficients observed are significant at the ten per cent level.

[2] It should be observed that the tests of significance are made to check the hypothesis that the coefficients are significantly different from zero. Hence, it should be no surprise that the coefficients for long durations, expected to be relatively close to zero, more often are not significant.

Figure 4.3 Logit coefficients for the effect of duration in employment on the probability of remaining employed (P_{ee}). Six dummy variables representing the number of quarters spent in employment with seven or more quarters used as the comparative norm

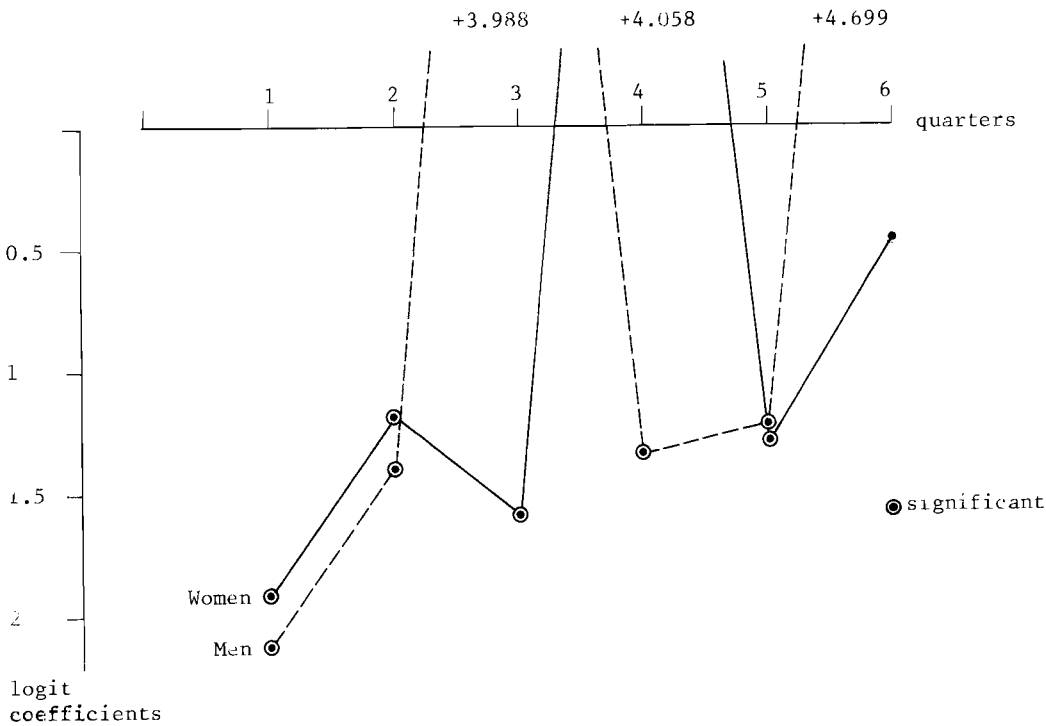

Table 4.3 presents transition probabilities for individuals who have been employed for different lengths of time. It has been computed in the same way as Table 4.2, drawing on the information in Table A.4.4.

Obviously, men and women who have been employed for longer times have much higher probabilities of remaining employed. For example, the probability of remaining employed for a 40 year old male is 0.69 after one quarter of employment and 0.98 after seven or more quarters. The effects of time spent in employment on the probabilities of leaving the labour force or

unemployment are also substantial, although the coefficient in Table A.4.4 for the effect of a duration of one quarter on the probability of becoming unemployed is not significant for women.

Table 4.3 Labour market transitions for males and females employed for one and seven or more quarters. Computations based on logit estimations (Table A.4.4)

	Males			Females		
	P_{en}	P_{ee}	P_{eu}	P_{en}	P_{ee}	P_{eu}
Employed for seven quarters of more						
Reference individual[1)]						
40 years old	0.01	0.98	0.01	0.00	0.99	0.01
20 years old	0.02	0.97	0.01	0.01	0.98	0.02
60 years old	0.03	0.96	0.01	0.01	0.98	0.01
Employed for one quarter						
Reference individual[1)]						
40 years old	0.15	0.69	0.15	0.09	0.86	0.05
20 years old	0.32	0.61	0.07	0.16	0.72	0.12
60 years old	0.34	0.52	0.14	0.26	0.69	0.05

1) A "reference" individual is 40 years old, not married, without children, with education for nine years or less and working in industry. In addition, the reference individual made the transition at the time when the business cycle index was equal to average for the period analyzed (July 1980 to June 1981) and lived in a county with an excess demand value on the labour market equal to the average for the counties. The characteristics in each row are the only ones that differ from those of the reference individual.

It is striking how high the probabilities of future employment are for both men and women, regardless of age, when duration is seven or more quarters. When duration is shorter, age and sex differences appear more distinct but the basic pattern is the same. The 40 year old have

the highest probabilities of continuing employment. Women have higher P_{ee}'s than men.

The relatively high probabilities of remaining employed observed for 40 year old men and women can be a consequence of higher productivity as well as of seniority rules. Also, individuals in this age category have less to gain from search and education than the youngest group, and as opposed to older workers they lack the option of retirement.[1]

Flows into the Labour Force

The results of one model estimated for individuals not in the labour force are presented in Table A.4.5. Education is included in the model as an explanatory variable. Duration is measured with six dummy variables.[2,3] A variation of this model, with duration entered as a continuous variable, has also been estimated. In addition, two estimations, for men and women separately, have been made of a model without education as an explanatory variable.[3,4]

Regardless of how duration is measured, it appears to be decisive for the future labour force status of individuals not in the labour force. In Figure 4.4, similar to Figure 4.3, the logit coefficients for the probability of staying outside the labour force (P_{nn}) are given for different durations.

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[1] The relatively high probabilities of continuing employment observed for women are more difficult to explain. They seem to contradict the results in Chapter 2.

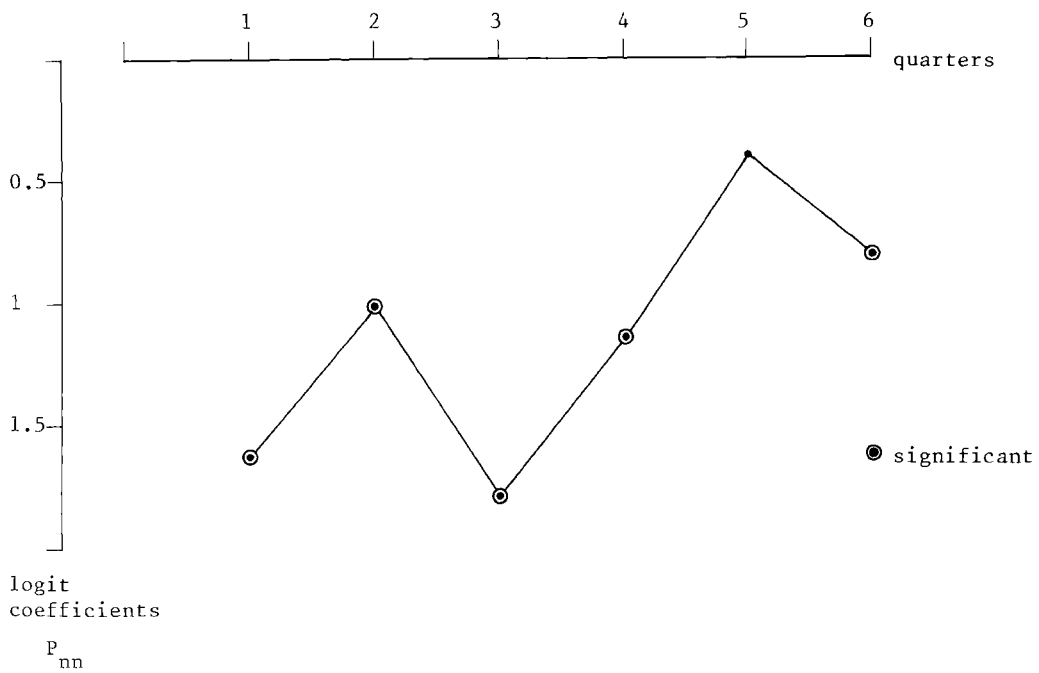
[2] Sectoral background is not available for most individuals not in the labour force. Hence, original sector is not among the independent variables in this estimation.

[3] The results from these models are available from the author upon request.

[4] Models for men and women separately, with education, failed to converge.

Compared with individuals who have been outside the labour force for seven or more quarters, those with shorter durations have lower probabilities of remaining outside the labour force (i.e. the coefficients are negative). Judging from Figure 4.4 the probability of remaining outside the labour force is particularly small for those with short durations (i.e. the coefficients approach zero when duration increases).

Figure 4.4 Logit coefficients for the effect of duration outside the labour force on the probability of remaining outside the labour force (P_{nn}). Six dummy variables representing the number of quarters spent outside the labour force with seven or more quarters as the comparative norm



In Table 4.4 transition probabilities for individuals who have spent one quarter or seven or more quarters outside the labour force are presented. They have been computed on the basis of the estimation given in Table A.4.5, applying the methodology described when Table 4.2 was presented.

Apparently, time spent outside the labour force is not only important for P_{nn}. Shorter durations imply greater probabilities of becoming both employed and unemployed. The coefficients for the dummy variable measuring the effect of one quarter outside the labour force on P_{ne} and P_{nu} are both significant.

Table 4.4 Labour market transitions for individuals not in the labour force for one and seven or more quarters. Computations based on logit estimations (Table A.4.5)

	P_{nn}	P_{ne}	P_{nu}
Not in the labour force for seven or more quarters			
Reference individual[1)]			
40 years old	0.98	0.02	0.00
20 years old	0.85	0.13	0.01
60 years old	0.99	0.01	0.00
Not in the labour force for one quarter			
Reference individual[1)]			
40 years old	0.82	0.14	0.04
20 years old	0.37	0.56	0.07
60 years old	0.93	0.05	0.02

1) A "reference" individual is a male, 40 years old, not married, without children, with education for nine years or less. In addition, the reference individual made the transition at the time when the business cycle index was equal to the average for the period analyzed (July 1980 to June 1981) and lived in a county with an excess demand value on the labour market equal to the average for the counties. The characteristics in each row are the only ones that differ from those of the reference individual.

The decision to stay outside the labour force is based on the returns from this compared with the alternative - to enter the labour force. The fact that P_{nn} increases with time outside the labour force could be a consequence of less attractive options in the regular labour market for those who have not been working for some time. In turn, this is likely to decrease the benefits from search. It is also possible that those who have been outside the labour force for some time value this alternative higher.

There are pronounced differences between age groups in the size of the transition probabilities. The probability that a 60 year old who has been outside the labour force for one quarter remains outside is 0.93, while the same probability for a 20 year old is 0.37.

A model was also estimated separately for men and women. This revealed one interesting difference between the sexes. The distincly negative relationship between duration and the flow into employment observed for all individuals holds only for women. Apparently, it is only for women that a longer time out of the labour force has a strong negative impact on the probability of becoming employed (P_{ne}).

The Effect of Duration - Another Test

According to many theories of labour market behaviour, duration matters for transitions out of employment and unemployment as well as into the labour force. The empirical results in this chapter and in several other studies also indicate that duration is of importance (although the findings can be attributed to heterogeneity).[1] On the other hand, many models used in labour economics (e.g. those applied in Chapters 2 and 3) rely on the Markov assumption, implying no duration dependence.[2] This is a

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[1] Lancaster (1979) and Kiefer and Neuman (1979) are examples of articles where the role of duration is studied.

[2] See Burdett (1982) for a discussion of this problem and an attempt to solve it.

strong reason to inquire further into the question of the effect of duration.

So far in this study, duration has been analyzed with one or several variables in a model. When the coefficients for these variables have been significant, it has been concluded that duration matters. In this section a likelihood ratio test will be applied in the analysis. The object of the test is to compare two models, one in which duration is constrained to have *no* effect and another in which it is allowed to influence the results. The explanatory value, the log likelihood, of a model without duration is compared with the sum of the explanatory values obtained when the sample is divided according to duration into two or more sub-samples and separate models are estimated for these. If the sum of the explanatory values of the models for different durations is sufficiently larger than that of the model for the whole group, the hypothesis that duration does not matter can be rejected.[1]

The individuals in the three original states, not in the labour force, employed and unemployed, have been divided into two groups, one with short and one with long duration in the state.[2] Separate models of labour market behaviour have been estimated for each of these six groups. Included in the models was the set of explanatory variables used earlier in this section except for the duration measures.

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[1] To be more precise, the difference between the sum of the log-likelihoods obtained when models are estimated for samples with different durations and the log-likelihood of a model for all individuals, regardless of duration, should be multiplied by two to obtain the test statistic. If this value is higher than the χ^2-value at a number of d.f. equal to the number of free parameters, the hypothesis that duration does not matter can be rejected. The number of free parameters is
[number of independent variables × (number of alternatives - 1)]
[Theil (1971)].

[2] For those not in the labour force or employed, short duration is defined as less than seven quarters. Very few unemployed had a duration longer than three quarters. Hence, short duration in this case is less than three quarters.

On the basis of these tests it cannot be ruled out that time in the labour market states is important for the probabilities of leaving each of the states.[1] The hypothesis that duration has no effect for individuals employed or not in the labour force is rejected at a significance level of 0.005. Duration also appears to affect the future labour market choices of the unemployed, but the significance level is 0.10.

4.6 CONCLUDING COMMENTS

A basis for this chapter was the empirical fact, noted in several studies using aggregate data, that the probability of leaving unemployment decreases with time in unemployment. This finding is open to two different interpretations. The first is that the probability of leaving unemployment is *truly* duration dependent. This may be a result of skill deterioration in longer periods of unemployment and the subsequent decline in job offers.

In the second interpretation, the relationship observed is essentially *spurious*. The population studied consists of individuals with different probabilities of re-employment. Those with high probabilities will spend a short time unemployed while those with low re-employment probabilities will remain unemployed for a longer period. When the aggregate is studied, a relationship between time spent in unemployment and the re-employment probabilities will be observed.

The analysis in this study, based on a sample from the Labour Force Surveys, lends some support to the second interpretation although the results are not clear-cut. When the effect of duration is studied separately, the relationship between time in unemployment and the flows out of unemployment is clear. Longer time in unemployment implies higher probabilities of remaining unemployed and lower ones of

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[1] The results from the estimations are available from the author upon request.

becoming employed. This study, contrary to other studies of the effect of unemployment duration on labour market behaviour, also includes withdrawals as an option for the unemployed. They appear to be most frequent directly after the individual becomes unemployed, decrease for a few quarters and then increase again. However, these relationships weaken a great deal when other variables like sex, age and marital status are included in the analysis, to control for differences between the unemployed. When educational level is included as an explanatory variable, the coefficients for the dummy variables measuring the effect of duration are no longer significant. But there are still differences in the probabilities which appear to be caused by duration, and when separate models are estimated for individuals with various durations the transition probabilities appear to differ between groups.

On the other hand, one could have included many more variables possibly affecting the probability of leaving the labour force. Some of these variables could even be found in the Labour Force Surveys, like unemployment compensation, while others, like motivation, are almost impossible to measure.

If the probabilities of leaving unemployment are duration dependent, labour market policy should promptly try to get the unemployed back to work. If, on the other hand, a factor like education is behind the observed aggregate relationship, then educational programs are the remedy. The results support at least the latter kind of programs.

Finally, it should be mentioned that the role of duration for the flows out of employment and into the labour force have been studied as well. They appear to be duration dependent even when controlling for the effect of several other variables. Time in employment or outside the labour force decreases the probabilities of leaving these labour market states to a substantial extent.

APPENDIX

Table A.4.1 Transition probabilities for individuals by duration and sex

Males

Transitions

Duration	P_{nn}	P_{ne}	P_{nu}	P_{en}	P_{ee}	P_{eu}	P_{un}	P_{ue}	P_{uu}
One quarter	0.74	0.24	0.02	0.16	0.74	0.10	0.15	0.39	0.45
Four quarters	0.87	0.11	0.02	0.14	0.85	0.02	-	0.27	0.73
Seven or more quarters	0.99	0.01	-	0.01	0.99	-	1.00	-	-

Females

Transitions

Duration	P_{nn}	P_{ne}	P_{nu}	P_{en}	P_{ee}	P_{eu}	P_{un}	P_{ue}	P_{uu}
One quarter	0.71	0.24	0.05	0.24	0.71	0.06	0.31	0.36	0.33
Four quarters	0.77	0.16	0.07	0.08	0.92	0.01	-	0.16	0.84
Seven or more quarters	0.98	0.02	-	0.01	0.99	0.01 *	-	-	1.00

* Significant at the 5 per cent level according to Pearson's coefficient of mean square contingency.

Table A.4.2 Transition probabilities for individuals by duration and age group

16-24 years

Transitions

Duration	P_{nn}	P_{ne}	P_{nu}	P_{en}	P_{ee}	P_{eu}	P_{un}	P_{ue}	P_{uu}
One quarter	0.68	0.30	0.03	0.20	0.71	0.08	0.39	0.30	0.31
Four quarters	0.60	0.27	0.13	0.08	0.91	0.01	-	0.70	0.31
Seven or more quarters	0.81	0.18	0.01 *	0.02	0.97	0.01 *	-	-	1.00

25-54 years

Transitions

Duration	P_{nn}	P_{ne}	P_{nu}	P_{en}	P_{ee}	P_{eu}	P_{un}	P_{ue}	P_{uu}
One quarter	0.68	0.27	0.05	0.16	0.76	0.07	0.11	0.45	0.44
Four quarters	0.86	0.14	-	0.08	0.92	0.01	-	0.15	0.85
Seven or more quarters	0.96	0.03	0.01	0.01	0.99	-		-	-

55- years

Transitions

Duration	P_{nn}	P_{ne}	P_{nu}	P_{en}	P_{ee}	P_{eu}	P_{un}	P_{ue}	P_{uu}
One quarter	0.88	0.08	0.04	0.33	0.64	0.03	0.06	0.41	0.54
Four quarters	0.99	0.01	-	0.29	0.68	0.03	-	-	1.00
Seven or more quarters	1.00	-	-	0.02	0.98	-	0.36	-	0.65

* Significant at the 5 per cent level according to Pearson's coefficent of mean square contingency.

Table A.4.3 Logit estimates of the effects on future labour force status for unemployed individuals (standard errors within parentheses)[1)]

Not in the labour force

	With education	Without education
Constant	2.007 (3.337)	0.9039 (2.560)
Sex (male=1)	0.4823E-01 (0.4243)	0.1718E-01 (0.3006)
Age	-0.1086 (0.1060)	-0.5808E-01 (0.7595E-01)
Age^2	0.1258E-02 (0.1317E-02)	0.7500E-03 (0.9554E-03)
Marital status (married=1)	0.5340 (0.6050)	-0.7267E-01 (0.3786)
Children	0.8132E-02 (0.5645)	0.3862 (0.3634)
Business cycle	0.9838 E-02 (0.3553E-01)	-0.6095E-02 (0.2290E-01)
Regional demand	36.58 (26.34)	34.46* (17.73)
High school education (10-12 years)	-0.6465E-01 (0.4307)	-
Academic education (13 years or more)	-7.898 (0.1316E+06)	-
Sector - industry	-	0.8938E-01 (0.5907)
Sector - construction	-	-0.9622 (0.8964)
Sector - private services	-	0.7372E-01 (0.6008)
Sector - public services	-	-0.1130 (0.6091)
Duration - 1 quarter	-0.2548 (0.5550)	0.8367E-01 (0.4366)
Duration - 2 quarters	0.1047 (0.6280)	0.1376 (0.4705)

Table A.4.3 (continued)

Employed

	With education	Without education
Constant	-0.2118 (2.446)	-0.3724 (1.834)
Sex (male=1)	0.3636 (0.3222)	0.1100 (0.2328)
Age	0.4189E-01 (0.8152E-01)	0.3081E-01 (0.5731E-01)
Age^2	-0.6431E-03 (0.1024E-02)	-0.5312E-03 (0.7227E-03)
Marital status (married=1)	0.4146 (0.4507)	0.2939 (0.2859)
Children	-0.1855 (0.4351)	-0.1486 (0.2788)
Business cycle	-0.1735E-01 (0.2750E-01)	0.9143E-02 (0.1772E-01)
Regional demand	-30.48* (16.33)	-17.34 (11.08)
High school education (10-12 years)	0.2486 (0.3264)	-
Academic education (13 years or more)	16.85 (0.8311E+05)	-
Sector - industry	-	-0.5947 (0.4300)
Sector - construction	-	0.2023 (0.5651)
Sector - private services	-	-0.7748* (0.4394)
Sector - public services	-	-0.5578 (0.4381)
Duration - 1 quarter	0.3405 (0.4565)	0.5093 (0.3527)
Duration - 2 quarters	-0.1026 (0.5344)	0.4784 (0.3797)

Table A.4.3 (continued)

Unemployed

	With education	Without education
Sex (male=1)	-0.4118 (0.3106)	-0.1272 (0.2248)
Age	0.6671E-01 (0.7660E-01)	0.2727E-01 (0.5518E-01)
Age^2	-0.6149E-03 (0.9627E-03)	-0.2188E-03 (0.6929E-03)
Marital status (married=1)	-0.9486* (0.4185)	-0.2212 (0.2747)
Children	0.1773 (0.3959)	-0.2376 (0.2673)
Business cycle	0.7512E-02 (0.2572E-01)	-0.3048E-02 (0.1700E-01)
Regional demand	-6.1 (16.2869)	-17.12 (10.9872)
High school education (10-12 years)	-0.1840 (0.3123)	-
Academic education (13 years or more)	-8.952 (131255)	-
Sector - industry	-	0.5053 (0.4827)
Sector - construction	-	0.7599 (0.6193)
Sector - private services	-	0.7011 (0.4875)
Sector - public services	-	0.6708 (0.4902
Duration - 1 quarter	-0.8570E-01 (0.4035)	-0.5930* (0.3020)
Duration - 2 quarters	-0.2100E-02 (0.4705)	-0.6160* (0.3328)

Table A.4.3 (continued)

	With education	Without education
Log likelihood	-109	-219
Degrees of freedom	222	446
Log likelihood (at zero)	-135	-260
Likelihood ratio index	0.1909	0.1572
Likelihood ratio statistic	51.59	81.87

* Significant at a ten per cent level.

1) Educational level, industrial sector and duration are measured with two or more dummy variables. The comparative norms are nine or fewer years of education, agricultural sector and three or more quarters duration.

Table A.4.4 Logit estimates of the effects on future labour force status for employed individuals (standard errors within parentheses)[1)]

Not in the labour force	Men	Women
Constant	5.685*	-0.9342
	(2.877)	(2.758)
Age	-0.1434*	-0.8261E-01
	(0.5652E-01)	(0.6484E-01)
Age^2	0.1753E-02*	0.1241E-02
	(0.6838E-03)	(0.8004E-03)
Marital status (married=1)	-0.3204E-01	0.3995E-01
	(0.3109)	(0.2707)
Children	-0.1064	0.3200
	(0.3259)	(0.3044)
Business cycle	-0.1098E-01	0.1073E-01
	(0.1693E-01)	(0.1633E-01)
Regional demand	6.801	4.929
	(10.93)	(10.53)
High school education (10-12 years)	0.1763	0.2912
	(0.2404)	(0.2469)
Academic education (13 years or more)	0.4460	0.2847
	(0.4032)	(0.3806)
Sector - industry	1.197	-0.1229
	(0.7461	(0.4596)
Sector - construction	0.9521	4.917
	(0.7736)	(1027.)
Sector - private services	0.5439	0.3092
	(0.7718)	(0.4183)
Sector - public services	1.301*	0.1469
	(0.7589)	(0.3914)
Duration - 1 quarter	1.053*	1.727*
	(0.2923)	(0.2818)
Duration - 2 quarters	0.7140*	1.240*
	(0.4048)	(0.4069)
Duration - 3 quarters	-10.50	1.334*
	(1027.)	(0.3413)
Duration - 4 quarters	0.8580*	6.201
	(0.5060)	(726.2)
Duration - 5 quarters	0.2556	1.114*
	(0.5032)	(0.4175)
Duration - 6 quarters	4.901	0.3011
	(918.3)	(0.7794)

Table A.4.4 (continued)

Employed	Men	Women
Constant	9.498*	1.540
	(2.303)	(2.375)
Age	0.4215E-01	0.1112*
	(0.4203E-01)	(0.4992E-01)
Age^2	-0.6392E-03	-0.1373E-02*
	(0.5124E-03)	(0.6219E-03)
Marital status (married=1)	0.6709*	0.1701
	(0.2199)	(0.2044)
Children	0.1344	-0.2953
	(0.2252)	(0.2268)
Business cycle	-0.2978E-01*	-0.1494E-01
	(0.1265E-01)	(0.1259E-01)
Regional demand	14.57*	-0.2515
	(7.358)	(8.110)
High school education (10-12 years)	-0.9532E-01	0.4075*
	(0.1756)	(0.1935)
Academic education (13 years or more)	0.1289	0.3564
	(0.3188)	(0.3001)
Sector - industry	-0.8458*	0.4652
	(0.4535)	(0.3383)
Sector - construction	-1.120*	5.360
	(0.4732)	(1027.)
Sector - private services	-0.5158	0.3469
	(0.4695)	(0.3219)
Sector - public services	-1.020*	0.4240
	(0.4673)	(0.2985)
Duration - 1 quarter	-2.127*	-1.922*
	(0.2280)	(0.2194)
Duration - 2 quarters	-1.396*	-1.187*
	(0.2981)	(0.3164)
Duration - 3 quarters	3.988	-1.576*
	(513.3)	(0.2582)
Duration - 4 quarters	-1.341*	4.058
	(0.4175)	(726.2)
Duration - 5 quarters	-1.226*	-1.276*
	(0.3563)	(0.3184)
Duration - 6 quarters	4.699	-0.4677
	(918.3)	(0.5036)

Table A.4.4 (continued)

Unemployed	Men	Women
Age	0.1013 (0.6953E-01)	-0.2859E-01 (0.8540E-01)
Age^2	-0.1114E-02 (0.8592E-03)	0.1320E-03 (0.1070E-02)
Marital status (married=1)	0.6389* (0.3596)	0.2101 (0.3468)
Children	0.2800E-01 (0.3641)	-0.2470E-01 (0.3864)
Business cycle	0.4076E-01* (0.2078E-01)	0.4210E-02 (0.2124E-01)
Regional demand	-21.371* (11.2279)	-4.6775 (13.6072)
High school education (10-12 years)	-0.8098E-01 (0.2839)	-0.6987* (0.3370)
Academic education (13 years or more)	-0.5749 (0.5592)	-0.6411 (0.5341)
Sector - industry	-0.3512 (0.6457)	-0.3423 (0.5400)
Sector - construction	0.1679 (0.6657)	-10.277 (2054)
Sector - private services	-0.2810E-01 (0.6687)	-0.6561 (0.5279)
Sector - public services	-0.2810 (0.6730)	-0.5709 (0.4837)
Duration - 1 quarter	1.074* (0.3559)	0.1950 (0.3706)
Duration - 2 quarters	0.6820 (0.4796)	-0.5300E-01 (0.5514)
Duration - 3 quarters	6.512 (514)	0.2420 (0.4323)
Duration - 4 quarters	0.4830 (0.7386)	10.259 (1452)
Duration - 5 quarters	0.9704* (0.5672)	0.1620 (0.5500)
Duration - 6 quarters	-9.600 (1837)	0.1666 (0.7911)

Table A.4.4 (continued)

	Men	Women
Log likelihood	-401	-416
Degrees of freedom	7316	6350
Log likelihood (at zero)	-4040	-3509
Likelihood ratio index	0.9007	0.8816
Likelihood ratio statistic	7277	6187

* Significant at a ten per cent level.

1) Educational level, industrial sector and duration are measured with two or more dummy variables. The comparative norms are nine or fewer years of education, agricultural sector and seven or more quarters duration.

Table A.4.5 Logit estimates of the effects on future labour force status for individuals not in the labour force (standard errors within parentheses)[1)]

	Not in the labour force	Employed	Unemployed
Constant	6.277* (2.459)	4.272* (2.571)	
Sex (male=1)	0.1189 (0.1853)	-0.8828E-01 (0.2024)	-0.3062E-01 (0.3186)
Age	-0.7446E-01 (0.4876E-01)	-0.1646E-03 (0.5416E-01)	0.7462E-01 (0.8615E-01)
Age^2	0.1388E-02* (0.6130E-03)	-0.3833E-03 (0.6846E-03)	-0.1005E-02 (0.1092E-02)
Marital status (married=1)	-0.1561E-01 (0.2286)	0.5988* (0.2669)	-0.5832 (0.3871)
Children	0.1048 (0.2366)	-0.6215* (0.2699)	0.5167 (0.4019)
Business cycle	0.1692E-01 (0.1353E-01)	-0.5659E-02 (0.1511E-01)	-0.1126E-01 (0.2353E-01)
Regional demand	1.089 (7.003)	16.57* (8.314)	-17.659 (11.4044)
High school education (10-12 years)	0.3000 (0.1877)	0.6586E-01 (0.2031)	-0.3659 (0.3113)
Academic Education (13 years or more)	0.1161 (0.2545)	-0.5514* (0.3067)	0.4353 (0.4075)
Duration - 1 quarter	-1.637* (0.2640)	0.6190* (0.2929)	1.018* (0.4835)
Duration - 2 quarters	-1.048* (0.3399)	0.6332* (0.3682)	0.4148 (0.6376)
Duration - 3 quarters	-1.814* (0.2669)	0.3568 (0.2980)	1.4572* (0.4757)
Duration - 4 quarters	-1.160* (0.3635)	0.1505 (0.4194)	1.0095 (0.6503)
Duration - 5 quarters	-0.4026 (0.4822)	-0.5840 (0.6379)	0.9866 (0.8314)
Duration - 6 quarters	-0.8197* (0.4210)	-0.7625 (0.5890)	1.5822* (0.6763)

Table A.4.5 (continued)

Log likelihood	-480
Degrees of freedom	3378
Log likelihood (at zero)	-1873
Likelihood ratio index	0.7440
Likelihood ratio statistic	2787

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* Significant at a ten per cent level.

1) Educational level and duration are measured with two or more dummy variables. The comparative norms are nine or fewer years of education and a duration of seven or more quarters.

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5. Re-employment Prospects for Workers who Become Unemployed

5.1 INTRODUCTION

This chapter presents an analysis of the labour market prospects of individuals entering unemployment following a period of employment. In the study a sample of individuals from the Labour Force Surveys whose post-employment labour market behaviour can be observed for five quarters is used.

The primary difference between this and the study in the previous chapter is one of time perspective. In Chapter 4, transitions out of unemployment were related to the labour market *histories* of individuals. Here, the question is studied in reverse: what are the *future* labour market prospects for those who have a certain history in common, i.e. having gone from employment to unemployment?

Existing Swedish studies of unemployment based on individual data are concentrated on the relationship between some individual characteristics and the labour market experience at one point in time. The unemployed have usually not been followed for an extended period. Moreover, few of the studies have utilized samples representative of all or major categories of unemployed workers. In fact, case studies of individuals laid off in connection with plant closures appear to be the most common type of study.

The analysis in this chapter is executed to improve knowledge gained in previously made case studies regarding the employment prospects of individuals laid off. Descriptive

techniques of various kinds are utilized as well as logit models relating future labour market state to a set of individual characteristics. This study is limited to unemployed persons who were formerly employed in order to facilitate comparisons with previous studies. The limitation also implies that a potentially important heterogeneity component, previous labour market state, is removed from the analysis.

The observations from those in the sample can however be used to illustrate several problems which have been central to empirical labour economics, but studied on Swedish data only to a limited extent. An example of this is the problem of time dependence, to which Chapter 4 was devoted. Another example concerns multiple spells of unemployment.[1] The assumption that individuals experience only single spells of unemployment leads measures of duration to underestimate the extent of unemployment experienced by some individuals. Thus the commonly held notion of unemployment underestimates concentration among individuals, with possible welfare implications.

A third issue in the literature on unemployment which can be discussed using this sample is the character of the flow between unemployed and not in the labour force. If, as Clark and Summers (1979) claimed, a substantial share of the unemployed who withdraw from the labour force are in essentially the same situation before and after the transition, it is clear that aggregate unemployment figures underestimate the duration of unemployment.

The analytical framework used in this chapter is presented in the next section. From this basis variables affecting the probabilities of remaining unemployed, becoming employed or withdrawing from the labour force are deduced. The independent variables will be related to flows out of unemployment in a logit framework of the kind introduced in Chapter 4.

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[1] Akerlof and Main (1980) is perhaps the classical reference. Pedersen (1983) contains information on multiple spells of unemployment from Denmark.

Section 5.3 is devoted to a presentation of the particular sample from the Labour Force Surveys utilized. It consists of individuals in the Labour Force Surveys for 1975 to 1979. Included are those who were employed at the time of the first or second interview and who became unemployed the following quarter. The labour market experience of these individuals during the five or six quarters they remained in the Labour Force Surveys is recorded and used in the analysis in this chapter.

In the fourth section the data base is used to describe in various ways what happened to those who became unemployed after having had a job. The discussion is then related to case studies of plant closures from the late sixties and early seventies.[1] In particular, comparisons can be made with those in the sample who became unemployed due to personnel and production cuts. A few problems of more general interest from the point of view of labour economics such as time dependence and multiple spells of unemployment will also be illustrated.

In existing studies of individual unemployment experiences hypotheses regarding the effects of variables such as sex, age and demand for labour on the rates of transition out of unemployment (P_{un} and P_{ue}) can be found. Some of these hypotheses are tested in Section 5.5. Differences in the labour market behaviour between men and women and between two age groups (16-24 years of age and 25 years or older) are analyzed, in particular.

Since workers unemployed due to personnel and production cuts are most comparable to those in the case studies, a separate analysis of this group would perhaps have been more relevant. However, limiting observations to this group yields

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[1] See Mossfeldt (1983) and Löfström (1983) for further references.

a sample which appears to be too small to permit meaningful tests of significance for the included explanatory variables.

Section 5.6 is also devoted to hypothesis-testing. Since membership in unemployment compensation funds is among the explanatory variables, it is possible to shed some light on the effects of unemployment benefits on the flows out of unemployment, so much disputed in theoretical and empirical studies during the last fifteen years.[1]

5.2 THE ANALYTICAL FRAMEWORK

Models of the behaviour of unemployed individuals were described in Chapters 1 and 4. The following is a brief summary stressing a few points of particular relevance for the analysis in this chapter.

The essential conclusion from the search model in Chapter 1 is that an unemployed individual chooses a reservation wage such that the marginal cost of obtaining one more offer and the marginal expected revenue from search are equal. Burdett (1979 b) extends the model by allowing individuals to substitute leisure for search. In his model, the unemployed will simultaneously decide on an optimal reservation wage and allocation of their time between leisure and search, equating marginal utility of leisure and marginal expected gains from search.

It is clear from this that factors affecting costs and benefits of further search will influence the reservation wage and hence the probability that someone unemployed will become employed. Similarly, factors affecting the marginal utility of leisure (or all other kinds of non-employment, non-search activity) and marginal expected gains from further time spent in search will affect the probability that an unemployed individual quits search and withdraws from the labour force. Thus we are equipped with a model to explain whether or not an

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[1] What evidence there is based on Swedish data is presented in Björklund and Holmlund (1983). In addition, they give references to the central pieces of work in this field.

individual will remain unemployed, become employed or withdraw from the labour force

$$(5.1) \qquad P_{ij} = f_{ij}(z) \qquad i = u \qquad j = n,e \text{ and } u$$

$$\text{where} \qquad \sum_j P_{ij} = 1$$

and the vector (z) consists of variables affecting the reservation wage or the leisure-search relation. With individual data on labour market transitions and the z-vector, (5.1) can be estimated with the multinomial logit model used in Chapter 4.[1]

In this study the z-vector will consist of a few variables such as sex, age, regional and aggregate demand, analyzed in many of the previously mentioned case studies. Moreover, the effect of membership in unemployment compensation funds and search intensity, two variables which have been treated intensively in labour economics, will be studied. Finally, marital status, children, occupational category, cause of unemployment and employment sector of origin are included in the z-vector primarily to control for heterogeneity. Precise definitions of the variables are given in Table 5.1. They are generally the same as in Chapter 4.

It is, of course, not difficult to think of other variables which might have an effect on individuals' labour market prospects. Among these are the level of wages or unemployment benefits. Related disciplines in psychology or sociology would suggest as important such variables as motivation. Limits are, however, set by the data available in the Labour Force Surveys.[2] The consequences of not including more control variables are not easily assessed.

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[1] As in Chapter 4, the program used is QUAIL [Berkman and Brownstone (1979)].

[2] An independent variable which would be of interest and, in principle, is available from the Labour Force Surveys, is educational level. It has not been included in this analysis because it is only available on one third of all individuals, i.e. those interviewed in February each year (see Appendix to Chapter 2).

Table 5.1 Variables used in the logit models[1)]

Age	Age, in years
Age^2	Age, in years, squared
Sex	Equals 1 for male and 0 for female
Marital status	Equals 1 for married and 0 for not married. The category not married includes formerly married as well as cohabitating couples
Children	Equals 1 for having one or more children under 16 years of age and 0 for no children under 16
Occupational category	Equals 1 for white collar workers and 0 for blue collar workers[2)]
Unemployment benefits	Equals 1 for those who are members in unemployment compensation funds and 0 for those who are not[3)]
Intensive search	Equals 1 for those who search through any channel other than the public employment service and 0 for those who search *only* through the public employment service[4)]
Unemployment reason	Two dummy variables, one for work completed and one for all other reasons. The comparative norm is personnel and production cuts[5)]
Sector	Four dummy variables for industry, construction, private services and public services. The comparative norm is agriculture[6)]
Business cycle	The value of an activity index during the first month the individual was recorded as unemployed[7)]
Regional demand	The average excess demand on the labour market from the period 1975 to 1979 in the county in which the individual lived when first recorded as unemployed[8)]

Notes 1-8, see next page.

Notes, Table 5.1:

1) In some estimations, interaction between variables in this table are tried. The interaction variables are defined in the respective contexts.

2) Individuals with the following work codes have been treated as white collar workers: 10, 20, 30, 40, 50, 100, 210, 220, 230, 310, 320, 330, 340 and 980. The remainder are classified as blue collar workers.

3) Table 6.9 gives a rough idea of the differences in benefit levels between various compensation schemes. It should be observed that being a member of an unemployment compensation fund does not necessarily imply that one is eligible for unemployment benefits.

4) In the Labour Force Surveys, unemployed individuals are asked if they search through the public employment service, employers, advertisements, some combinations of these or in some other way.

5) The following reasons for unemployment are given in the Labour Force Surveys by those individuals who were previously employed: personnel and production cuts, work completed, health, children and housework, studies, retirement, moving to another area, temporarily laid off without pay and other(s).

6) Sectoral background is defined as in Chapter 4.

7) The index is a weighted combination of the percentage of firms having full capacity utilization and the percentage of firms lacking skilled workers and technicians [National Economic Research Institute (1982)]. The index is the same as was used in Chapter 4. When entered in the estimation, the values of the index have been divided by a factor of 100. As an alternative, the percentage of the labour force which was unemployed was used in some preliminary estimations [National Labour Market Board (1982)]. The results were similar.

8) Five measures were computed for each county

$$\frac{V-U}{L}\ ,\ \frac{V}{U}\ ,\ \frac{U}{L}\ ,\ \frac{U}{R}$$

(where V is vacancies, U is the number of unemployed workers, L is total number of workers in the labour force and R is the population between 16 and 74 years) and per cent change in employment (dagbefolkning) between 1975 and 1980. A ranking of the counties, according to the different measures, gave similar results for all measures except per cent change in employment. The relative excess demand measure

$$\frac{V-U}{L}$$

is used. It has been computed as in Chapter 4.

The relationships between the included variables and the P_{ij}'s will not be discussed until the results are presented, with the exception of membership in unemployment compensation funds and search intensity. Burdett's article demonstrates that an increase in unemployment benefits not only decreases search costs, and hence has a positive effect on the reservation wage (the effect in the standard search model in Chapter 1), but also results in a lower search intensity. Both effects imply a lower probability of finding an acceptable job offer. This connection between unemployment benefits and search intensity will be studied in Section 5.6. It should, however, also be kept in mind when the models in Section 5.5 are analyzed. The full effect (direct and via search intensity) of membership in unemployment compensation funds might be underestimated since search intensity is included separately in the models.

5.3 THE DATA

The individuals in the data base have been selected from those who entered the Labour Force Surveys during the years 1975 to 1979. It was required that the individuals be identified as employed one quarter and unemployed the next, and that this two-quarter sequence be in the beginning of the two year period for which each individual is in the Surveys (i.e. the first and second or second and third observations). The latter requirement is included to ensure information on the individuals' labour market experience for at least five quarters after unemployment was first recorded.[1]

It is likely that a sample constructed in this way will differ in a number of respects from categories more frequently used to describe developments in the Swedish labour market. To demonstrate some of these differences, comparisons were

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[1] The sample includes 1539 individuals in total.

made between the current sample, the total labour force and the unemployed for the same period (1975-1979).[1] Some of these comparisons will be reported below.

The age distributions differ substantially between this sample and the other two categories. In the sample used in this study youths (16-24 years of age) account for 48.1 per cent and older workers (55 years and older) for 9.7 per cent of the individuals. For the unemployed in general, the same figures are 39.8 and 14.8 per cent and for the population in the labour force 16.5 and 17.3 per cent. The relatively large share of youth in this sample is an obvious consequence of their greater mobility between labour market states.

Further insight into the differences between the unemployed in general and the sample used in this chapter can be gained by looking at the reasons for unemployment, as given in the Labour Force Surveys. "Work completed" and "temporarily laid off without pay" are two reasons that are overrepresented in this sample.

Table 5.2 Reasons for unemployment. A comparison of the sample used in this study and all unemployed according to the Labour Force Surveys 1975-1979. Per cent.

	Sample	Labour Force Surveys
Personnel or production cut	19.2	20.8
Work completed	43.7	33.3
Health, retirement, child care, studying, moving to other area, etc.	13.0	24.1
Temporarily laid off without pay	5.4	2.7
Other reason(s)	18.8	19.0
	100	100

[1] The figures for the population in the labour force and the unemployed have been computed from the basic files (råtabeller) of the Labour Force Surveys [Statistics Sweden (1975-1979)].

"Work completed" is a reason for unemployment commonly given by younger individuals. It has also increased in importance during the last years (see Chapter 1). Note that only blue-collar workers can be temporarily laid off without pay. Both "work completed" and "temporarily laid off without pay" are more common in sectors where movements in and out of employment are frequent, such as agriculture, construction and parts of the private service sector. A relatively large share of the individuals in the sample used in this study originate from these sectors.[1]

It should be no surprise when samples that have been selected on different bases, e.g. unemployed at a certain time, for a certain length of time or, as in this case, becoming unemployed after having had a job, differ. The crucial criterion is whether each of the samples is useful for the analysis to which it is applied. In this sample individuals who for some reason frequently move from employment to unemployment are "overrepresented". This must be borne in mind, especially when the descriptive Section 5.4 is read. In the following sections, 5.5 and 5.6, the discussion is based on logit models in which several variables related to frequent movements between labour market states, such as age, sectoral background and unemployment reason, can be controlled for.

5.4 DO THE UNEMPLOYED STAY UNEMPLOYED?

The object of this section is to describe the movements between labour market states in the five to six quarters following the transition from employment to unemployment. In the next section an attempt will be made to explain the observed flows.

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[1] Workers who have been "temporarily laid off without pay" will (with the exception of one logit model with interaction between sex and other independent variables in Section 5.5) not be included in the following analysis. The reason is that this group differs from all the other unemployed in the sense that they have a job to which they will return within one or two weeks.

What Happens After One Quarter in Unemployment?

It might be instructive to begin with a table showing the distribution across labour market states one quarter after the individuals became unemployed. Table 5.3 gives the figures for the sample as a whole, separately for men and women, for different age groups and for different sectors of origin.[1] Judging from earlier studies of individual labour market consequences of plant closures, age and sex are particularly important. [For example, see Mossfeldt (1983).]

It is apparent that men and women become employed to more or less the same extent. However, it seems as if relatively more unemployed women leave the labour force, while men in the same situation remain unemployed.

The differences between age groups are even more striking. A large share of the youth become employed. At the same time, many of them leave the labour force. Therefore, relatively few stay unemployed. The opposite pattern characterizes the old. More than half of them remain unemployed while only about a third had begun a new job after one quarter.

There are differences, although less striking, between the sectors as well. The share of those from the industrial sector who find a new job is distinctively lower than for those from other sectors. As a result both the proportion of unemployed and of those leaving the labour force are relatively high. The sector of origin related to the highest share of employment is public services. Almost 60 per cent of the unemployed from this sector have a new job the next quarter.[2]

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[1] The percentages given in the table are computed in the same way as the P_{ij}'s in the earlier chapters, although the data base, of course, is different.

[2] From the first columns in Table A.5.4, the same information as in Table 5.3 can be obtained for individuals unemployed due to personnel and production cuts or completed work. The differences are striking. Over 40 per cent of the unemployed due to personnel and production cuts are still unemployed after one quarter. The figure for those who have completed work is less than 30 per cent.

Table 5.3 Labour force status. Distribution of unemployed workers one quarter after becoming unemployed. Total number and per cent [1]

	Not in the labour force	Employed	Unemployed	Total
Total	189	717	447	1353
	(14.0)	(53.0)	(33.0)	
Sex				
Males	87	370	245	702
	(12.4)	(52.7)	(34.9)	
Females	102	347	202	651
	(15.7)	(53.3)	(31.0)	
Age				
16-24	104	353	171	628
	(16.6)	(56.2)	(27.2)	
25-54	68	317	204	589
	(11.5)	(53.8)	(34.6)	
55-	17	47	72	136
	(12.5)	(34.6)	(52.9)	
Sector [2]				
Agriculture	8	53	38	99
	(8.1)	(53.5)	(38.4)	
Industry	47	122	110	279
	(16.8)	(43.7)	(39.4)	
Construction	19	100	66	185
	(10.3)	(54.1)	(35.7)	
Private services	43	204	129	376
	(11.4)	(54.3)	(34.3)	
Public services	68	232	93	393
	(17.3)	(59.0)	(23.7)	

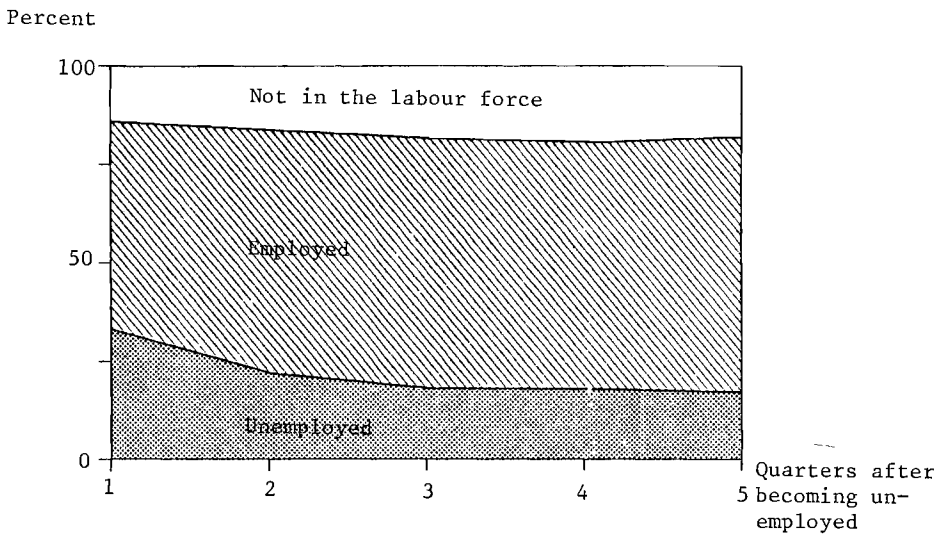
1) The total observed is lower than the 1539 individuals included in the sample for two reasons. Individuals temporarily laid off without pay are not included. Labour force status was not observed for all individuals in the sample one quarter after becoming unemployed.

2) The sums of individuals with different original sectors do not sum to the total because information about sector is missing for some individuals.

Changes in Labour Force Status Over Time

The distribution of the unemployed over the three labour market states during the five quarters following the initial quarter of unemployment is shown for the sample as a whole in Figure 5.1.

Figure 5.1 Labour force status. Distribution of unemployed workers five quarters after becoming unemployed. Per cent of all individuals in the sample.



The share of the unemployed decreases, while that of the employed and those leaving the labour force increases. At the end about 18 per cent are out of the labour force, 65 per cent employed and 17 per cent unemployed. This general pattern is in agreement with earlier studies of the labour market effects of plant closures.[1]

Tables with the distributions on labour market states by sex, age, sector and cause of unemployment during five quarters following unemployment are available in the Appendix (Tables A.5.1 - A.5.4).

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[1] For examples, see the survey by Löfström (1983).

Men and women are, throughout the period, employed to more or less the same extent. The most notable difference is that a higher proportion of men are unemployed at each observation, while the share of those leaving the labour force is higher for women.

In Table 5.3 youth were shown to have the highest rate of employment after one quarter while the lowest rate was noted for the old. According to Table A.5.2, the employment share increases as time passes, a pattern which is particularly strong in the prime-age group. Youth and the prime-age group have a more or less equal percentage of employed at the final observation. However, a higher percentage of the young are outside the labour force, while unemployment is higher in the prime-age group. Older workers consistently have higher although decreasing unemployment and a sharply increasing withdrawal from the labour force.

A few words should also be said about sector of origin. The first quarter after unemployment was recorded, employment is highest for those previously in the public sector and lowest for those from industry. After five quarters the differences are smaller, but reemployment rates for the industry and agriculture groups remain below those for groups from private and public services, as well as from construction. Withdrawal from the labour force is, in the fifth quarter, more frequent for those with a background in agriculture, industry and public services, while the highest unemployment shares are found for workers from construction and industry.

Finally, the variation among groups with different causes of unemployment should be commented on. Those unemployed due to personnel and production cuts have a very low re-employment share the first quarter after becoming unemployed, while a high share is noted for those who have completed work. After five quarters the differences are smaller, but the rate of re-employment is still lower for those who were laid off.

Individual Flows Behind the Aggregate Distributions

The aggregate distributions hide information. Figure 5.1 suggests a smooth process in which more and more individuals leave unemployment to become employed or to withdraw from the labour force. But this is far from the whole truth, as Figure 5.2 demonstrates. Movements of individuals between labour market states can, in this kind of figure (called an employment tree), be traced for five quarters.

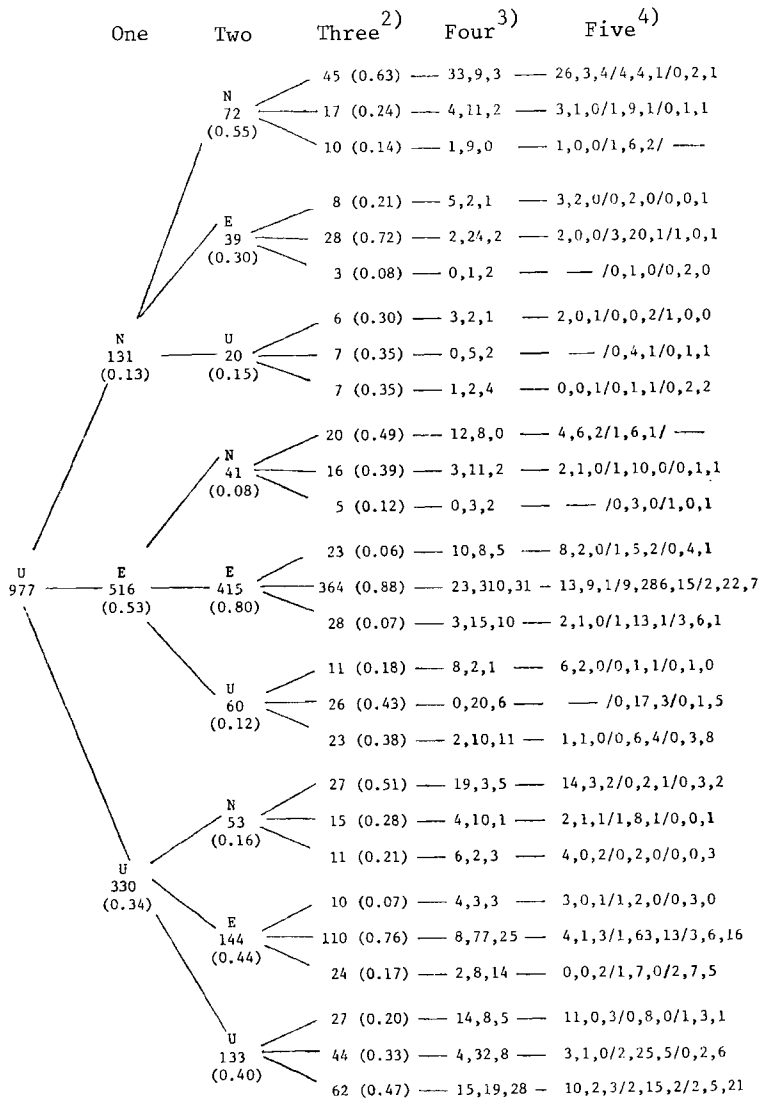
The calculations presented in the employment tree indicate a high degree of mobility between different labour market states. Only 21 out of the original 977 individuals, who can be followed for five quarters, are unemployed at each of the interviews. Among the 131 individuals leaving the labour force after one quarter, no more than 26 are still outside four quarters later. For those re-employed these figures are higher. Nevertheless, only 55 per cent of the 516 employed after one quarter still have a job after five quarters.

Multiple spells of unemployment are common. Approximately a third of the individuals who leave unemployment in quarter one or two have been unemployed again by quarter five. This figure can be compared with findings in a study from the National Labour Market Board (1983): an estimated 30 per cent of those applying for jobs through the public employment services during one year were registered as searching in two or more separate periods.

Judging from Figure 5.2, the labour market situation in one quarter is important for what happens in the following quarter. After two quarters the probability of having left the labour force, or being employed or unemployed, is higher for those who were in the same state the previous quarter. This is (with few exceptions) true for successive periods as well. For those employed, this relationship is particularly strong.

Figure 5.2 Employment tree. Employment histories for individuals five quarters after becoming unemployed. Number of individuals and share of individuals in preceding state (within parentheses)[1)]

Quarters after becoming unemployed



1) Only individuals for which observations of labour force status are available from all five quarters were included in the calculations presented in this figure. Hence the size of the sample is smaller than in Table 5.3.

2) Read column from top to bottom as N, E, U, N, E, etc.

3) Read each row from left to right as N, E, U.

4) Read each row from left to right. The first observations for N, E, U within brackets belong to those who were in N after four quarters, the following three figures to those with E after four quarters, etc.

The effect of time spent in a labour market state on the probability of remaining in the respective state was analyzed in Chapter 4. Time dependence can be studied in Figure 5.2 as well, while there are of course no controls for other independent variables. A longer duration appears to increase the probability of staying in a state. To take an example: among the individuals who were employed both after one and two quarters (i.e. a duration of two quarters), 88 per cent were still employed after three quarters. This figure is higher than the 72 or 76 per cent obtained for those who were employed after two quarters but not after one (i.e. a duration of one quarter). Other indications of the importance of the prior labour market history are easy to find. The probability of being unemployed in quarter three is almost seven times as high for those who have been unemployed during the first two quarters (0.47) as it is for those employed in both quarter one and two (0.07).

Table 5.4 Probabilities of being in three labour market states in quarter five conditional on labour market state in quarter one

	Labour market state in quarter five		
Labour market state in quarter one	N	E	U
N	0.37	0.47	0.17
E	0.11	0.79	0.10
U	0.20	0.51	0.28

In Table 5.4 the probabilities of being in one of the three labour market states in quarter five, conditional on the labour market state in quarter one, are presented. Those unemployed in quarter one have a 0.28 probability of being in the same state in quarter five, as compared to a 0.10 probability of unemployment for persons who were employed in quarter one. It can be further noted that the probability

of leaving the labour force in quarter five is almost twice as high for the unemployed in quarter one as for those employed in that quarter. The probability of becoming unemployed is also higher for those who have withdrawn in quarter one than it is for the employed in the first quarter. One can think of at least two different reasons for these relatively large flows between unemployed and not in the labour force. Unemployment can via discouragement lead to withdrawals while time outside the labour force can make it more difficult to get a job offer. Moreover, it is possible that individuals in the *same* labour market situation are classified as unemployed in one quarter and not in the labour force in the next or *vice versa*.[1]

Employment trees have also been computed for males and females, for each of the three age categories (16-24 years, 25-54 years and 55 years and older) and for individuals unemployed due to personnel and production cuts.[2] The employment trees reveal that women have higher probabilities not only of leaving the labour force directly after they become unemployed, but also of staying outside once they leave. The fact is that women generally change labour market states less frequently than men. Between the first and second quarters 39 per cent of the men switch to another state compared to 34 per cent of the women. A similar relation holds between men and women for the subsequent quarters.

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[1] Another indication of the same thing is the high withdrawals from unemployment compared to employment in almost all quarters which can be noted in Figure 5.2. These findings suggest that studies of unemployment duration, not considering the sometimes close resemblance of this state and not in the labour force, might seriously underestimate the "actual" time in unemployment. See Chapters 1 and 2 for a discussion of this problem.

[2] To facilitate comparison with some of the case-studies of plant closures the employment tree for individuals unemployed due to personnel and production cuts is given in the Appendix. The other employment trees are available from the author upon request.

A high proportion of older workers who are unemployed after one quarter remain unemployed the entire period. A similar stability can be noted for employed youths and prime-age workers. On the other hand, youths who are unemployed or not in the labour force appear to be more mobile than older persons in the same labour market states.

It was earlier noted that a relatively large share of those unemployed due to personnel and production cuts remain unemployed. This group of unemployed make relatively few transitions after the first two quarters to new states, particularly in comparison to those who have stated work completed as their cause of unemployment.

Table 5.5 is computed from the employment trees. It shows the unemployed distributed according to the number of uninterrupted quarters they remained unemployed. Besides columns for all individuals, for men and women, and for the three age groups studied earlier, a column for individuals unemployed due to personnel and production cuts has been included.

The differences between men and women, in terms of time before leaving the initial unemployment state, are not great. A larger share of men remain unemployed more than two quarters mainly because a higher per cent of women withdraw after one or two quarters in unemployment. The differences between age groups are more noticeable. The unemployment spells increase with the age of the group. As many as ten per cent of the older workers appear to have unemployment spells which are six quarters or more. The pronounced difference between this age group and the other two is probably partly a consequence of the laws regulating unemployment compensation and disability pensions. Finally, it is apparent that workers unemployed due to personnel and production cuts tend to remain unemployed for a relatively long time.[1]

[1] Björklund (1983) reports figures on expected duration in unemployment for individuals with various unemployment reasons. The figures were computed from the Labour Force Surveys for individuals who *were* unemployed. The longest expected time in unemployment was obtained for those stating personnel and production cuts as cause of unemployment.

Table 5.5 Quarters in unemployment. Per cent of each category

Duration (D) in unemployment	All	Men	Women	16-24 years	25-54 years	55- years	Unemployed due to personnel and production cuts
$\leq$ 2 quarters	66	64	69	72	65	45	59
2 < D $\leq$ 3 quarters	20	21	19	21	19	25	22
3 < D $\leq$ 4 quarters	7	8	7	5	9	10	8
4 < D $\leq$ 5 quarters	3	4	3	2	4	8	4
5 < D $\leq$ 6 quarters	1	2	0	0	1	2	1
> 6 quarters	2	1	1	0	2	10	6
	100	100	100	100	100	100	100

Table 5.5 can be compared with a table computed by Löfström (1983) on the basis of several studies of plant closures mainly from Great Britain and the U.S. According to her table, almost all the studies show that between 80 and 90 per cent of the individuals laid off have left unemployment within six months. The results in Table 5.5 do not suggest too different a conclusion. The per cent of individuals reported who have left unemployment within two quarters appears almost small by comparison.[1]

[1] Most of the studies referred to in Löfström's table were made in the 1960's and early 1970's. At that time it was easier to be reemployed in all the countries observed. This is one possible reason why in Table 5.5, with figures from a later period, relatively few individuals have left unemployment after two quarters. Another possible reason has to do with the Labour Force Surveys. As noted in the Appendix to Chapter 2, individuals are only observed once every quarter. Hence, it is likely that some of the individuals characterized as long term unemployed have been employed or not in the labour force although this has not been observed. Finally, and probably even more important, one should note that only those individuals who were unemployed when they were interviewed are in the sample. It is quite possible that a substantial number of individuals became unemployed after having had a job but found a new job before they were reported as unemployed in the Labour Force Surveys. If all these individuals had been included, Table 5.5 would perhaps have looked quite different.

A few descriptive statements may be made in summary. After one quarter in unemployment, more than half of the individuals in the sample had received a job. Women had chosen to leave the labour force to a greater extent. Furthermore, there appeared to be substantial differences depending on age, original sector of employment and reason for unemployment. The effect of age and sex is in accordance with findings in previous studies.

The number of individuals recorded as unemployed decreases throughout the five quarter sequence, while the share of those employed and of withdrawals increases. The specific pattern differs by sex, age and sector of origin as well as between individuals with different reasons for unemployment. Moreover, it is not a smooth process. Many of the individuals move back and forth between different states. More than a third of those individuals who leave unemployment during the first two quarters are unemployed again within five quarters.

Finally, the individuals' recent labour market experience seems to affect the probabilities of each of these moves. For example, for those with three repeated quarters in unemployment, the probability of being unemployed in quarter three is almost seven times as high as it is for those employed in quarter one and two.

5.5 WHO LEAVES UNEMPLOYMENT?

In the preceding section, variables such as sex, age, original sector of employment and reason for unemployment appear to be important for the labour market behaviour of unemployed individuals. Some other variables which might be of importance were identified in Section 5.2 presenting the analytical framework (i.e. membership in unemployment compensation funds and search intensity). The purpose of this section is to see how in particular sex and age relate to the employment situation of unemployed individuals who recently lost their jobs. However, other variables which appear to be of importance for the labour market prospects will also be commented on. Towards this end

several logit models have been estimated on the whole sample, for men, for women and for two age groups. The model utilized can be found in Section 5.2. The vector z includes all the variables in Table 5.1. Any deviations from the basic model are explicitly mentioned.

Differences Between Men and Women

Differences by sex in determining labour market transitions of the unemployed have been studied in seven different logit models. Most of the discussion will be based on a model estimated separately for men and women, in which the probabilities of going to one of the three labour market states not in the labour force (P_{un}), employment (P_{ue}), and unemployment (P_{uu}) *one* quarter after becoming unemployed are explained. Probabilities based on the results from the two estimations are presented in Table 5.6. Logit coefficients, standard errors and fit statistics for these models, and an equivalent model for all unemployed, are given in Table A.5.5.[1]

In addition, a model to explain the distribution on labour market states *five* quarters after the individuals became unemployed has been estimated for the total sample and for men and women separately. The results obtained were, on the whole, similar to those in the models explaining behaviour after one quarter. A few interesting deviations will be mentioned in the text but the complete results from the estimations will not be presented.[2]

Finally, a model including interaction terms between sex and age, age squared, children, occupational category, membership in unemployment compensation funds, and regional demand was estimated on the whole sample to explain the distribution

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[1] Two tail tests have been used to test the hypothesis that the coefficients are significantly different from zero. Coefficients significant at the ten per cent level are marked with an *.

[2] They are available from the author upon request.

across labour market states after one quarter.[1] It is possible to use this model to test whether the importance of some of the specific explanatory variables, for the labour market behaviour after one quarter, differs substantially between the sexes.[2,3]

In Table 5.6, flow rates are given for one quarter after the individuals became unemployed, computed on the basis of two logit estimations, for men and women separately. The first row in the table presents the "reference" case, with attributes as described in note 1 to the table. In the following rows new probabilities are presented. They have been computed by changing the values of some of the independent variables, one at a time.

Age appears to have a similar effect on the labour market behaviour of the two sexes. Compared with those 40 years old, 20 year olds have higher probabilities of withdrawal (P_{un}) and lower probabilities of unemployment (P_{uu}). Those 60 years old

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[1] This estimation includes those temporarily laid off (see note 1, p. 170). Comparisons between other estimations with and without those temporarily laid off (not including the interaction terms) show small differences in the signs and sizes of the coefficients as well as the standard errors.

[2] For this purpose, the null hypothesis of the equality of two substantively comparable coefficients in the same model will be tested using the test statistic

$$t = |(b_i - b_j) - 0| / s_{(b_i - b_j)}$$

The variance of the difference of two random variables is

$$\text{var}(b_i - b_j) = \text{var}(b_i) + \text{var}(b_j) - 2\,\text{cov}(b_i b_j)$$

[Hanushek and Jackson (1977)].

[3] The results from this estimation will not be presented. They are available from the author upon request.

have lower probabilities of becoming employed (P_{ue}) while the probabilities of continued unemployment (P_{uu}) are higher.[1,2]

Table 5.6 Labour market transitions one quarter after becoming unemployed. Computations based on logit estimations (Table A.5.4)

	Males			Females		
	P_{un}	P_{ue}	P_{uu}	P_{un}	P_{ue}	P_{uu}
"Reference" individual[1)] 40 years old	0.18	0.46	0.36	0.18	0.46	0.35
20 years old	0.29	0.44	0.27	0.27	0.44	0.29
60 years old	0.18	0.38	0.44	0.24	0.20	0.56
married	0.19	0.45	0.36	0.31	0.43	0.26
with children	0.21	0.47	0.31	0.12	0.40	0.48
member in unemployment compensation fund	0.10	0.48	0.42	0.11	0.38	0.51
searching intensively	0.16	0.54	0.30	0.15	0.64	0.21
working in public sector	0.19	0.53	0.29	0.17	0.65	0.18

1) A "reference" individual is 40 years old, not married, without children, a blue collar worker, not a member of an unemployment compensation fund, not searching intensively and working inindustry. In addition, the reference individual stated other(s) as reason for unemployment, became unemployed at a time when the value of the business cycle index was equal to the median for the five year period 1975 to 1979 and lived in a county with an excess demand value on the labour market equal to the median for counties. The characteristics in each row are the only ones that differ from those of the reference individual.

[1] MacKay (1972) suggests that P_{ue} decreases over 40 because of rising standards applied by the employers. This effect should be particularly strong for men, since for women there is an effect working in the opposite direction, i.e. that women over 40 rarely have small children. The pattern in Table 5.6 does not support MacKay's hypothesis.

[2] Only a few of the coefficients for age and age squared are significant (see Table A.5.5).

Marriage increases the probability that women leave the labour force (P_{un}).[1] Since marriage appears to decrease the probability of continued unemployment for women, but not for men, it is tempting to draw the conclusion that women who would otherwise be unemployed prefer to withdraw when they are married. It is interesting to note that this relation does not hold in the model explaining the distribution on labour market states after five quarters. The effect seems to be transient.

The changes in transition probabilities caused by the existence of children seem reasonable for the men.[2] When they have children, the probabilities of withdrawal (P_{un}) increase somewhat, which could be an effect of higher value being given to work at home. At the same time the probabilities of their remaining unemployed (P_{uu}) decrease.

The effect of children on the labour market behaviour of women is more surprising. High withdrawals should be expected but the most notable and only significant effect is a strong increase in the probability of continued unemployment (P_{uu}). This effect is no longer visible in the model explaining the labour market behaviour five quarters after unemployment. It seems as if women with children, for some time after they become unemployed, "prefer" to stay in this state. After five quarters, the existence of children has a positive (but not significant) effect on P_{ue}.

A negative effect of membership in unemployment compensation funds on the probability of leaving the labour force (P_{un}), and a positive one on the probability of remaining unemployed (P_{uu}), is found for both sexes. However, the effect

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[1] Other studies have noted that married men who, *ceteris paribus*, are under greater financial pressure to find work tend to obtain employment more quickly than single men. See for example MacKay and Reid (1972). In Table 5.6 there are no signs of this.

[2] But none of the coefficients in Table A.5.5 are significant.

of membership on the employment probabilities (P_{ue}) differs.[1] For males the probability of becoming employed increases, while membership for women appears to have the opposite effect. The effect of this variable and its relation to search intensity will be studied more closely in the next section.

Search intensity appears to be important in explaining the probabilities of becoming employed (P_{ue}) and remaining unemployed (P_{uu}). The former increases with intensive search while the latter decreases to a great extent for women in particular.[2,3] It is important, however, not to overstate the role of search strategy for the probability of obtaining employment. The effect observed might be the result of self-selection. The higher probabilities of becoming employed, as well as the intensive search strategy, might be caused by some underlying variables.[4]

The flow probabilities for individuals previously employed in the public sector have also been computed. Compared with those from industry, the probabilities of becoming employed (P_{ue}) are higher and the probabilities of remaining unemployed

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[1] But the two coefficients are not significant.

[2] The coefficients are significant for women.

[3] MacKay (1972) has made the distinction between "stickers" and "snatchers". "Stickers" attempt to obtain a new job with attributes comparable to those of the original job. This exposes them to longer periods of unemployment than "snatchers", who take whatever employment opportunities are available to them, thus experiencing shorter unemployment. In the short run "snatchers" accept lower wages but in the longer run their incomes are found to be just as high as, or higher than, those received by "stickers". In a later paper MacKay, together with Reid (1972), included variables to "pick up" search strategy in a regression model explaining length of unemployment after redundancy. They concluded: "The speed and intensity with which men looked for work and the particular search strategy they adopted had a considerable effect on the length of transitional unemployment they experienced". However, the actual channel of job search used in their study (e.g. employment service etc.) was not found to be significant.

[4] A method to correct for self-selection in the context of migration is suggested in Nakosteen and Zimmer (1980).

(P_{uu}) lower for those with a background in the public sector.[1,2]

A few comments should be made regarding the demand variables used, even though their effect (along with the effect of occupational category and reasons for unemployment) is not explicitly demonstrated in Table 5.6. From the coefficients in Table A.5.5 it is apparent that better business conditions lead to increases in P_{ue}, while P_{un} and P_{uu} decrease.[3]

The effect of regional demand on the flows is small.[4] However, regional demand has interesting and significant effects in the model explaining labour market behaviour after five quarters. The better the regional labour market prospects are, the higher is the probability of becoming employed (P_{ue}) and the lower the probability of remaining unemployed (P_{uu}) for women. This is possibly a consequence of employment prospects having greater regional variation for women than for men. These differences are not visible after one quarter, but after five quarters women in regions with low labour market demand remain unemployed to a larger extent than men. Alternatively, the finding may be not so much a consequence of differences in demand for men and women as it is of differences in behaviour. It is suggested in Chapter 6 that women remain unemployed after plant closures to a larger extent because they are reluctant to migrate. The regional variation result *could* be explained in a similar way: unemployed men in labour markets with weak demand migrate after a while, while women to a greater extent remain unemployed.

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1 The coefficients for P_{un} and P_{uu} are significant for women.

2 Applying the test statistic presented in note 2, page 183, it can be inferred that P_{ue} for women coming from industry is significantly lower than P_{ue} for women earlier employed in the public sector.

3 But the effect is only significant for the P_{ue} of women.

4 None of the coefficients are significant.

In Chapter 4 the likelihood ratio test was used to gauge the importance of duration for labour market transitions (see page 143). The same method will be used in this study to test the effect of sex on the labour market state distribution one and five quarters following the transition to unemployment. The explanatory value, the log likelihood, for a model with all individuals where sex is constrained to have no effect will be compared to the sum of the explanatory values obtained from the model estimated separately for men and women.

Judging from the empirical results presented in Table A.5.5 the hypothesis that the transition probabilities do not differ between the sexes cannot be rejected at a significance level of 0.10. However, for the models explaining the distribution on labour market states after five quarters the result is different. The hypothesis that the transition probabilities are not better explained with two models, one for each sex, can be rejected at the 0.10 level of significance.

Differences Between Age Groups

To study the age effect *one* quarter after becoming unemployed, six different logit models have been estimated. The discussion will rely primarily on two models, one for individuals 16 to 24 years of age and one for those 25 years and older. The results from these two estimations and from one for all individuals appear in Table A.5.6.[1] Transition probabilities based on the estimated models for the younger and older age groups have been computed and are presented in Table 5.7.

In addition, two models explaining the distribution across labour market states after *five* quarters have been estimated for the same two age groups. The explanatory

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[1] The set of explanatory variables is identical in the models for all individuals and for the older age group (see Table A.5.6). With this set of explanatory variables the model for youth did not converge. Therefore some changes were made. Marital status and unemployment reason were not included among the explanatory variables. Moreover, no interaction variables between sex and children or regional demand were included.

variables included in these models differ in some respects from those in the model which is constructed to explain behaviour during the first quarter.[1] References are made to these models when they differ in some interesting way from the models presented in Table 5.7.[2]

Moreover, a model to study the interaction between the two age categories and several independent variables has been estimated for the entire sample to explain the distribution across labour market states one quarter after the individuals in the sample became unemployed.[3] Based on this model it is possible, as was mentioned on page 183, to test whether the effects of the explanatory variables differ substantially between the two age groups.[4]

Table 5.7 is of the same kind as Table 5.6. The probabilities that individuals younger than 25 or 25 years and older will become employed, leave the labour force or remain unemployed, are presented. The estimates for a "reference" individual are given in the first row. In the following rows new probabilities, computed by changing the values of some of the independent variables, one at a time, are presented.

The computed transition probabilities of young men and women are similar. This indicates that sex is of little importance for the labour market behaviour of individuals younger than 25 years of age. The pattern observed for those 25 or older is different. Men have a significantly lower probability of leaving the labour force (P_{un}). Judging from the

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[1] Age and age squared are included in the models. On the other hand, sex is not an explanatory variable and the effects of children and regional demand are not analyzed together with sex, in interaction variables, as they are in Table A.5.6.

[2] The full results are available from the author upon request.

[3] The independent variables allowed to interact with age are sex, occupational category, membership in unemployment compensation funds, search intensity, dummy variables for sector industry and sector public services, and two interaction variables with sex and regional demand and sex and children.

[4] The complete results from this estimation are available from the author upon request.

computed probabilities they also tend to become employed (P_{ue}) and remain unemployed (P_{uu}) to a greater extent.[1]

These results are of some interest. They may imply that the relative merits of being outside the labour force are higher for women than for men, at least for those who are 25 or older. This would lead to a higher reservation wage for women, in turn resulting in lower P_{ue}'s and higher P_{un}'s. It is also conceivable that the results are a consequence of women receiving fewer offers. There could also be some unknown heterogeneity components behind the results. For example, the attitudes towards labour market participation or the education levels in the late 1970's might have differed between older men and women.

When the separate models for the two sexes were discussed, it was noted that the existence of children had a positive transient effect on P_{uu} for women. This effect is confirmed in Table 5.7, but only for the young women. For older women, children lead instead to a significant increase in P_{ue}. A possible explanation can be found. Young women are more likely to have small children. Consequently work at home might be relatively attractive to them. Thus they stay at home and remain unemployed, at least as long as they can collect some kind of unemployment compensation. For older women, who are more likely to have older children, the dominating effect is greater economic need. This need encourages them relatively more to work outside the home.

Membership in unemployment compensation funds increases P_{uu}, to a significant extent, for both age groups, while P_{un} decreases significantly for the older group. It is worth observing that the effect of membership in unemployment compensation funds on P_{ue} differs significantly between the two age groups.[2] For the older group, membership leads to higher

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[1] But the two coefficients are not significant.

[2] The conclusion is based on the model with interaction variables (in this case a variable for interaction between age group and membership in unemployment compensation funds).

P_{ue}, while the opposite seems to be true for the young. This indicates that unemployment compensation has a relatively stronger effect on the reservation wage of the young. In addition, it can be noted that the difference between the age groups is not significant after five quarters, when membership in the funds should be less important for the support received since the compensation period has expired.

Table 5.7 Labour market transitions one quarter after becoming unemployed. Comparisons based on logit estimations (Table A.5.6)

	Younger than 25 years			25 years and older		
	P_{un}	P_{ue}	P_{uu}	P_{un}	P_{ue}	P_{uu}
"Reference" individual[1)]	0.22	0.49	0.28	0.38	0.26	0.37
male	0.23	0.49	0.28	0.24	0.32	0.44
with children	0.18	0.44	0.37	0.22	0.44	0.34
member in unemployment compensation fund	0.17	0.44	0.38	0.19	0.29	0.52
searching intensively	0.19	0.57	0.23	0.34	0.40	0.26
working in public sector	0.20	0.60	0.20	0.42	0.35	0.22

1) A "reference" individual is female, not married, without children, a blue collar worker, not a member of an unemployment compensation fund, not searching intensively and working in industry. In addition, the "reference" individual has stated other(s) as reason for unemployment, became unemployed at a time when the value of the business cycle index was equal to the median for the five year period 1975 to 1979 and lived in a county with an excess demand value on the labour market equal to the median for the counties. The characteristics in each row are the only ones that differ from those of the "reference" individual.

The effect of intensive search is the same as was observed in the two separate models for men and women. It seems to pay off for both age groups, in the sense that P_{ue} increases to a significant extent. For the older group P_{uu} also decreases to a significant extent.

Basically, the effect of original sector of employment is the same as that observed earlier. A background in industry as compared with the public sector seems to imply lower P_{ue}'s and higher P_{uu}'s for both age groups.[1]

Finally, a few words should be said about the explanatory value of the full models. The likelihood ratio index indicates that the behaviour of the older group is better explained by the model. According to the likelihood ratio test, the hypothesis that age does not matter for the transition probabilities after one or five quarters can be rejected at a significance level of 0.10.

5.6 IS MEMBERSHIP IN UNEMPLOYMENT COMPENSATION FUNDS IMPORTANT?

The effects of various unemployment compensation schemes on the flow out of unemployment have been studied intensively during the last fifteen years. Most of the studies have used a search-theoretic framework although there are some studies utilizing other models (e.g. the traditional income-leisure choice model).[2]

What are the consequences of unemployment compensation on the behaviour of an unemployed individual? In Chapter 1 it was noted that a higher level of compensation in the standard search model has the direct effect of lowering search costs. Being unemployed becomes less costly. Hence, the reservation wage will increase, as will the time in unemployment.

Most, but not all, search models predict that an increase in unemployment benefits increases expected time in unemployment. Mortensen (1977) has developed a model that includes

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[1] Several of the coefficients for original sector, at least for industry and public services, are significant for the older group. For the young group none of the coefficients for original sectors are significant.

[2] See Pedersen (1981) for a survey of various theoretical approaches to the analysis of unemployment benefits.

the possibility of being laid off. Workers who are not eligible for unemployment compensation, new entrants for example, might in this model decrease their reservation wages and their expected durations when compensation is increased. The reason is that the value of working, which includes eventual unemployment compensation, has increased. The same situation applies to those who are on the verge of losing their compensation.

The conclusion from Mortensen's model is that a higher unemployment compensation increases the relative merits of work, in a world where layoffs exist. At the same time, search costs are lowered. Which of the two effects dominate? Burdett (1979 a) has demonstrated that the increase in the acceptance wage following the decrease in search costs dominates for those who have been unemployed a short time. For the long-term unemployed the increased attractiveness of work is more important. These results hinge on the assumption that unemployment benefits are not available forever. The closer to the end of the period for which unemployment benefits are available, the less important is the effect of an increase in unemployment benefits on the search costs.

This leads to an interesting conclusion. A higher compensation level should have a negative effect on long-term unemployment. Thus, the effect on average unemployment is not obvious, since it is the sum of short and long term unemployment.

In addition to these effects of unemployment compensation on the behaviour of those unemployed, there should be effects on labour force participation. Unemployment is clearly more favourable compared to withdrawal when unemployment benefits are increased. Since being employed implies some expected unemployment, a higher unemployment compensation will also make employment relative to withdrawal more favourable. Hence labour force participation should increase.

The Empirical Picture

Are these theoretical results in accordance with empirical facts from the Swedish labour market? An unambiguous answer to this question cannot be given. Several studies have been pursued, but the effects of unemployment benefits on unemployment are in these non-existent or weak. However, this might be a consequence of the lack of good data. For a discussion of this see Björklund and Holmlund (1983).

The empirical studies from Great Britain and the United States have been surveyed by Atkinson (1981) and Danziger, Haveman and Plotnick (1981) respectively. The conclusions seem to be that an increase in the benefit level by ten per cent increases the average unemployment time in Great Britain by one to two weeks and in the U.S. by one week.[1]

In this section will be studied the effect of membership in unemployment compensation funds, which in principle is voluntary, for the labour market behaviour of unemployed individuals. It can perhaps be questioned whether the theories presented are relevant for this purpose, since most of them have been developed with a pure transfer system in mind. However, the Swedish system has much in common with a transfer system. The government provided 75 per cent of the expenses of the system 1975 and by 1979 this share had increased to 88 per cent [Björklund and Holmlund (1983)]. In 1975, 64 per cent of the labour force were members of unemployment compensation funds.[2] Membership is voluntary, although in joining several of the labour unions one simultaneously becomes a fund member.

Which were the effects of membership in unemployment compensation funds noticed earlier in this chapter? As expected, membership implied a lower withdrawal for men, women and those

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[1] The benefit level = $\frac{\text{unemployment compensation}}{\text{normal wage}}$.

[2] In January, 1980, this figure was around 72 per cent [Björklund and Holmlund (1983)].

25 years and older. The same conclusion could be drawn from models explaining the distribution on labour market states one quarter and five quarters after the original unemployment (although the coefficient for men in the latter case is not significant).

The effect on the probability of remaining unemployed (P_{uu}) is also expected. In the estimations presented, explaining the developments during the first quarter, membership in unemployment compensation funds has a positive and significant effect on P_{uu} for men, women and both age groups. The effect is positive as well in the models predicting the labour market state after five quarters (although the results are not significant for men and for the young). Most of the coefficients are smaller after five quarters. This is in agreement with theoretical predictions.

In the models estimated, the effect of membership in unemployment compensation funds on the probability of going from unemployment to employment (P_{ue}) was never significant. In the standard search model and in most extensions, individuals choose between two states, employed and unemployed. In the framework used in this study they have a third option - to leave the labour force. This could explain why membership in unemployment funds has no significant effects on P_{ue}. The dominant effect is that on withdrawal (P_{un}): fund members find it worthwhile to stay in the labour force. Hence, they become unemployed (in fact in most cases, although not significant, also employed) to a greater extent.

Consequences of Fund Membership for Individuals with Various Unemployment Reasons

One way to examine the conclusions drawn from search theory, and perhaps get some insights into the effect of membership in unemployment compensation funds, is to estimate the logit model analyzed earlier for groups of individuals who are unemployed due to different reasons. Behind this procedure is the idea that search theory is more relevant for individuals with certain causes of unemployment.

Unemployment due to personnel and production cuts is hard to forecast. It seems likely that it affects individuals who had wanted and expected to continue their work. Since they are frequently in sectors like industry where unemployment is not part of the normal pattern, long term unemployment is likely to be regarded as somewhat suspicious by potential employers. In addition, the unemployed risk the deterioration of their skills. In the following analysis the presumption is that the aspects generally stressed in search theory are of lesser importance for these groups of unemployed.[1]

For individuals who have completed a job, the situation is likely to be different. In agriculture and construction, unemployment - when the season is over or when the job is finished - is part of the normal pattern. Potential employers are thus not likely to view unemployment as a signal of lower competence. Moreover, many of the unemployed stating work completed as reason for unemployment are youths who are not established in the labour market. It seems likely that search theory has a higher explanatory value for this group.

Even more obvious is the relevance of search theory for the group of people who have stated moving to another area as their reason for unemployment. Thus, in the following analysis this group has been lumped together with those who have completed their jobs. Logit models for the two groups have been estimated. The results obtained are those expected, coefficients for membership in unemployment compensation funds on the probability to remain unemployed (P_{uu}) were positive. This effect was stronger for those who had completed their jobs.[2]

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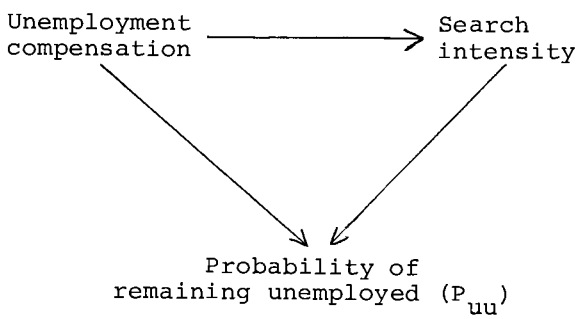
[1] Arguments for this standpoint can be found in many of the case studies referred to earlier of the behaviour of individuals affected by plant closures.

[2] The complete results from the estimations are available from the author. The coefficients measuring the effect on P_{uu} were, for individuals unemployed due to personnel and production cuts, 0.2075 (standard error 0.2335) while it was 0.2741 (standard error 0.1434) for unemployed due to completed work.

Unemployment Compensation and Search Intensity

In the section introducing the analytical framework, a model by Burdett (1979 b) was cited in which unemployment compensation was found to have two effects on the probability of remaining unemployed. First, higher unemployment compensation, as in the standard search model, led to a higher reservation wage and hence a longer duration in unemployment. Second, an increase in unemployment compensation reduced the search intensity, thereby decreasing the number of offers obtained, resulting in increased duration of unemployment.



The models estimated so far are reduced forms of the system above. The total effect of membership in unemployment compensation funds is not evident in these models. Part of it can be "picked up" by the measure of search intensity.

To study the importance of these relations, search intensity has been removed from three of the models estimated earlier: that for the full sample presented in Table A.5.5 and for the two with individuals unemployed due to various reasons discussed in this section.[1] Changes were noted in the coefficients for the effects of membership in unemployment compensation funds. For example, the positive effect of fund-membership on the probability to remain unemployed is, as expected, stronger in all three models, but on the whole the changes

[1] The full results from the estimations are available from the author upon request.

are minor. To take one example, in the model with search intensity estimated for all unemployed individuals fund members have a probability of remaining unemployed which is 0.10 higher than non-members. This difference has increased to 0.12 in the model without search intensity.

To draw firm conclusions from these models, regarding the effect of membership in unemployment compensation funds on future labour market states, would be presumptuous. It is obvious that membership is important in explaining the probabilities of withdrawal from the labour force (P_{un}) and of remaining unemployed (P_{uu}). Moreover, the effect seems to decrease over time in unemployment, which is what one would expect. The coefficient for the effect on P_{uu} was also somewhat higher for a certain group of unemployed for whom the predictions from search theory could be expected to be particularly relevant. However, it is not difficult to think of other plausible explanations for the observed results, including reverse causality. Membership could be more common among individuals who have greater probabilities of remaining unemployed. Membership in unemployment compensation funds could also be acting as a proxy for an established position in the labour market. It would then increase the probability of becoming employed and decrease the probability of withdrawal.

5.7 CONCLUDING COMMENTS

This chapter examines the future labour market prospects for workers who become unemployed. Using the Labour Force Surveys it is possible to obtain an eight quarter labour market history for a random sample of individuals in this situation. The results obtained complement the literature on plant closures, which is based mainly on case studies and rarely following individuals for more than a quarter or two after they become unemployed. They also shed some light on a few problems of more general interest for

labour economists, such as time dependence and multiple spells of unemployment.

Of particular relevance for comparisons with the case studies of plant closures are those giving personnel and production cuts as cause of unemployment. Thus, this group was distinguished whenever possible.

Previous studies of plant closures have focused on the distribution of the unemployed over labour market states at one, sometimes several, occasions after the shutdown. These studies leave the impression that the process following unemployment is smooth, that more and more individuals leave unemployment to become employed or to withdraw from the labour force without returning to unemployment. This is, however, far from an accurate description. Many individuals, especially youths, move back and forth between states. Approximately one third of the individuals in the full sample who leave unemployment during the first two quarters have been unemployed again by the fifth quarter. The same proportion of the full sample change labour market state in each quarter. Although this rate of change is somewhat lower for those unemployed due to personnel and production cuts, about 20 to 25 per cent of the individuals in this category change labour market state between quarters. A strong indication of the mobility is the fact that only 21 out of 977 individuals appear to have been unemployed for six consecutive quarters.

Substantial differences between men and women and between various age categories regarding the percentages reemployed and withdrawn from the labour force have been noted in previous studies. Similar results have been obtained here.

Studies of the consequences of plant closures for individuals' employment patterns have rarely included unemployment compensation as an independent variable. On the other hand, a substantial literature in labour economics has been devoted to an analysis of this variable. In this study, membership in unemployment compensation funds was found to have a significant

effect on the labour market behaviour of the unemployed. The findings lend some support to models implying that P_{uu} increases with higher unemployment compensation. The most important effect of membership was on withdrawals, which decreased to a significant extent. The results might seem provocative. At the least, they motivate further studies of incentive effects of the Swedish system of unemployment compensation.

Table 5.8 Labour market transitions one quarter after becoming unemployed. Computations based on logit estimations (Table A.5.4)

	Males			Females		
	P_{un}	P_{ue}	P_{uu}	P_{un}	P_{ue}	P_{uu}
"Reference" individual in public sector	0.19	0.53	0.29	0.17	0.65	0.18
in industry, unemployment reason other(s)[1)]	0.18	0.46	0.36	0.18	0.46	0.35
unemployment reason personnel and production cuts	0.16	0.44	0.39	0.18	0.45	0.37

1) See notes to Table 5.6.

It has been noted, furthermore, that unemployed workers who were previously employed in industry tend to be reemployed to a lower extent than those formerly employed in the public sector. The importance of original employment sector and cause of unemployment for the labour market prospects of men and women after one quarter can be assessed from Table 5.8 (partly relying on Table 5.6). Apparently, individuals from industry unemployed due to layoffs have a particularly rough labour market situation. This indicates a need to study the labour market prospects of this group more closely. This is the purpose of the following chapter.

APPENDIX

Table A.5.1 Labour force status. Distribution of unemployed five quarters after becoming unemployed. Total number and per cent

Males	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	87	103	107	104	91
	(12.4)	(15.0)	(16.1)	(16.7)	(15.7)
E	370	417	430	398	387
	(52.7)	(60.7)	(64.6)	(64.0)	(66.7)
U	245	167	129	120	102
	(34.9)	(24.3)	(19.4)	(19.3)	(17.6)
	702	687	666	622	580

Females	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	102	116	126	133	112
	(15.7)	(17.6)	(19.8)	(22.1)	(20.4)
E	347	410	402	367	348
	(53.3)	(62.2)	(63.1)	(61.0)	(63.3)
U	202	133	109	102	90
	(31.0)	(20.2)	(17.1)	(16.9)	(16.4)
	651	659	637	602	550

Table A.5.2 Labour force status. Distribution of unemployed five quarters after becoming unemployed. Total number and per cent

Age 16-24 Quarters after becoming unemployed

LF-status	1	2	3	4	5
N	104	124	122	131	99
	(16.6)	(19.7)	(20.4)	(22.7)	(18.5)
E	353	401	381	369	361
	(56.2)	(63.7)	(63.7)	(64.0)	(67.6)
U	171	105	95	77	74
	(27.2)	(16.7)	(15.9)	(13.3)	(13.9)
	628	630	598	577	534

Age 25-54 Quarters after becoming unemployed

LF-status	1	2	3	4	5
N	68	75	91	79	75
	(11.5)	(13.0)	(16.0)	(15.1)	(15.4)
E	317	365	381	342	327
	(53.8)	(63.1)	(67.1)	(65.5)	(67.3)
U	204	138	96	101	84
	(34.6)	(23.9)	(16.9)	(19.3)	(17.3)
	589	578	568	522	486

Age 55- Quarters after becoming unemployed

LF-status	1	2	3	4	5
N	17	20	20	27	29
	(12.5)	(14.5)	(14.6)	(21.6)	(26.4)
E	47	61	70	54	47
	(34.6)	(44.2)	(51.1)	(43.2)	(42.7)
U	72	57	47	44	34
	(52.9)	(41.3)	(34.3)	(35.2)	(30.9)
	136	138	137	125	110

Table A.5.3 *Labour force status. Distribution of unemployed five quarters after becoming unemployed. Total number and per cent*

Agriculture	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	8	5	16	25	19
	(8.1)	(5.0)	(16.3)	(26.6)	(22.6)
E	53	65	67	44	50
	(53.5)	(65.0)	(68.4)	(46.8)	(59.5)
U	38	30	15	25	15
	(38.4)	(30.0)	(15.3)	(26.6)	(17.9)
	99	100	98	94	84

Industry	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	47	49	52	49	44
	(16.8)	(17.8)	(19.1)	(19.9)	(19.1)
E	122	157	163	156	144
	(43.7)	(57.1)	(59.9)	(63.4)	(62.6)
U	110	69	57	41	42
	(39.4)	(25.1)	(21.0)	(16.7)	(18.3)
	279	275	272	246	230

Construction	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	19	23	23	22	22
	(10.3)	(12.8)	(12.8)	(13.3)	(14.8)
E	100	112	118	103	98
	(54.1)	(62.6)	(65.9)	(62.0)	(65.8)
U	66	44	38	41	29
	(35.7)	(24.6)	(21.2)	(24.7)	(19.5)
	185	179	179	166	149

Table A.5.3 (continued)

Private services	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	43 (11.4)	61 (16.4)	62 (17.5)	64 (18.6)	49 (15.4)
E	204 (54.3)	225 (60.5)	225 (63.4)	223 (64.6)	214 (67.3)
U	129 (34.3)	86 (23.1)	68 (19.2)	58 (16.8)	55 (17.3)
	376	372	355	345	318

Public services	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	68 (17.3)	78 (19.5)	78 (20.6)	74 (20.9)	66 (19.8)
E	232 (59.0)	251 (62.9)	242 (64.0)	230 (65.0)	221 (66.4)
U	93 (23.7)	70 (17.5)	58 (15.3)	50 (14.1)	46 (13.8)
	393	399	378	354	333

Table A.5.4 Labour force status. Distribution of unemployed five quarters after becoming unemployed. Total number and per cent

Personnel or production cut	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	36	40	45	37	41
	(13.3)	(15.1)	(17.2)	(15.0)	(17.8)
E	124	154	166	156	140
	(45.9)	(58.1)	(63.6)	(63.4)	(60.9)
U	110	71	50	53	49
	(40.7)	(26.8)	(19.2)	(21.5)	(21.3)
	270	265	261	246	230

Work completed	Quarters after becoming unemployed				
LF-status	1	2	3	4	5
N	80	97	104	107	96
	(12.9)	(15.5)	(17.3)	(18.9)	(18.6)
E	357	406	385	342	332
	(57.6)	(64.9)	(64.2)	(60.3)	(64.2)
U	183	123	111	118	89
	(29.5)	(19.6)	(18.5)	(20.8)	(17.2)
	620	626	600	567	517

Table A.5.5 Logit estimates of the impacts on labour force status one quarter after first recorded unemployment. All individuals, males and females. (Standard errors within parentheses)[1)]

	All unemployed	Males	Females
Not in the labour force			
Constant	0.1934 (0.9665)	0.9886 (1.328)	-1.591 (1.727)
Age	-0.5069E-01* (0.2961E-01)	-0.5264E-01 (0.4326E-01)	-0.6233E-01 (0.4529E-01)
Age^2	0.5554E-03 (0.3826E-03)	0.5164E-03 (0.5619E-03)	0.7712E-03 (0.5869E-03)
Marital status (married=1)	0.2957* (0.1660)	0.3620E-01 (0.2499)	0.4890* (0.2418)
Children	-0.1503 (0.1625)	0.1555 (0.2505)	-0.3475 (0.2279)
Occupational category (white collar = 1)	-0.1640 (0.1322)	-0.2721 (0.2504)	-0.1557 (0.1648)
Unemployment benefits	-0.3890* (0.1208)	-0.4326* (0.1775)	-0.3730* (0.1706)
Intensive search	-0.7611E-01 (0.1266)	-0.7625E-01 (0.1840)	-0.7739E-01 (0.1793)
Unemployment reason - work completed	-0.7094E-01 (0.1618)	-0.2319 (0.2200)	0.1043 (0.2577)
Unemployment reason - other(s)	0.8419E-02 (0.1603)	0.3156E-01 (0.2202)	0.1236E-01 (0.2502)
Sector - industry	0.5408* (0.2832)	0.1663 (0.3289)	1.439* (0.7235)
Sector - construction	0.2343 (0.3074)	-0.5501E-01 (0.3388)	1.560* (0.9027)
Sector - private services	0.2159 (0.2813)	-0.8699E-01 (0.3339)	1.065 (0.7159)
Sector - public services	0.6064* (0.2783)	0.2199 (0.3531)	1.492* (0.7094)
Business cycle	-0.5308 (0.8430)	-0.3624 (1.237)	-0.6684 (1.206)
Regional demand	0.6014E-02 (0.3246E-01)	-0.1031E-01 (0.4230E-01)	0.1514E-01 (0.5301E-01)

Table A.5.5 (continued)

	All unemployed	Males	Females
Employed			
Constant	-0.1627 (0.6568)	0.2298 (0.8684)	-1.516 (1.102)
Age	0.3347E-01 (0.2143E-01)	0.2631E-01 (0.2974E-01)	0.7046E-01* (0.3528E-01)
Age^2	-0.5146E-03* (0.2788E-03)	-0.3577E-03 (0.3834E-03)	-0.1097E-02* (0.4704E-03)
Marital status (married=1)	-0.1126 (0.1169)	-0.4658E-01 (0.1689)	-0.1314 (0.1759)
Children	0.3436E-01 (0.1145)	-0.1126E-02 (0.1718)	-0.4678E-01 (0.1664)
Occupational category (white collar = 1)	-0.1214E-01 (0.9649E-01)	0.7945E-03 (0.1737)	0.2238E-02 (0.1249)
Unemployment benefits	0.3410E-01 (0.8789E-01)	0.1489 (0.1267)	-0.9313E-01 (0.1273)
Intensive search	0.3164* (0.9053E-01)	0.1925 (0.1290)	0.4324* (0.1323)
Unemployment reason - work completed	0.1280 (0.1163)	0.2399 (0.1520)	0.2589E-01 (0.1940)
Unemployment reason - other(s)	0.3914E-02 (0.1179)	-0.1546E-01 (0.1595)	0.2862E-01 (0.1913)
Sector - industry	-0.4160* (0.1937)	-0.2710 (0.2308)	-0.6674 (0.4346)
Sector - construction	-0.2175E-02 (0.2029)	-0.2462E-01 (0.2267)	-0.1725 (0.6178)
Sector - private services	-0.1653 (0.1885)	-0.8301E-01 (0.2288)	-0.3524 (0.4241)
Sector - public services	-0.8482E-01 (0.1883)	-0.1271 (0.2464)	-0.1973 (0.4192)
Business cycle	1.521* (0.6054)	1.308 (0.8583)	1.786* (0.8960)
Regional demand	0.1311E-01 (0.2293E-01)	0.2708E-01 (0.2961E-01)	0.3414E-03 (0.3802E-01)

Table A.5.5 (continued)

	All unemployed	Males	Females
Unemployed			
Age	0.1722E-01	0.2633E-01	-0.0813E-01
	(0.3669E-01)	(0.3155E-01)	(0.3781E-01
Age^2	-0.0408E-03	-0.1587E-03	0.3258E-03
	(0.3826E-03)	(0.4031E-03)	(0.4931E-03)
Marital status (married=1)	-0.1831	0.1038E-01	-0.3576*
	(0.1655)	(0.1791)	(0.1891)
Children	0.1160	-0.1544	0.3943*
	(0.1229)	(0.1839)	(0.1805)
Occupational category (white collar = 1)	0.1761	0.2713	0.1535
	(0.1081)	(0.1863)	(0.1430)
Unemployment benefits	0.3549*	0.2837*	0.4661*
	(0.9718E-01)	(0.1377)	(0.1445)
Intensive search	-0.2403*	-0.1163	-0.4324*
	(0.1090)	(0.1430)	(0.1619)
Unemployment reason - work completed	-0.0571	-0.0080	-0.1302
	(0.1242)	(0.1621)	(0.2077)
Unemployment reason - other(s)	-0.1233E-01	-0.1610	-0.4098E-01
	(0.2525)	(0.1685)	(0.1988)
Sector - industry	-0.1248	0.1047	-0.7716*
	(0.2047)	(0.2523)	(0.4365)
Sector - construction	-0.2321	0.7963E-01	-1.3875*
	(0.2148)	(0.2470)	(0.6942)
Sector - private services	-0.0506	0.1700	-0.7126*
	(0.2001)	(0.2506)	(0.4259)
Sector - public services	-0.5216*	-0.0928	-1.2947*
	(0.2041)	(0.2736)	(0.4245)
Business cycle	-0.9902	-0.9456	-1.1176
	(0.6779)	(0.9418)	(1.0331)
Regional demand	-0.1912E-01	-0.1677E-01	-0.1548E-01
	(0.2475E-01)	(0.3067E-01)	(0.4438E-01)
Log likelihood	-1218	-637	-564
Degrees of freedom	2588	1338	1218
Log likelihood (at zero)	-1439	-753	-687
Likelihood ratio index	0.1535	0.1530	0.1782
Likelihood ratio statistic	442	230	245

1) For exact definitions of the variables see Table 5.1.
* Significant at a ten per cent level.

Table A.5.6 Logit estimates of the impacts on labour force status one quarter after first recorded unemployment. All individuals, 16-24 years of age and 25 years and older. (Standard errors within parentheses)[1)]

Not in the labour force	All unemployed	Younger than 25 years	25 years and older
Constant	-0.9032 (0.6187)	-1.198 (0.8361)	-0.8138 (0.9606)
Sex (male=1)	-0.2404 (0.1490)	0.3486E-01 (0.1731)	-0.4717* (0.2588)
Marital status (married=1)	0.1120 (0.1312)	-	0.2326 (0.1796)
Occupational category (white collar=1)	-0.1985 (0.1337)	0.3585E-01 (0.1799)	-0.4205* (0.2105)
Unemployment benefits	-0.4398* (0.1192)	-0.2334 (0.1615)	-0.6187* (0.1806)
Intensive search	-0.6663E-01 (0.1264)	-0.7319E-01 (0.1695)	-0.1113 (0.1951)
Unemployment reason - work completed	-0.4601E-01 (0.1616)	-	0.6042E-01 (0.2439)
Unemployment reason - other(s)	0.2918E-01 (0.1601)	-	0.2808 (0.2307)
Sector - industry	0.6001* (0.2810)	0.3518 (0.3995)	0.7049* (0.4248)
Sector - construction	0.2584 (0.3104)	0.5468E-01 (0.4768)	0.5233 (0.4394)
Sector - private services	0.2559 (0.2795)	0.1125 (0.3995)	0.3235 (0.4232)
Sector - public services	0.6398* (0.2777)	0.3296 (0.4013)	0.8379* (0.4120)
Business cycle	-0.5847 (0.8451)	0.1721 (1.151)	-1.548 (1.304)
Children (for men)	-0.6700E-01 (0.2003)	-0.7320E-01 (0.2586)	0.6297E-01 (0.2470)
Children (for women)	-0.3585* (0.1777)		-0.5220* (0.2402)
Regional demand (for men)	-0.2479E-02 (0.4166E-01)	-0.1375E-01 (0.3945E-01)	0.7257E-01 (0.8480E-01)
Regional demand (for women)	0.1740E-01 (0.5127E-01)		-0.6034E-01 (0.1058)

Table A.5.6 (continued)

Employed	All unemployed	Younger than 25 years	25 years and older
Constant	-0.1851 (0.4062)	-0.1548 (0.6081)	-0.3959 (0.5764)
Sex (male=1)	0.7113E-01 (0.1107)	-0.6012E-02 (0.1317)	0.2194 (0.1910)
Marital status (married=1)	-0.1896* (0.9540E-01)	-	-0.1374 (0.1242)
Occupational category (White collar=1)	0.1478E-01 (0.9767E-01)	0.5573E-01 (0.1370)	0.9768E-02 (0.1480)
Unemployment benefits	0.2901E-01 (0.8662E-01)	-0.7987E-01 (0.1223)	0.2026 (0.1299)
Intensive search	0.3336* (0.9028E-01)	0.2122* (0.1267)	0.4556* (0.1347)
Unemployment reason - work completed	0.1412 (0.1160)	-	0.1207 (0.1636)
Unemployment reason - other(s)	0.1824E-01 (0.1179)	-	-0.1544 (0.1635)
Sector - industry	-0.3735* (0.1913)	-0.2378 (0.2917)	-0.5141* (0.2752)
Sector - construction	-0.2459E-02 (0.2044)	-0.1567 (0.3445)	-0.1101 (0.2731)
Sector - private services	-0.1259 (0.1864)	-0.3476E-01 (0.2879)	-0.2469 (0.2677)
Sector - public services	-0.4350E-01 (0.1871)	0.3375E-01 (0.2911)	-0.1879 (0.2650)
Business cycle	1.488* (0.6049)	1.533* (0.8714)	1.775* (0.8917)
Children (for men)	0.1518 (0.1407)	-0.3084 (0.2008)	0.7932E-01 (0.1665)
Children (for women)	0.1607 (0.1283)		0.5595* (0.1768)
Regional demand (for men)	0.2200E-01 (0.2925E-01)	-0.2737E-03 (0.3053E-01)	-0.1027E-01 (0.4920E-01)
Regional demand (for women)	0.5290E-02 (0.3691E-01)		0.1567 (0.9654E-01)

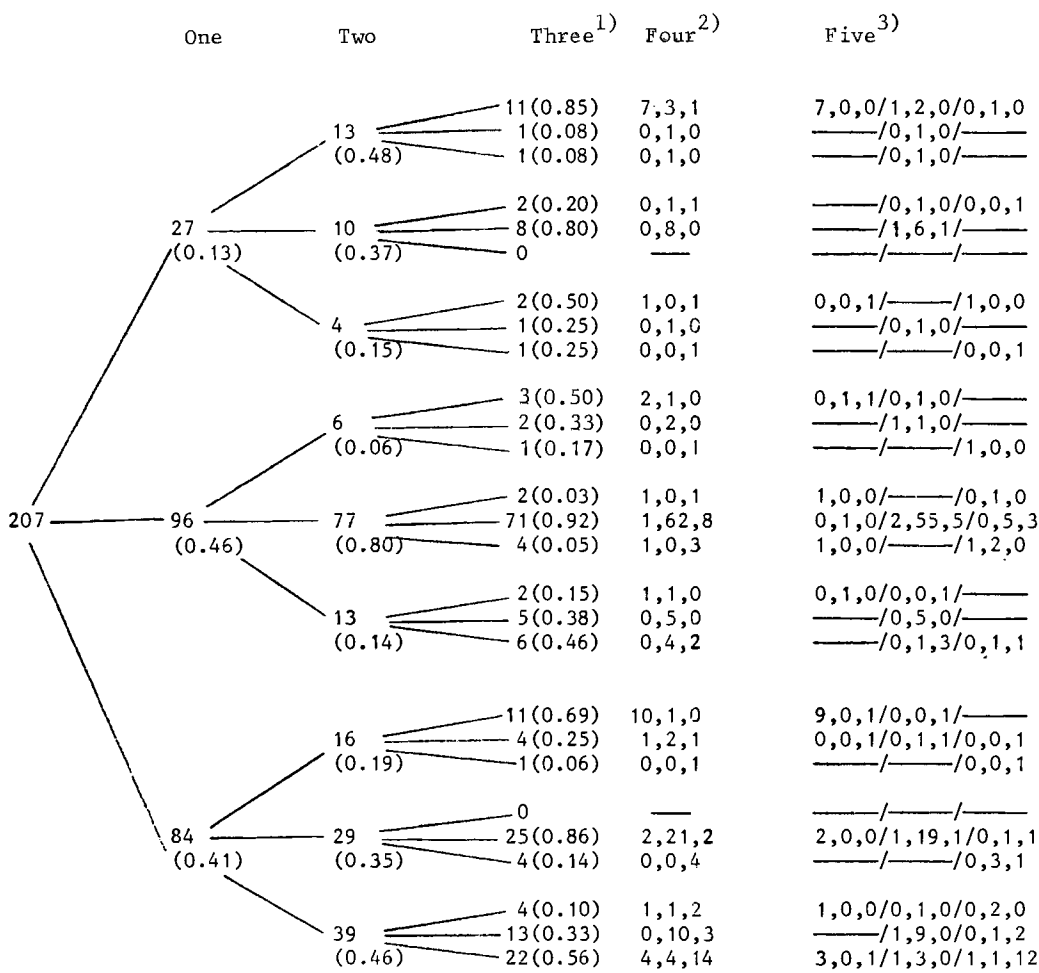
Table A.5.6 (continued)

Unemployed	All unemployed	Younger than 25 years	25 years and older
Sex (male=1)	0.1693 (0.1229)	-0.2885E-01 (0.1545)	0.2523 (0.1931)
Marital status (married=1)	0.0776 (0.2054)	-	-0.0952 (0.1305)
Occupational category (white collar=1)	0.1837* (0.1096)	-0.9158E-01 (0.1644)	0.4107* (0.1564)
Unemployment benefits	0.4108* (0.9570E-01)	0.3133* (0.1399)	0.4161* (0.1384)
Intensive search	-0.2670* (0.1045)	-0.1390 (0.1518)	-0.3443* (0.1504)
Unemployment reason - work completed	-0.0952 (0.1233)	-	-0.1811 (0.1699)
Unemployment reason - other(s)	-0.4742E-01 (0.1238)	-	-0.1264 (0.1648)
Sector - industry	-0.2266 (0.2012)	-0.1140 (0.3332)	-0.1908 (0.2802)
Sector - construction	-0.2559 (0.2162)	0.1020 (0.3782)	-0.4132 (0.2826)
Sector - private services	-0.1300 (0.1974)	-0.0777 (0.3258)	-0.0766 (0.2740)
Sector - public services	-0.5963* (0.2025)	-0.3607 (0.3330)	-0.6500* (0.2784)
Business cycle	-0.9033 (0.6765)	-1.7051 (1.0403)	-0.2270 (0.9455)
Children (for men)	-0.8480E-01 (0.1523)	0.3816* (0.2107)	-0.1423 (0.1751)
Children (for women)	-0.1978 (0.1408)		-0.3750E-01 (0.1874)
Regional demand (for men)	-0.1950E-01 (0.3029E-01)	0.1402E-01 (0.3656E-01)	-0.6230E-01 (0.4966E-01)
Regional demand (for women)	-0.2270E-01 (0.4151E-01)		-0.9640E-01 (0.8372E-01)
At convergence			
Log likelihood	-1225	- 567	- 638
Degrees of freedom	2586	1170	1392
Log likelihood (at zero)	-1439	- 656	- 783
Likelihood ratio index	0.1487	0.1352	0.1862
Likelihood ratio statistic	428	177	292

1) For exact definitions of the variables see Table 5.1.
* Significant at a ten per cent level.

Figure A.5.1 Employment tree. Individual employment histories for six quarters, for those unemployed due to personnel and production cuts. Total number. (Relative frequencies within parenthesis).

Quarters after becoming unemployed



1) Read column from top to bottom as N, E, U, N, E, etc.

2) Read each row from left to right as N, E, U.

3) Read each row from left to right. The first observations for N, E, U within brackets belong to those who were in N after four quarters, the following three figures to those with E after four quarters, etc.

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6. Consequences of Plant Closures for Individual Employment

6.1 INTRODUCTION

In Chapter 1 it was noted that the effects of plant closures during the 1970's were a matter of strong public concern in Sweden. The primary reason for this was probably an awareness of the severe consequences for many of the individuals directly affected by the closures. In several studies from the late 1960's and early 1970's, it was noted that a relatively large share of the individuals laid off were not re-employed.[1,2]

Considering the attention paid to plant closures in the political discussion, and the money spent on measures to prevent them or ease their consequences, it should be no surprise that plant closures have been studied by many researchers from various academic fields.[3] An interest in the consequences of plant closures has also motivated some of the chapters in this dissertation: notably this chapter, Chapter 3, and, to a substantial extent, Chapter 5.

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[1] See Pettersson (1973), Berger (1973) and Gonäs (1974).

[2] There may be additional reasons for the role played by plant closures in the public discussion. When big plants close down, many individuals are hit by unemployment at the same time. As a group they can, better than other categories of unemployed, put pressure on the politicians and get attention from the media.

[3] Some references are Lipsky (1970), MacKay and Reid (1972), Stern (1972), Stern, Root and Hills (1974) and Jacobson and Thomason (1979). For Swedish examples besides those mentioned in note 1, see Hansson (1976), Edin (1981), Heikensten (1982), Löfström (1983) and Mossfeldt (1983).

In this chapter, individual consequences of plant closures will be studied. The intention is to describe and explain what, in fact, happened to individuals who were laid off when industrial plants closed down in Sweden during (mainly) the late 1970's. This knowledge is useful when the employment consequences of a plant closure are forecasted. In turn, forecasts of this kind are a necessary input in cost-benefit studies of different policy alternatives in situations when big industrial plants face the risk of closure.[1]

In the next section, an analytical framework for the study of individual labour market consequences of plant closures is developed, drawing on earlier studies of plant closures, on the search model presented in Chapter 1 and on the preceding discussions in this dissertation, especially Chapters 4 and 5.

The empirical analyses contained in Chapters 2-5 have been based on the Labour Force Surveys. The data used as the basis for this chapter were drawn from reports to the National Labour Market Board (Arbetsmarknadsverket) regarding the labour market status of workers at one point in time following lay off due to plant closure. Approximately half of those involved in closures of larger plants in Sweden between 1975 and 1979 are included. The data base is described in detail in Section 6.3.

In Section 6.4 these data are used to describe what happened to the unemployed some months after the plant closure; for example, reemployment and migration are evaluated by sex and age. The results can be compared with some of the figures from Chapter 5.

Section 6.5 is devoted to a study of factors explaining which individuals will become employed locally. A logit model is used for this analysis. The main disadvantage with this model, and the ones analyzed in the following sections, is the constraints set by the data base on the explanatory variables available. Age and current business conditions appear to be the most important variables in affecting the probability of becoming employed locally.

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[1] Indevo (1980), Jungenfelt et al. (1981) and Heikensten (1982) are examples of this kind of studies.

Individuals who do not become reemployed locally are assumed to choose between migrating or staying in the local labour market. This choice is analyzed with a logit model in Section 6.6. Again, age is found to be important, but so are sex and other factors.

Unemployment, withdrawal from the labour force or participation in some kind of program organized by the labour market authorities are the options available for those individuals who have neither received (and accepted) a job nor migrated. The state in which different individuals are in is partly a function of their preferences, but is also affected to a great extent by decisions made by the labour market authorities. Factors explaining the distribution of individuals without regular work on different labour market states are studied with a logit model in Section 6.7.

6.2 ANALYTICAL FRAMEWORK

In Chapter 5, the labour market situation of individuals who were unemployed after having had a job was analyzed. A similar task is undertaken in this chapter, but the population studied is limited to those unemployed due to plant closures. Judging from the figures presented in Chapter 5, on the labour market prospects of unemployed due to personnel and production cuts in industry, as well as from earlier studies of plant closures, the particular group studied in this chapter faces a relatively difficult labour market situation. This does not, however, preclude the use of more or less the same analytical framework.

It can safely be assumed that *most* individuals who are laid off when a plant closes down want a new, similar job in the same area. This is a conclusion that can be drawn from earlier studies of plant closures. In addition, the individuals have, in a sense, revealed this preference for a job in the region, by working there until they were laid off. This is not to say that there are no individuals who would turn down offers of new jobs with the same characteristics as the old job. The attitude

towards work, the income situation or, for that matter, any other factor like family situation, might have changed in connection with the plant closure.

If it is assumed that most individuals who receive local job offers accept them, traditional search theory is a less useful tool in explaining who becomes employed. Instead, it becomes more important to study decisions made by employers. Why do certain individuals and not others receive job offers? It is reasonable to assume that the decisive factor is the productivity or potential productivity of the individual as perceived by employers.

The individuals who remain unemployed can stay in the region and continue to search for acceptable job offers, join some program organized by the labour market authorities, such as retraining, or withdraw from the labour market. Alternatively, they can migrate to some other region, to search or to take a job. In the following study, it will be assumed that the individual chooses between two options, staying or migrating. This decision is made to maximize expected future benefits for an individual or a household. The benefits depend to a great extent on the job offer probabilities in the local labour market relative to those in other regions.[1]

Individuals who have neither been offered and accepted a local job nor migrated may continue to search, withdraw or accept some "offer" from the labour market authorities. In some of the earlier chapters, the choice between continued search and withdrawal was discussed. Individuals' decisions were assumed to be based on the relative returns from different labour market states. For example, continued search is more attractive the higher the direct unemployment compensation. Withdrawal, on the other hand, is encouraged by some compensation schemes, such as those for retirement and disability pensions. Preferences would also be expected to play a role. Individuals who value work at home or leisure relatively more are more likely to withdraw.

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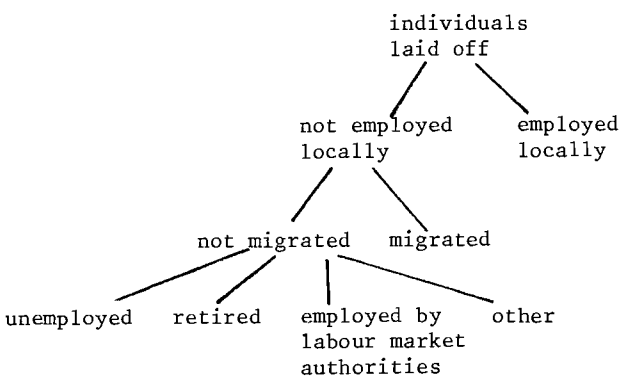
[1] Naturally, differences in wages offered are of importance. In present day Sweden, however, there is little variance in wages offered for similar jobs in different regions.

In principle, nothing would change if a third alternative, participation in programs organized by the labour market authorities, is added. The relative returns are still decisive.[1] Different labour market programs probably have different effects on future labour market prospects. This, as well as the direct compensation for the different activities, is important for the choices made by the individuals. However, it is obvious that the individuals cannot choose freely between the programs or, for that matter, between different compensation schemes when unemployed or outside the labour force. Some alternatives might simply not be available, due to lack of funds etc. Others are restricted to some categories of individuals. The individuals will act with these restrictions in mind. In the end, the distribution over labour market states will be a result of a complex interplay between the individuals concerned, the authorities and the existing regulations.

The previous discussion, based on the story told in earlier studies of plant closures, indicates that the decision problem of a laid-off individual may be represented in the following way:



[1] Returns have to be given a broad interpretation. For example studies referred to in Wadensjö (1983 a) suggest that those offered the same compensation in the form of a disability pension or for sheltered work prefer the latter.

There are statistical advantages with a structure of this kind. If models explaining each step in the decision process are estimated, the explanatory power in each of the models could be relatively high, at least compared with a model of a simultaneous choice between all labour market options. At the same time, it is clear that tests based on this framework, chosen *a priori*, hinge on the assumption that the way the decision process is structured is relevant. Since systematic comparisons have not been made between different possible frameworks, it cannot be concluded that the framework used here is "best", in any statistical sense.[1]

6.3 THE DATA BASE

When an employer in Sweden intends to lay off more than five individuals, he is required to notify the county office of the National Labour Market Board (länsarbetsnämnden) at least two months in advance. The local labour market authorities will then form a committee (samarbetsgrupp) to help the individuals concerned. They also report the plans of the employer to the National Labour Market Board.

For some time during the 1970's many of the district offices reported the result of their work to the National Labour Market Board. It is possible to get relevant information from these reports for a study of the employment consequences of industrial close-downs.[2] The reports include the address of the plant, the industrial sector to which it belongs, the number of people affected (divided into broad occupational

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[1] A possibility which has been pursued is that the individuals originally choose between staying and migrating. The explanatory power in this migrational model was found to be low compared to the model explaining migration in the present framework. A nested model could also be used where, for example, the migrational choice is made simultaneously with the choice of a local non-employment alternative.

[2] The formal code for these reports is U4109. Information based on them has earlier been used by Heikensten (1980) and Edin (1981 and 1983). In the latter studies non-standardized information collected from committee minutes is also used.

groups), the date of the notification to the Labour Market Board and the date the individuals were laid off. To this was added a table with all the individuals affected, divided into sex and age groups, and the distribution over new labour market states a few months after the plant closure.[1]

The length of the period from the actual closing of the plant to the time when the Labour Market Board is notified (i.e. reports are made) varies between one and nine months. This creates problems attempting to explain future labour market status of individuals laid off in connection with plant closures. The existent literature shows that the distribution of such individuals across labour market states, changes as the time from closure is lengthened [see for example Löfström (1983)]. This change, characterized by a gradual decrease in the proportion of unemployed and an increase in the proportion of employed, was also noted for the sample of unemployed analyzed in Chapter 5 (see Figure 5.1).

To shed light on this particular aspect of the data, frequency tables were made relating the distribution of individuals over labour market states to different periods between the actual time of the plant closure and the time when the reports were sent to the Labour Market Board. No dependence between the distribution on labour market states and time after closure was found.[2] This could be interpreted as a challenge to the conclusions drawn in earlier studies or in Chapter 5. However, it is more likely that the lack of a systematic relation between the distribution on labour market states and the time from the closure to the observation is, in fact, a result of

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[1] The following labour market states were included: continued employment in firm, new local employment, employment in other regions, labour market training, semi-sheltered employment, relief work, archive work, sheltered employment, retirement or disability pension, sick leave, others, and unemployment. Sheltered and semi-sheltered work as well as archive work will, in the following, be lumped together under the heading sheltered work.

[2] Several different measures for time between closure and observation are used by Edin (1981 and 1983), included in regressions explaining the share of laid off individuals getting a new job. The results are not conclusive.

the character of the data. Few closures are actually accomplished at one specific point in time. More commonly, people are laid off during a period of a few months. Thus, it is often hard to identify the exact date of closure.[1,2]

To make inferences regarding the population of Swedes affected by plant closures the data base should ideally cover all plant closures in the country or, alternatively, be a random sample from that population. However, it is not possible to even determine the actual number of plant closures in Sweden. What is known is only the number of plants that have reported *plans* to close down (varsel). These figures are given in Figure 6.1 for the years 1965 to 1980 together with the number of individuals affected.

There are reasons to believe that the labour market consequences are more severe when plants employing many individuals close down. Moreover, it is mainly in these situations that extraordinary policy measures have been taken. For these reasons, but also because the coverage of data from larger plants is better, *the analysis will be based on information only from closures involving more than 50 persons*.

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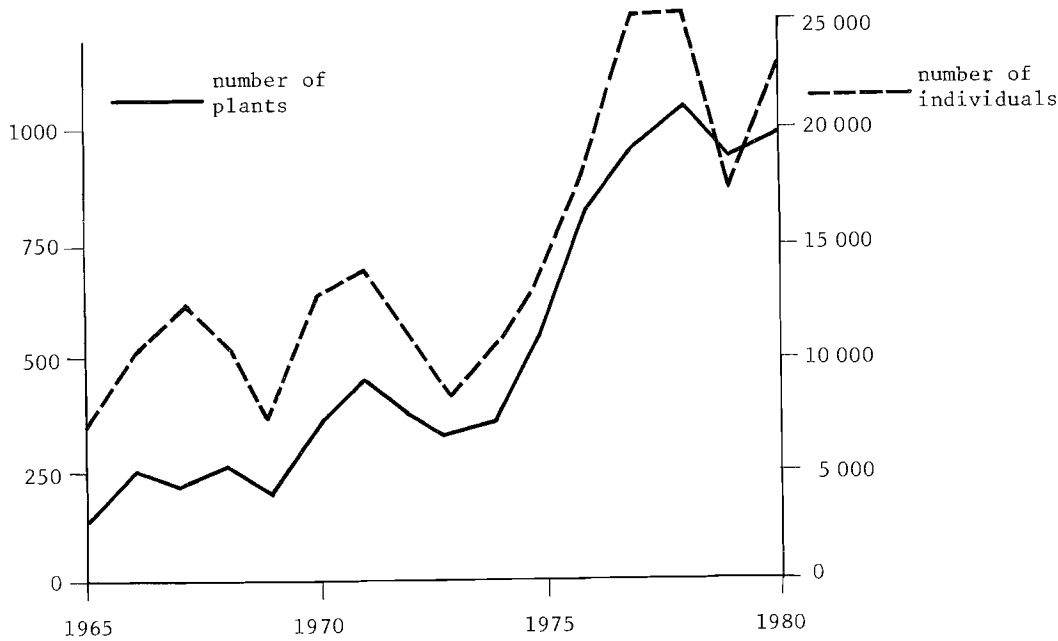
[1] In this data base the median value of time from the last individual is laid off to observation is two to three months.

[2] There is another possible reason for the lack of a systematic relation between the distribution on labour market states and the time of observation in this data set. The reports on which the data set is built are filed by the local employment agencies. They do this at different times after the closures, but they tend to do it when the acute crisis is over and the distribution of the laid off individuals is beginning to stabilize. This would, in itself, result in relatively similar employment patterns being reported.

Figure 6.1 Planned closures of industrial plants in Sweden 1965-1980 (number of plants and individuals affected)



Source: The diagram is based on figures from National Labour Market Board (1965-1980).

Only from some of the plants that actually have closed is it possible to obtain information about the consequences. Table 6.1 gives the number of plants and individuals covered by the data base by county.[1] For comparison one would like to have these figures for all closures carried out.[2] Since this is not available, figures on reported planned closures are given. The study will concentrate on the years 1975-1979, the time

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[1] Around 20 per cent of the plants referred to as closed down, and included in the data base, were actually not closed. More than 50 individuals had to leave, but the firm kept operating on a smaller scale.

[2] No studies have been made since the 1950's to find out the exact number of *actual* plant closures in Sweden. Before the late 1970's almost all the planned closures of plants with more than 50 employees were, however, carried through. [Sources in the National Labour Market Board.]

period when the coverage measured as in Table 6.1 is best.[1]

From Table 6.1 it seems as if some counties like Stockholm, Jönköping, Kronoberg, Kristianstad, Älvsborg, Västmanland and Norrbotten kept records over almost all closures and reported the information to the National Labour Market Board. Therefore, knowledge is available from most of the plant closures which were reported as planned. Other counties have filed reports on few or no closures. This could render inferences for the population at large inappropriate if counties with a particular kind of labour market (e.g. high unemployment rates) were over-represented in the data base. However, no systematic bias of this kind can be detected in Table 6.1.[2]

In the empirical work the data will be divided into the three regional groups used in Chapter 3: big cities (counties 01, 12 and 14), forest districts (counties 17 and 20-25) and the rest of the country. Separate studies will be made for the two industrial sectors with most big plant closures: the textile and clothing industry and the pulp and paper industry. How well data from these sectors cover the planned closures is shown in Table 6.2.

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[1] The relation between actual closures and closures included in the data base might, during this period, be more favourable. Policies were, from the first of February 1977, changed in a way which encouraged advanced notice of plans to close down. This may have had a positive effect on the ratio between planned and actual closures.

[2] Älvsborg accounts for 25 per cent of the individuals observed in this study. Edin (1981) compares the distribution of individuals on labour market states in this district with that in other districts. Minor differences were found.

Table 6.1 Closures of industrial plants, affecting more than 50 persons, planned and covered by the data base 1975-1979 (number of plants and individuals)

county	planned		in the data base	
	number of plants	number of individuals	number of plants	number of individuals
01 Stockholm[1)]	9	1,162	14	1,299
03 Uppsala	1	113	-	-
04 Södermanland	5	593	3	238
05 Östergötland	6	397	-	-
06 Jönköping	13	1,320	10	936
07 Kronoberg[1)]	12	845	11	868
08 Kalmar	15	1,413	2	132
09 Gotland	-	-	-	-
10 Blekinge	11	894	3	283
11 Kristianstad	12	1,189	9	1,077
12 Malmöhus	16	1,956	2	137
13 Halland	13	1,398	-	-
14 Göteborg and Bohus	22	2,281	9	940
15 Älvsborg[1)]	20	2,760	28	2,693
16 Skaraborg	10	917	7	491
17 Värmland	16	1,444	-	-
18 Örebro	11	824	-	-
19 Västmanland[1)]	8	1,082	10	903
20 Kopparberg	10	899	2	114
21 Gävleborg	8	901	1	213
22 Västernorrland	6	777	-	-
23 Jämtland[1)]	3	279	3	390
24 Västerbotten	3	452	-	-
25 Norrbotten[1)]	1	58	1	66
Total	231	23,954	115	10,780

1) The number of plant closures or individuals included for these counties in the data base is higher than the number anticipated. Two explanations are possible. Either some closures were never recorded as planned or the final figure from a reported closure was greater than the planned figure.

Table 6.2 Closures of industrial plants, affecting more than 50 persons, planned and covered by the data base, textile and clothing industry and pulp and paper industry (number of plants and individuals)

sector	planned		in the data base	
	number of plants	number of individuals	number of plants	number of individuals
Textile and clothing 1975-1979	60	6,645	31	2,877
Pulp and paper 1970-1980	28	4,239	10	1,133

Only four of the closures in the pulp and paper sector between 1975 and 1979 were recorded. Thus, the period of analysis for this sector was extended. For the period 1970 to 1980 data from ten closures can be found. If the period is extended further back to 1966, another four plants can be included, but now no comparison with the number of planned closures is possible. All the 14 plants from which information is available, with a total of 2445 individuals, will be included in the data base.[1,2]

This section has presented the data base, which is one with major advantages, above all its coverage of more than 10,000 individuals and more than 100 plant closures. At the same time it has drawbacks, namely the non-randomness of the sample and the time from closure to observation ambiguity. These drawbacks should be kept in mind when interpreting the results.

6.4 THE DISTRIBUTION ON LABOUR MARKET STATES

In this section the labour market consequences for individuals laid off due to closures of big plants will be described using four figures. The population observed is broken down according to labour market states by sex, age, a business cycle indicator

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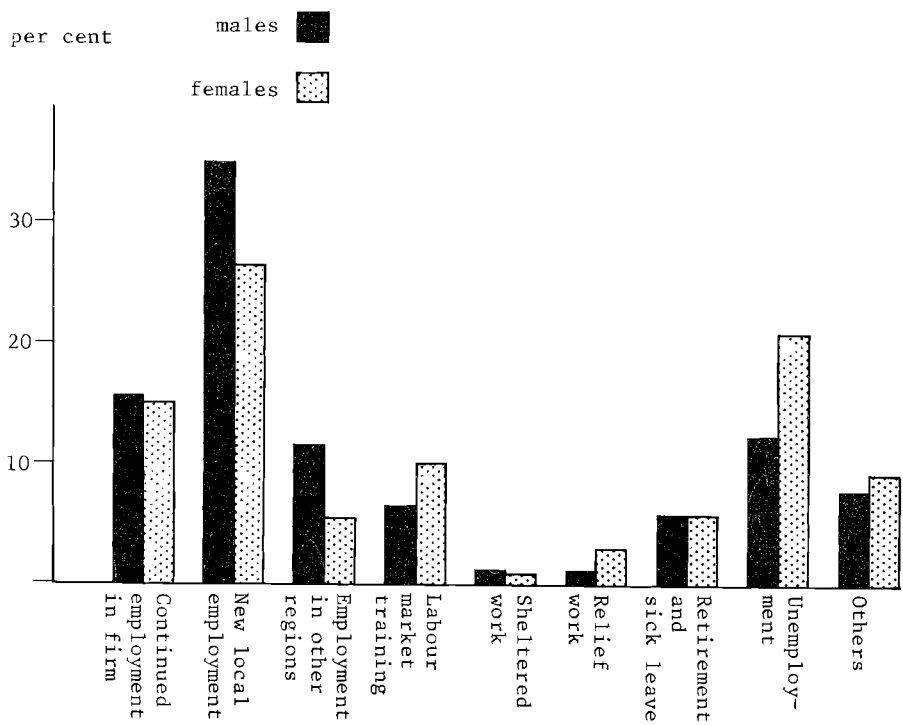
[1] The four plants from the 1960's included in the data base were all situated in Västernorrland, a county with a particularly harsh labour market.

[2] The labour market has, since the middle of the 1960's, gone through changes. This must be remembered when the results of the pulp and paper sector are interpreted. It also makes comparisons between this sector and the textile and clothing industry as well as the different regions somewhat dubious.

and a measure of the size of the plant closed down as a share of total local employment.[1,2] Some of these variables, notably sex and age, were found in Chapter 5 to be important for the labour market prospects of unemployed individuals. From the discussion in the following sections it will be apparent that the business index and relative plant size, as well as sex and age, can be expected to be important on theoretical grounds.

Figure 6.2 Men and women distributed over labour market states after plant closures. Swedish industry 1975-1979 (per cent)

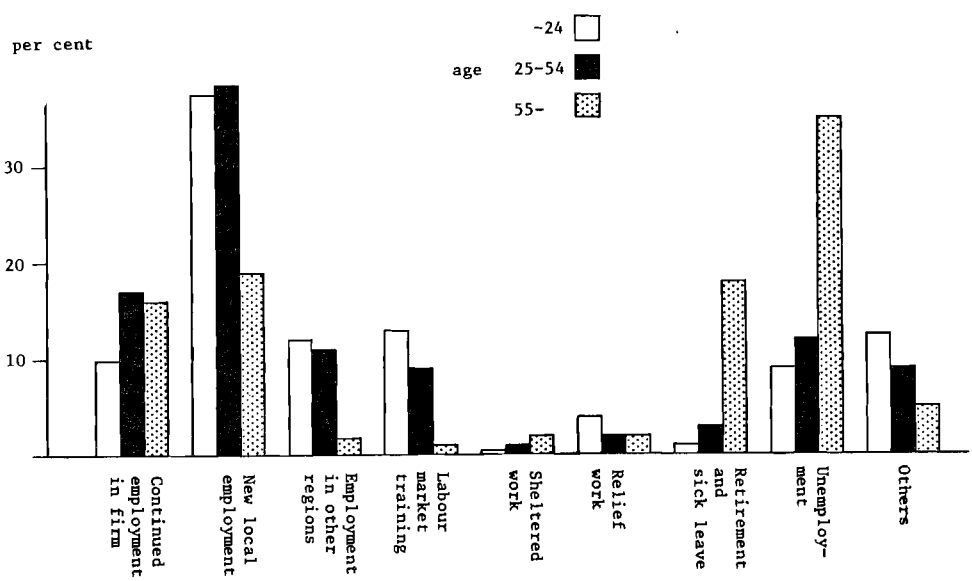


[1] Economic activity is measured by the value of a business cycle index from the month in which the plant closed down. The index is a weighted combination of per cent firms having full capacity utilization and per cent firms lacking skilled workers and technicians [National Economic Research Institute (1982)]. In this chapter the original index values have been multiplied by a factor of ten.

[2] The measure used to relate the size of the plant closed down to the local labour market is the number of individuals laid off in relation to the total number of full time employed in the community (tätort) according to the census of 1975. For closures in the pulp and paper sector made before 1975, the census of 1970 is used instead [Statistics Sweden (1970 and 1975)].

Figure 6.2 shows the distribution of men and women over nine separate labour market states. The differences between the sexes are marked. More than 36 per cent of the men, compared with 27 per cent of the women, received new jobs locally. Migration to new jobs was also much more common among men. Altogether, around half of the men got new jobs. This was true for only about a third of the women. The mirror image of this is the shares of men and women in non-employment states. Among the women 22 per cent remained unemployed, while over ten per cent received labour market training. The comparable figures for men were thirteen and seven per cent respectively.

Figure 6.3 Individuals in different age groups distributed over labour market states after plant closures. Swedish industry 1975-1979 (per cent)



The figure above shows the distribution of individuals in three different age groups on the same labour market states as in Figure 6.2. Obviously, the chances are much greater for youths or prime-age workers to find new jobs than for older

workers. The prime-age group is slightly more successful in finding local jobs, while younger people migrate to a somewhat larger extent. Labour market training and relief work is, clearly, more important for youths, while older workers tend to be found in various categories of sheltered work, retirement and unemployment. Continued employment in the firm is somewhat more common for those between 25 and 54 years of age than it is for older workers. Two conflicting tendencies are perhaps hidden behind this: According to the new "security laws" mentioned in Chapter 1, priority should be given to those with more tenure, when it is decided who should be allowed to stay in the firm. In addition, older people are in some cases, particularly in the pulp and paper industry, offered to stay for a few months and "clean up" the site. People in their most productive ages are, on the other hand, kept in the firm on a long-term basis.

Figure 6.4 Individuals distributed over labour market states after plant closures at times with high and low economic activity. Swedish industry 1975-1979 (per cent)

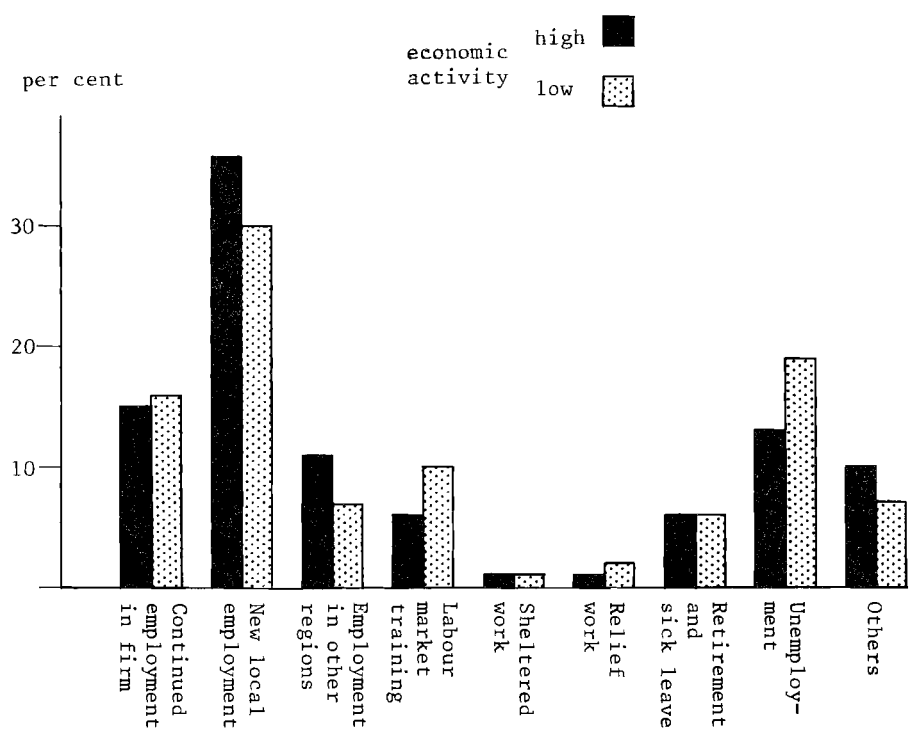
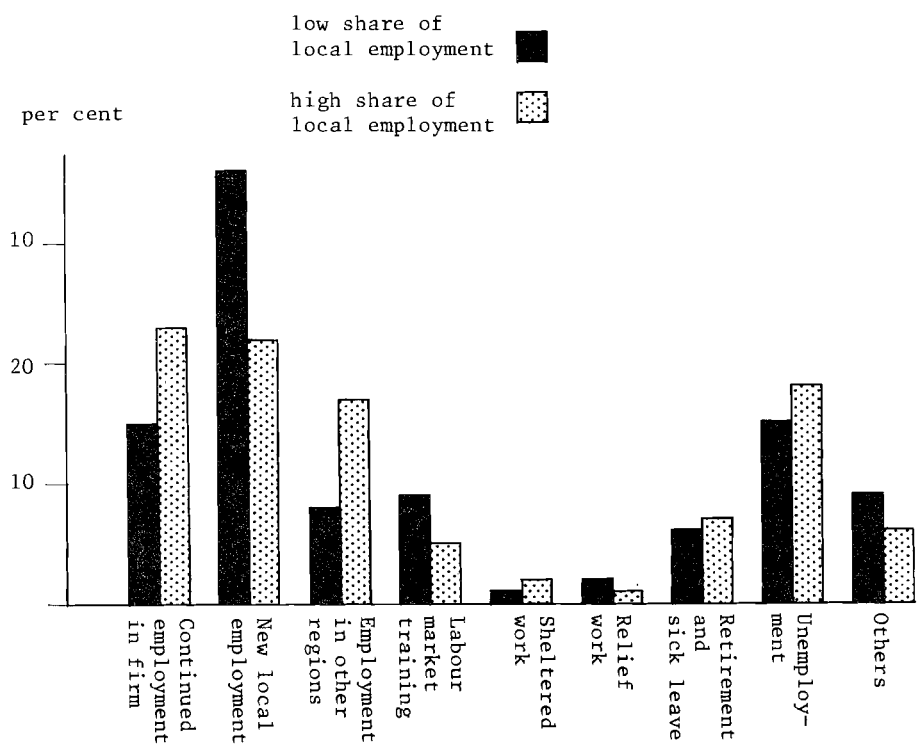


Figure 6.4 indicates the role of the level of economic activity for the employment situation after a plant closure.[1] When business conditions are good, around 65 per cent obtain regular employment compared to 50 per cent when economic activity is low. Somewhat surprising is the fact that continued employment in the firm is not lower when economic activity is low. This is, possibly, an effect of the subsidy schemes mentioned in Chapter 1, which were introduced to encourage firms to refrain from layoffs (e.g. the so-called 25-krona). Labour market training, relief work and unemployment are more common in periods with low activity, while the pattern for different kinds of sheltered work and retirement is less clear-cut.

Figure 6.5 Individuals distributed over labour market states after closures of plants with low or high shares of local employment. Swedish industry 1975-1979 (per cent)



[1] Values of the index over the median for the period are regarded as high.

Finally, the distribution across states by the number of individuals laid off as a percentage of local employment is shown.[1] When the plant closing down is large relative to the local labour market, a smaller share of the individuals affected obtain new local jobs. On the other hand, the share remaining employed in the old firm, or migrating, is in this case relatively high. How the number of individuals enrolled in different labour market programs is affected is not as clear, although it seems as if labour market training is more common when the firms are small relative to the labour market, while the opposite is true for sheltered work. The proportion of the unemployed increases somewhat with the relative size of the plant.

6.5 WHO BECOMES EMPLOYED LOCALLY?

The notion that individuals laid off after plant closures generally would accept offers of jobs with similar characteristics in the same area was the point of departure for the analytical framework in Section 6.2. It follows from this that an analysis of the question of who becomes employed locally must concentrate on a more basic question: who gets job offers?

If there are differences between individuals, the local firms will be willing to pay more for those who either have a higher current productivity or are relatively cheaper to train.[2] Trade union policies in Sweden hold variances of wages for the same kind of work to a very low level. Therefore, the most suitable individuals will instead be hired first.

Many individual characteristics are related to productivity. Training, experience, education and physical or mental capability

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[1] The share of local employment is considered high when the number of individuals laid off in relation to the total number of full time employed in the community is more than five per cent.

[2] Thurow argues that the greater part of the necessary skills for most jobs is gained "on-the-job". Where an individual will be placed in the unemployment line will thus be decided by the cost of training [Thurow (1979)].

is, perhaps, what comes first to mind. One of these, education, could be observed in the sample from the Labour Force Surveys used in Chapter 4. The data used in this chapter are more limited. The only individual characteristics that can be observed are age and sex.

Age is important because it is related to training and experience. Young persons do not, on the one hand, have much experience. On the other hand, they have a higher average level of education. They are perhaps also easier to train, and money invested by a firm in their training can be regained over a longer period. Moreover, older persons tend to have a lower physical capacity.

Sex is also related to experience and education. Women are on average less educated and tend to have a shorter working life. In addition, sex *per se* might play a role. Physical differences and prejudices can be detrimental to the labour market prospects of women.

The probability that an individual receives an offer of a local job depends not only on individual characteristics. The relation between demand and supply on the labour market is also of importance. If wages are constant, the number of job openings, in relation to the length of the unemployment line, will play a decisive role. The number of job openings is likely to follow a business cycle pattern. It is also influenced by regional growth. At the same time, the unemployment line will be affected by the relative size of the plant closed down. The fewer the individuals laid off, the greater their chances to get a new job.

Even if most individuals offered a job are likely to accept the offer, it is clear that the probabilities of acceptance cannot be ignored totally.[1] For some categories of individuals the merits of remaining unemployed or withdrawing from the labour force might

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[1] In addition, it should be remembered that search intensity was found in Chapter 5 to be important for the probability to become employed. The same conclusion has been drawn by other researchers [MacKay and Reid (1972)]. This indicates that it might be dangerous to look at the offer probabilities separately, without considering the effect that search might have on the number of offers received.

be relatively high (e.g. young students, women with small children or older persons covered by pension schemes). This must be remembered when the results are interpreted.

On the basis of this discussion, a model to explain who becomes employed locally after plant closures can be formulated:

$$(6.1) \qquad P_{ij} = f_{ij}(z) \; ; \quad i = u \quad j = el, ne$$

The vector z includes variables which explain whether an individual becomes employed locally (el) or remains without a local job (ne). *Sex* and *age* are two variables of obvious relevance that are available from the data base.[1] In addition, the month when the plant closed down is available and a monthly business cycle index used (see note 1, page 227) to obtain a measure of *aggregate demand*.[2] It is also possible to *relate the size of the plant closed down to the local labour market* (see note 2 on page 227). An index could be used to study regional demand as well (see Chapters 4 and 5). To increase flexibility, separate estimations for different regions will be made.[3]

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[1] Age has, in Chapters 4 and 5, been introduced not only linearly, but squared as well. In addition, separate models have in some cases been estimated for different age groups. Other studies have used dummy variables. All this has been done because there are reasons to believe that the probabilities to become unemployed differ between age groups, and that they are high in both the young and old age brackets. In this particular sample, consisting of individuals with *industrial experience* laid off when the plant where they worked closed down, especially harsh labour market prospects for the old but not for the young are to be expected. Therefore, age is only entered linearly in the models estimated.

[2] In Chapter 1 it was argued that the labour market, since the middle of the 1960's, has gone through a period of rapid structural changes. Edin (1981 and 1983) draws the same conclusion in his studies, where he compares the employment prospects for individuals laid off during the period 1966-1980. This could motivate the introduction of a trend variable based, for example, on the year and month when the plants close down. However, since in this case the period studied is only five years long for all sectors except pulp and paper, no trend variable will be included.

[3] It is not so obvious theoretically why industrial sector of origin should affect the probability of getting a new local job. However, in some earlier studies it has been observed to be important. Thus, separate models will be estimated for two different industrial sectors: pulp and paper and textiles.

The model in (6.1) will be estimated with the logit model used in Chapters 4 and 5 to guarantee that $\sum_j P_{ij} = 1$ and $0 \leq P_{ij} \leq 1$.[1]

Before the estimated logit models are commented on, it seems worthwhile to show how the observed individuals, in different regions and sectors, are divided between the two labour market options, employed locally and not employed locally. Clearly, there are, according to Table 6.3, differences between the regions and sectors. A comparatively large share of the individuals affected in the forest counties and the pulp and

Table 6.3 Individuals employed locally and not employed locally, by region and industrial sector

	Big cities		Forest counties		Rest of the country		Total	
	employed locally	not employed locally	employed locally	not employed locally	employed locally	not employed locally	employed locally	not employed locally
Number of observations	1306	1070	199	586	3570	3915	5168	5470
% of observed individuals	55.0	45.0	25.4	75.6	47.7	52.3	48.5	51.5

	Textile and clothing industry		Pulp and paper industry	
	employed locally	not employed locally	employed locally	not employed locally
Number of observations	1282	1595	827	1618
% of observed individuals	44.6	55.4	33.8	66.2

[1] The program used is QUAIL [Berkman and Brownstone (1979)].

paper industry obtained no local job.[1] On the contrary, more than 50 per cent of the unemployed in the big cities did get a new local job.

Table 6.5 gives intercepts, logit coefficients, standard errors and goodness of fit statistics from six different regional and sectoral estimations. Based on the model for total Swedish industry, the probabilities for different values of the explanatory variables have been computed in Table 6.4. This exercise demonstrates the relative importance of the different variables. It is evident that age is important. The probability that an individual who is 20 years old gets a local job is fifteen percentage units higher than that for someone 60 years old. Economic activity also seems to have an important effect. Going from the median value of the index to the highest in the period increases the probability of local employment by twelve percentage points. Sex and the size of the plant employment share seem to be relatively unimportant.

[1] In the data used there are two different states of employment which individuals can enter when chosen by local employers: continued employment in firm and new local employment. As mentioned earlier, people obtain "continued employment in firm" for very different reasons. In some cases the closures were only partial or the individuals were chosen by their old company to stay and take on a new job. In other cases, notably in the forest counties and in the pulp and paper industry, they were only employed for a short adjustment period, while the plant was closing down. The first situation is similar to being chosen by a new employer, while the other type of employment tends to be given to people who otherwise would be out of work. To take this into account, individuals with "continued employment in firm" in the forest counties and the pulp and paper industry have been classified as unemployed. However, even if they had been classified as employed, the differences in Table 6.3 would have been apparent.

Table 6.4 Probabilities of becoming and not becoming employed locally after a plant closure. Computations based on logit estimation for total Swedish industry (see Table 6.5)

	Probability of becoming employed locally (P_{el})	Probability of not becoming employed locally (P_{ne})
"Reference" individual[1)]	0.63	0.37
20 years old	0.70	0.30
60 years old	0.55	0.45
females	0.62	0.38
formerly employed at a large plant[2)]	0.59	0.41
laid off when aggregate demand is high[3)]	0.75	0.25

1) A reference individual is a man, 40 years of age, laid off from a plant employing five per cent of the local labour market at a time when the value of the business cycle index is equal to the median.

2) The number of individuals laid off from the plant is equal to 25 per cent of the local labour force.

3) The highest value of the business cycle index for the period 1975-1979.

The effect of age is negative and significant in the models for all regions and sectors (see Table 6.5). This indicates that the employers act as if the longer training and experience accompanying age is less important than adaptability and physical strength, or that the short time to regain human investment is detrimental to the employment prospects of the old. In addition, the observed sign on the age variable could be a result of the behaviour of the unemployed. Older unemployed persons have lower incentives to search for a job. Among other factors, more favourable compensation schemes are open to them if they stay unemployed or withdraw from the labour market.[1]

[1] Wadensjö (1983 b) shows how the social compensation schemes during the seventies have changed so that disability pensions and sick leave compensation have improved more than returns from regular work, particularly for older workers. He also refers to a study according to which older workers, in situations when plants close down, are under social pressure not to compete with younger workers for the few local jobs available.

The coefficients for sex (females = 1) are negative in all models in Table 6.5 (not significant in the forest counties). This indicates that women, as expected, obtain fewer job offers and/or have lower probabilities of acceptance.

The hypothesis that a higher level of aggregate demand has a positive effect on P_{el} gets substantial support.[1] Only in one case, the pulp and paper industry, does the opposite seem to be true.[2] The effect of the size of the plant closure in relation to the local labour market is not as clear-cut. In all regions a relatively large plant seems to imply lower probabilities of local employment. This was expected. Also, the high standard error in the big cities seems reasonable. In this region no establishments are large relative to the labour market as a whole. In the textiles or pulp and paper sectors, however, the opposite effect is obtained. This may be an effect of larger spending on labour market measures to "save jobs" in situations where a large plant dominates a local labour market.[3]

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1 Löfström (1983) concludes, on the basis of a literature survey abour plant closures, that "the role of the business cycle for the labour market adjustment of individuals laid off is likely to be small". Judging from Table 6.5, Löfström is not right.

2 The interpretation of the result for the paper and pulp industry is complicated by the combination of a relatively long period of observation and structural changes in the labour market, noted in Chapter 1.

3 Edin (1981) estimated the role of the size of the plant closed down and the size of the local labour market (defined as the number of employed in a municipality, a wider definition than the one used in this study) for the share of individuals at a certain plant getting new jobs. His results were not conclusive. In a later study, Edin (1983) draws the same conclusion on the basis of a similar model. His results cannot be directly compared with the findings in this section. He tries to explain the share of the individuals in a certain plant who become employed. What is explained in this section is the probability that an individual gets a *local* job. The findings can be reconciled if those who, according to the model in this section, do not find local jobs, because of the size of the plant closed down relative to the local labour market, migrate and find jobs.

Table 6.5 Binary logit estimates of contributions to the probability that a laid off individual will be locally employed (P_{le}) (standard errors within parentheses)[1),2)]

	Big cities	Forest counties	Rest of the country	Total	Textile and clothing industry	Pulp and paper industry
Constant term	-0.2475 (0.3260)	-0.5459 (0.8368)	0.6825E-02 (0.1425)	0.5102* (0.1219)	0.3643E-01 (0.2772)	1.709* (0.3136)
Sex (women=1)	-0.1093* (0.4638E-01)	-0.3605E-01 (0.1031)	-0.2383* (0.2393E-01)	-0.1879* (0.2014E-01)	-0.3090* (0.4362E-01)	-0.5044* (0.8888E-01)
Age	-0.6370E-02* (0.1777E-02)	-0.1019E-01* (0.3246E-02)	-0.9170E-02* (0.8726E-03)	-0.7849E-02* (0.7419E-03)	-0.1015E-01* (0.1445E-02)	-0.1286E-01* (0.1570E-02)
Aggregate demand	0.2705E-02* (0.5003E-03)	0.8557E-03 (0.1189E-02)	0.2847E-02* (0.2220E-03)	0.1330E-02* (0.1748E-03)	0.3457E-02* (0.4319E-03)	-0.5284E-03* (0.2579E-03)
Share of local employment	-0.1312 (0.2493)	-0.9146 (0.5815)	-0.1656* (0.7618E-01)	-0.3500* (0.7035E-01)	0.4732E-01 (0.1776)	0.2136* (0.6527E-01)
Log likelihood	-1603	-437	-5003	-7234	-1899	-1508
Degrees of freedom	2371	780	7480	10640	2872	2440
Log likelihood (at zero)	-1647	-544	-5188	-7379	-1994	-1695
Likelihood ratio index	0.2690E-01	0.1955	0.3577E-01	0.1965E-01	0.4756E-01	0.1100
Likelihood ratio statistic	89	213	371	290	190	373

1) In this and the following tables an * implies that the coefficient is significantly different from zero. A two tail test has been used and the level of significance is five per cent.

2) The coefficient for P_{ne} is equal - P_{el}.

To get an idea of the relative importance of different explanatory variables for the local employment probabilities, a review of computations in Table 6.4 is most appropriate. However, in Table 6.5 it is possible to compare the size of a certain coefficient in a model for one region or sector with the same coefficient in another model. Apparently, sex is relatively most important for P_{el} and P_{ne} in the two industrial sectors: one is dominated by male and the other by female employment. Age is also of relatively great importance for P_{el} and P_{ne} in the industrial sectors and in the forest counties as well. The coefficients for the business cycle variable are largest in the textile industry and the rest of the country

(which has a large share of industrial employment in textile industry). Finally, the coefficient for the share of local employment is largest in the forest counties.

The likelihood ratio test used in Chapters 4 and 5 will be utilized to test the hypothesis that the probabilities of becoming or not becoming employed locally do *not* differ between the three regions controlling for other characteristics in the model. This implies a comparison between the sum of the log likelihoods from the three regional models and the log likelihood from the model for total Swedish industry.[1,2] Since a model consisting of three separate estimations, one for each region, has an explanatory value significantly higher (at the one per cent level) than a model for all regions combined, the hypothesis is rejected.[3]

6.6 WHO MIGRATES?

In Chapter 3, a model was developed to study the consequences of a plant closure for a regional labour market. It relied partly on the standard migratory model [Sjaastad (1962)] which was presented briefly. Central to this model is the assumption that individuals maximize utility. Since income is the most

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[1] See page 143, Chapter 4.

[2] As mentioned in Chapter 4, the goodness of fit statistics give limited information. When the log likelihoods at convergence and zero are compared, it is obvious that the models have *some* explanatory value. Judging from likelihood ratio indices the models for forest counties and the pulp and paper sectors have the highest explanatory values.

[3] In note 1, page 235, it is mentioned that individuals with continued employment in firm have been classified as employed in total Swedish industry, big cities and rest of the country, while they are treated as unemployed in the forest counties. The likelihood ratio test can only be used to compare models similar in this respect. Hence, separate models for the forest counties, with the same classification as in the other regions, have been estimated for the likelihood ratio tests used in this section and the following one.

important argument in the utility function, choices between regions are based on present value calculations, where the difference in costs between the two alternatives is subtracted from the difference in incomes.

As mentioned in Chapter 3, this formulation overlooks the fact that non-monetary factors play a decisive role for the choice of region in which to live. It also has an underlying premise of perfect information. It was made clear in Chapter 1 that search theory emphasizes the role of the wage distribution for individual employment decisions.[1] This central position normally given to the distribution of wages does not seem particularly interesting for analyses of migration in Sweden. Wages, especially after tax wages, facing individuals probably do not differ much between regions. The deciding factor for the choice of an unemployed individual will be the probability of getting a job.[2]

Many individual characteristics are likely to influence migration decisions and thus should ideally be included in a model explaining migration. As in the last section, where the probability of getting a local job was studied, the analysis of the impact of individual factors on migration has to be limited to age and sex. An older person can expect to have a lower probability of getting a local job in the future, since a firm that has to pay for the introduction of a new worker will prefer someone younger. This will induce out-migration of older persons. A young individual, on the other hand, may have more to gain by migrating. Being out of work is more costly

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[1] Few search theoretic formulations of migration seem to exist. In David (1974) individuals are assumed to choose between different labour markets on the basis of the distribution of wages. The search for a new job does not begin until after the individual has moved. This approach may be questioned for at least two reasons. The choice of labour market, in which an individual laid off chooses to search, is probably not made on the basis of the distribution of wages, but rather on the probability of getting a job. Besides, the search for a job normally begins before the decision to migrate is made.

[2] This does not imply that incomes play no role in migration decisions. Lower compensation for unemployment or participation in different labour market programs is likely to increase migration out of regions with unemployment.

the younger one is, if human capital deteriorates with unemployment or if the work provides "on the job training", which is suggested by findings in Björklund (1981).

In addition, age is related to several other factors that might influence the decision. Younger persons could be expected to adjust more easily to a new environment and perhaps have another evaluation of risk. On average, they also have less capital invested locally and therefore might have less to lose when migrating.

Sex is also of importance in the migration context. Women can be expected to have lower chances to receive new local jobs. At least this conclusion can be drawn from the previous section. This might induce migration.

So far, each individual has been assumed to maximize his or her own present value of future costs and benefits. It would, perhaps, be more reasonable to assume that a couple maximizes the future income of the household [Mincer (1978)]. To study this particular hypothesis in depth is, unfortunately, not possible since there is no information on marital status or incomes of the spouses in this data base. But the idea that couples maximize the future income of the household has consequences for the effects of sex on migration. Since it is likely that women have a lower income, it follows that their choice will often be dominated by men's, when the incomes are maximized jointly. A couple is therefore less likely to migrate when it is the woman who loses her job. As a consequence, the rate of migration for women should be lower.

The probability of migration depends on factors other than individual characteristics. A high level of economic activity will increase the probability of getting a job within the region, and in other regions as well. Thus, the effect on migration cannot be decided *a priori*. The effect of a greater local excess supply of labour or of a slow rate of regional growth is, however, obvious. Migration is stimulated.

A model to explain the probability of migration (P_m) and of staying in the local labour market (P_s) may now be formulated in terms similar to expression (6.1).

$$(6.2) \qquad P_{ij} = f_{ij}(z) \; ; \quad i = u \quad j = m,s$$

The migration choice is explained with the same variables (z) as the probability to get a local job: sex, age, aggregate demand and the size of the plant closed down in relation to the local labour market. The variables are also defined as in the previous section. Separate estimations will again be made for three different regions and two industrial sectors.[1]

In Table 6.6 the actual migration choices made by the individuals laid off who have not received new jobs in the region, are observed.[2] There are substantial differences between regions in percentages of migrants. In the late 1970's most indicators of labour market demand would favour big cities, with the rest of the country coming second and the forest districts last. If the regions are ranked according to the percentage of migrants, the same order is obtained. The proportion of workers from the textile and clothing industry who have migrated is relatively small. This is consistent with the hypothesis that women are less likely to migrate than men, an issue to which we shall return.

The intercepts, coefficients, standard errors and goodness of fit statistics from the logit models estimated are presented in Table 6.8. Based on the model for total Swedish industry, probabilities of migration (P_m) and staying (P_s) have been computed for different values on the explanatory variables. They are presented in Table 6.7.

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[1] The logit model utilized earlier will be used to guarantee that $\sum_j P_{ij} = 1$ and $0 \leq P_{ij} \leq 1$.

[2] It should be observed that all individuals in this data base who are observed as migrants are *employed* in their new place of residence.

Table 6.6 Individuals migrating and staying in the local labour market, conditional on not having been employed locally, by region and industrial sector

	Big cities		Forest counties		Rest of the country		Total	
	migrants	non-migr.	migrants	non-migr.	migrants	non-migr.	migrants	non-migr.
Number of observations	99	971	204	382	663	3252	966	4512
% of observed individuals	9.3	90.7	34.8	65.2	16.9	83.1	17.6	82.4

	Textile and clothing industry		Pulp and paper industry	
	migrants	non migr.	migrants	non-migr.
Number of observations	139	1456	486	1132
% of observed individuals	8.7	91.3	30.0	70.0

Obviously, age is important not only for the probability of getting a local job. It also has a large effect on the probability of migrating. But the other three variables appear to be of great importance as well. An improvement in business conditions leads to an increase in the probability of migration by 0.25. The probability that a woman migrates is 0.27 lower than that of a man. Finally, when the size of the plant increases from 5 per cent to 25 per cent of the local labour force the probability of migration goes up by 0.09.

Table 6.7 Probabilities of migration and of staying in the local labour market after plant closures conditional on not having been employed locally. Computations based on logit estimation for total Swedish industry (see Table 6.8)

	Probability of migration (P_m)	Probability of staying (P_s)
"Reference" individual[1)]	0.50	0.50
20 years old	0.72	0.28
60 years old	0.29	0.71
females	0.23	0.77
formerly employed at a large plant[2)]	0.59	0.41
laid off when aggregate demand is high[3)]	0.75	0.25

1),2),3) See notes to Table 6.4.

The coefficients for age and sex are negative and significant in all models presented in Table 6.8. This supports the hypothesis that women and older workers migrate to a relatively low extent. The coefficients for age have the highest absolute value in the forest counties and the pulp and paper industry. Sex, on the other hand, seems to make a greater difference in the probability of migration in the textile and clothing industry.

In the model for total Swedish industry, aggregate demand has a positive and significant effect on migration. Judging from Table 6.8 this effect is not unambiguous. In the forest counties, the rest of the country and the textile and clothing industry, the effect of aggregate demand is the same as for total Swedish industry: it increases migration, indicating that "pull" is more important for migration than "push". The opposite seems to be the case in the big cities and the pulp and paper industry, but the t-values in these cases are small.[1]

[1] The conclusion for the pulp and paper sector is based on a longer period with a different business cycle pattern.

Table 6.8 Binary logit estimates of contributions to the probability that an individual laid off and not employed locally will migrate (P_m) (standard errors within parentheses) 1)

	Big cities	Forest counties	Rest of the country	Total	Textile and clothing industry	Pulp and paper industry
Constant term	0.8707 (0.9105)	-0.7175E-01 (1.00)	1.459* (0.2723)	0.5235* (0.2252)	-0.7170 (0.6204)	3.145* (0.3943)
Sex (females=1)	-0.3048* (0.1240)	-0.5434* (0.1385)	-0.6842* (0.4990E-01)	-0.6111* (0.4310E-01)	-0.7470* (0.1003)	-0.5674* (0.1036)
Age	-0.1668E-01* (0.4576E-02)	-0.3076E-01* (0.3987E-02)	-0.2398E-01* (0.1669E-02)	-0.2318E-01* (0.1434E-02)	-0.2095E-01* (0.3235E-02)	-0.3151E-01* (0.2184E-02)
Aggregate demand	-0.2330E-02 (0.1538E-02)	0.4855E-02* (0.1496E-02)	0.1223E-02* (0.4261E-03)	0.2516E-02* (0.3103E-03)	0.5301E-02* (0.1046E-02)	-0.3011E-03 (0.3278E-03)
Share of local employment	-0.6045 (0.7472)	0.4399 (0.6551)	0.8077* (0.1150)	0.8804* (0.1055)	0.2409 (0.3841)	0.2403* (0.8823E-01)
Log likelihood	-319	314	-1542	-2222	-418	-855
Degrees of freedom	1065	581	3910	5473	1590	1613
Log likelihood (at zero)	-741	-406	-2714	-3797	-1106	-1122
Likelihood ratio index	0.5692	0.2278	0.4319	0.4149	0.6220	0.2370
Likelihood ratio statistic	844	185	2344	3150	1375	532

* Significant at a five per cent level.

1) The coefficient for P_s is equal to $-P_m$.

The last variable included, the share of individuals laid off in relation to the number of locally employed, appeared in Table 6.7 to be relatively important for the probability of migration. The coefficient is positive and significant in the rest of the country and in the pulp and paper sector too.[1]

Finally, in this section as well as in Section 6.5, the likelihood ratio test will be used to examine the importance of the regional dimension. The hypothesis that the probabilities of migration do *not* differ between the three regions controlling for

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[1] The sign is reversed in the big cities. However, almost all observations from the big cities are from Stockholm and Gothenburg. Thus, it is likely that the discriminatory value of the measure used will be small.

other characteristics in the model is tested. The explanatory value of the models for three separate regions is (at a one per cent level) significantly higher than in the model including all regions.[1]

6.7 WHAT HAPPENED TO THOSE WITHOUT EMPLOYMENT?

Some individuals have received and accepted local employment, others have decided to migrate. But there are still individuals left in the local labour market without a new job. What options do they have?

Labour market programs of different kinds (training, relief work and sheltered work) are available for many. Some are ill or old enough to retire. Still others go to school or do military service. Finally, some remain unemployed.

In which one of these states an individual is finally observed is, to some extent, a matter of individual choice, but it also depends on the rules of the Labour Market Board, the way these rules are interpreted, and the government's expenditures on different programs. Therefore, it is a substantial simplification to look at the individuals out of work as if they had such a broad choice and maximized the net present value of expected future incomes; their choices were often severely restricted.[2]

The choice of a person without work will be assumed to be based on a present value calculation of the returns from being in different labour market states. This implies that direct incomes are important for the decisions made, but at least as important are, for many individuals, the *potential* benefits from being in a certain labour market state.

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[1] Judging from the likelihood ratio index, the models for the textile and clothing industry and the big cities have the highest explanatory power. On the whole, the migration decision seems to be explained better than who becomes employed locally.

[2] An additional problem is the continuous change in rules and regulations governing labour market policy during the period studied (see Chapter 1).

A point of reference for the analysis is given in Table 6.9, indicating the yearly compensation levels offered to an "average" industrial worker in different labour market states.[1,2]

Employment in the regular labour market gives the highest yearly income. Relief work and sheltered work are also paid according to the ruling wages in different sectors. Nevertheless, for most individuals a regular job is likely to give a higher income. Many of the relief jobs are of a character which is relatively low-paying. Moreover, bonuses and alike are expected to be lower. In addition, relief jobs are usually not designed to last for long periods (maximum of six months). Individuals choosing this alternative are thus likely to be unemployed in periods between different relief jobs. However, there are cases where the yearly income from relief work or sheltered work is as high as that in a regular job.

Sheltered work should, in principle, not be an alternative to regular work. Only individuals with so-called work handicaps should get sheltered work. But work handicap is so defined that it depends on both individual characteristics and available employment opportunities. The importance of the latter is discernible from the regional distribution of sheltered jobs; regions with low demand for labour have more sheltered jobs.

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[1] The figures are given on a yearly basis. However, relatively few individuals will stay in any of the non-employment states for a whole year. A combination of states is much more common. After some time in unemployment, labour market training and relief work become relatively more advantageous, particularly if the individual at that time can only get cash labour market assistance [KAS]. Other measures, like disability pensions, are only available after a relatively long period in unemployment or on sick leave. There are also schemes to compensate individuals laid off or retiring from a job. For industrial blue collar workers these schemes in 1982 gave around 9 000 Sw.Cr., on the average, to each individual laid off, regardless if the individual got a new regular job or not. Besides, up to 27 000 Sw.Cr. (tax free) could be paid out during 21 months, if the individual continued to be unemployed [AFA (1983)]. Other schemes were available for white collar workers.

[2] A thorough discussion of the schemes for unemployment compensation is available in Björklund and Holmlund (1983).

Table 6.9 Yearly individual compensation in different labour market states (Sw.Cr., nominal values, before tax). Average for industrial workers

		Average	Male	Female
Employment regular labour market, relief work and sheltered work [1),2)]	1975	42 966	44 016	38 556
	1979	60 543	61 509	56 196
	1982	78 120	79 443	73 059
Unemployment and labour market training[3)]	1975	34 125	34 125	34 125
	1979	49 219	49 219	49 219
	1982	66 019	66 019	66 019
Sick leave[4)]	1975	27 825	28 350	24 938
	1979	39 112	39 900	36 225
	1982	50 662	51 450	47 250
Retirement (disability pension)[5)]	1975		23 275	14 829
	1979		40 027	24 955
	1982		54 078	34 836

1) Actual average yearly income, industrial workers, based on 2nd quarter each year [Lönestatistik, SAF/LO].

2) Individuals in sheltered and relief work should be paid the wages agreed upon in collective wage agreements. The actual average yearly income in sheltered work 1982 was 69 804 Sw.Cr. The figures for males and females were 70 476 and 68 670 Sw.Cr. For 1979 the average was 53 340 Sw.Cr. This figure is lower than the figure for employed at the regular labour market, which involves, among other things, differences in the sectoral composition [Samhällsföretag (1983)].

3) For individuals with wages as high as those for an average male or female industrial worker maximum unemployment compensation is obtainable. Therefore the figures computed are the same regardless of sex.

4) The figures are computed on the basis of average incomes in regular employment above.

5) Actual average figures for individuals receiving full time disability pension at the age of 60 [Riksförsäkringsverket (1983)]. No figures were available for the total average.

In labour market training and unemployment, compensation will be higher for individuals covered by unemployment insurance schemes. The figures in Table 6.9 are based on the maximum daily unemployment compensation. Most of the industrial workers hit by plant closures are likely to reach this level. A person in labour market training will receive the highest daily remuneration

for the duration of the course; in the example in the table this is a whole year.[1] For the unemployed, the highest level of compensation is paid out for 300 days.[2] An additional 150 days in unemployment can be compensated with so-called cash labour market assistance (kontant arbetsmarknadsstöd).[3]

Compensation for individuals who are on sick leave or receiving disability pensions depends on earlier wages and years of work. In Table 6.9, those who are on sick leave are assumed to receive a daily compensation based on the given average incomes in regular work. To compute pensions is more complicated. They are influenced not only by the persons' incomes at the time of retirement but also by their working history. The figures given are actual averages for individuals receiving disability pension at the age of 60.[4]

In addition to the direct compensation offered in different labour market states, the individuals have to consider future consequences of their choices. Studies of individuals in sheltered work show that very few reenter the regular labour market [Jonsson (1981), Sandström (1982)]. On the other hand, the studies made of labour market training indicate - at least for the 1960's - that chances to get a new regular job are increased [Dahlberg (1972), Dahlström (1974), Kjellman (1975)].

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1 Before 1979/80 persons in labour market training received 10 Sw.Cr. more per day than unemployed. This is not considered in the table.

2 Individuals older than 55 years can receive compensation from the unemployment funds for 450 days. Besides, the schemes for leave-payments (avgångsvederlag) are often more generous for the old.

3 For individuals between 55 and 60 years of age cash labour market assistance can be received for 300 days. Between 60 and 65 years there is no limit as to the time that cash labour market assistance is available. The payments are much lower than regular unemployment compensation.

4 It could be argued that only those with disability pensions for labour market reasons should be included. The average figure for this group (males and females, all ages) was 30 287 Sw.Cr. in 1979 [Riksförsäkringsverket (1983)]. On the other hand, disability pensions for labour market reasons should not be common among the individuals studied here. It is rarely available during the first year of unemployment.

How do the individual variables available in the data base and used earlier - age and sex - relate to possible life time incomes in various labour market states? A longer future productive lifespan increases *a priori* the incentives to go into labour market states leading to regular employment. This would imply higher shares of young persons, and perhaps also men, in labour market training. These groups can be expected to be overrepresented in relief work too, since many kinds of relief work give valuable work experience. Older persons and women would, on the other hand, more often end up in unemployment and sheltered work. In addition, they would retire from the labour market to a greater extent. For older workers, these effects would be reinforced by the compensation schemes.

Labour market policy programs are likely to counteract these results, at least partly. They are, for example, designed to help particular risk groups, work-handicapped, women and very young people. Therefore, the expected age and sex pattern for sheltered work might be distorted. The same may be true of labour market training, since it is offered on a large scale to women.

Even more obvious is the influence of labour market policy on the expected effects of aggregate and regional demand or of the size of the plant closed down relative to the local labour market. *Ceteris paribus*, a low level of demand, aggregate or regional, or a small local demand for labour, in relation to the number of individuals laid off, should lead to higher unemployment. But this effect might be neutralized by labour market policy. More funds are made available for relief work during times of low aggregate demand. This is also true, to some extent, for labour market training (see Chapter 1). Moreover, it is obvious that regions with excess supply of labour get more money for relief work and labour market training. Even the share of people receiving disability pensions and of those who get sheltered work is likely to increase with a deterioraring labour market.

So far, two states - sick leave and others - have not been discussed. For obvious reasons, sick leave can be assumed to be more common for older persons. On the other hand, many young people will end up in "others", as this state includes students and those doing military service.

A model will now be formulated and estimated to explain the probability that individuals laid off who have neither become employed nor migrated, will end up unemployed, outside the labour force or in some program organized by the labour market authorities:

$$(6.3) \qquad P_{ij} = f_{ij}(z) \; ; \quad i = u \quad j = et, rw, sw, si, re, ot \text{ and } u,$$

where et is labour market training, rw relief work, sw sheltered work, si sick leave, re retirement, ot others and u, as before, unemployment.[1] The vector of explanatory variables z consists of sex, age, aggregate demand and the size of the plant closed down relative to the local labour market, defined as earlier in this chapter.

Based on the previous discussion the following signs on partial derivatives can be expected, when the choices of the individuals are considered, together with the actions taken by the labour market authorities.

	P_{et}	P_{rw}	P_{sw}	P_{si}	P_{re}	P_{ot}	P_{u}
variable							
sex (female=1)	?	?	?	?	?	?	+
age	-	-	?	+	+	-	+
aggregate demand	-	-	?	?	?	?	-
share of local employment	+	+	?	?	?	?	+

[1] The logit model applied earlier will be used to guarantee that $\Sigma_j P_{ij} = 1$ and $0 \leq P_{ij} \leq 1$.

Table 6.10 Individuals without regular work, by region and industrial sector

BIG CITIES	In relief work or labour market training	Other labour market policies (e.g. sheltered work)	Sick leave or retirement	Other labour market states	Unemployed
Number of observations	207	16	126	405	217
% of observed individuals	21.3	1.6	13.0	41.7	22.3
FOREST COUNTIES					
Number of observations	59	11	57	55	200
% of observed individuals	15.4	2.9	14.9	14.4	52.4
REST OF THE COUNTRY					
Number of observations	814	76	463	463	1436
% of observed individuals	25.0	2.3	14.2	14.2	44.2
TOTAL					
Number of observations	1080	103	646	923	1760
% of observed individuals	23.9	2.3	14.3	20.5	39.0
TEXTILE-AND CLOTHING INDUSTRY					
Number of observations	365	35	215	183	658
% of observed individuals	25.1	2.4	14.8	12.6	45.2
PULP- AND PAPER INDUSTRY					
Number of observations	134	54	212	130	602
% of observed individuals	11.8	4.8	18.7	11.5	53.2

Table 6.10 indicates sharp regional and sectoral differences in the distribution of individuals out of work over different labour market states.[1] In the big cities, for example, only around 20 per cent are unemployed, while in the forest counties as well as in pulp and paper this figure is around 50 per cent.[2]

[1] To bring down computational costs for the following logit estimations, labour market training and relief work have been merged into one state and sick leave and retirement into another. The expected partial derivatives for the states merged are the same, but the number of individuals in each state can differ substantially between regions.

[2] It should be observed that the unemployed in the forest counties and the pulp and paper industry include individuals with continued employment in the firm. Subtracting these unemployment would still be over 40 per cent.

The group of "others" is, on the other hand, much larger in the big cities.[1] Other labour market programs (e.g. sheltered work) follow a relatively stable regional and sectoral pattern. The same could perhaps be said about sick leave and retirement. For relief work and labour market training the variation between regions and sectors is somewhat larger.[2]

Next, the results from five logit models will be presented in two tables. Table 6.12 gives intercepts, coefficients, standard errors and goodness of fit statistics, while Table 6.11, based on the model estimated for the rest of the country, demonstrates the effects of changes in the explanatory variables on the probabilities of being observed in different labour market states.[3]

In the two earlier sections, analyzing who becomes employed or migrates, age was found to have a large effect on the probabilities. From Table 6.11 it is obvious that this is true for the model explaining what happens to those without a regular job as well. For a 20 year old the probability of becoming employed in relief work or entering labour market training is for example 0.45. The same figure for a 60 year old is 0.07. On the other hand, the probability of continued unemployment for 60 year olds is 0.45 compared with 0.14 for 20 year olds. Business conditions also appear to have a substantial effect. When aggregate demand is high, the probabilities of being unemployed or in relief work and labour market training both decrease with twelve percentage units.

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[1] Individuals for whom the labour market authorities lacked information about labour force status might in some cases have been classified as others. This may have contributed to the relatively high figure for others in the big cities, since it is in these regions more difficult to have a continuous contact with all the persons laid off.

[2] It is of some interest to note the low percentage of individuals laid off from pulp and paper plants getting relief work or labour market training. Many of the closures in this sector were done in the late 1960's and early 1970's, when labour market policy was less "ambitious".

[3] Computational costs increase with the number of alternatives and observations. To bring the costs down, no model for total Swedish industry has been estimated in this section.

Sex is less important. The probability of remaining unemployed is only seven percentage units higher for women than for men. Smaller is also the effect of the share of local employment.

Table 6.11 Probabilities of being in various labour market states conditional on not having been employed locally or migrated. Computations based on logit estimations for the rest of the country (see Table 6.12)

	Probability of relief work or labour market training	Probability of other labour market policies	Probability of sick leave or retirement	Probability of being in other labour market states	Probability of unemployment
	(P_{et} and P_{rw})	(P_{sw})	(P_{si} and P_{re})	(P_{ot})	(P_{u})
"Reference" individual[1)]	0.24	0.06	0.12	0.24	0.35
20 years old	0.45	0.02	0.02	0.37	0.14
60 years old	0.07	0.08	0.32	0.08	0.45
Female	0.27	0.02	0.09	0.20	0.42
formerly employed at a large plant[2)]	0.21	0.07	0.14	0.23	0.35
laid off when aggregate demand is high[3)]	0.12	0.18	0.11	0.34	0.23

1),2),3) See notes to Table 6.4.

What about the hypotheses formulated? Are they generally supported by the results in Table 6.12? Women seem to have a higher probability of remaining unemployed. Positive coefficients are obtained in all models except the one for the forest counties. But the coefficients are only significant in two models. In addition, women have a higher probability of getting labour market training and relief work in the big cities, the rest of the country and the textile and clothing industry. It is

possible that women, with lower average education, prefer labour market training. However, the results most likely reflect the priorities of the labour market authorities. Women in these sectors and regions were perhaps considered to be in relatively greater need of support. No clear-cut effect of sex on sheltered work, sick leave/retirement and "others" is spotted, which is to be expected from the theoretical discussion.

One would expect the effects of age to be more obvious. This is the case. In all regions and sectors, the probability of unemployment, sick leave/retirement and sheltered work increases with age, while the opposite is true of labour market training/relief work as well as "others". Moreover, the effects are significant in most cases.[1]

The result for sheltered work is more conclusive than expected. Apparently, the degree of work handicap increases with age. It is also worth observing that the labour market measures have not been sufficient in the specific sense that older persons, just as females, still have higher unemployment risks.[2]

A lower demand increases the probability of remaining unemployed, except in the pulp and paper sector.[3] A higher probability of being engaged in relief work or labour market training is also expected when business conditions are poor, but this hypothesis receives no support in the big cities and the forest counties. In the theoretical discussion, no clear-cut effects of the level of demand on the probability of sick leave/retirement, sheltered work and "others" were deduced. While the signs on the coefficients for sheltered work differ between region and sector, the coefficients for sick leave/retirement are all negative and for "others" positive.

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[1] Wadensjö (1978) analyzed the statistics on individuals registered as unemployed at the local offices of the Labour Market Board (arbetsförmedlingar). He found that women were, on the whole, to a lower extent than men benefitting from relief work, labour market training and other labour market policy measures. Moreover, youth were found to have a high probability of getting relief work and labour market training. No clear age pattern was found for sheltered work.

[2] This might be a dubious statement. Some of the older unemployed could be "waiting for" disability pension. If that is the case, the observed unemployment among the old is, in fact, partly "caused" by the labour market policy.

[3] The discrepancy in the effect of aggregate demand between the pulp and paper sector and the other cases could be due to the fact that many of the observed closures in this sector are from another time period.

Table 6.12 Logit estimates of contributions to the probabilities that an individual laid off who has not been employed locally or migrated is in various labour market states (standard errors within parentheses)

	In relief work or labour market training	Other labour market policies (e.g. sheltered work)	Sick leave or retirement	Other labour market states	Unemployed
BIG CITIES					
Constant term		-6.454* (2.412)	-4.441* (1.123)	-2.012* (0.7916)	-0.3693* (0.9210)
Sex (female=1)	0.2549E-01 (0.1756)	0.5213 (0.4218)	-0.5079* (0.2087)	-0.3958E-01 (0.1562)	0.6906E-03 (0.1710)
Age	-0.6060E-01* (0.7290E-02)	0.3269E-01 (0.1693E-01)	0.5795E-01* (0.8283E-02)	-0.4334E-01* (0.6227E-02)	0.1330E-01* (0.6653E-02)
Aggregate demand	0.1905E-02 (0.2555E-02)	-0.1678E-02 (0.6090E-02)	-0.7567E-03 (0.2703E-02)	0.1139E-01* (0.2267E-02)	-0.1086E-01* (0.2393E-02)
Share of local employment	-2.2296 (1.2337)	0.9397 (2.695)	0.2939 (1.187)	-3.853* (1.076)	4.849* (0.9471)
FOREST COUNTIES					
Constant term		-1.785 (3.193)	1.187 (1.822)	-0.3549E-01 (1.791)	4.472* (1.451)
Sex (female=1)	-0.4368 (0.3188)	0.8329 (0.5380)	-0.6642 (0.3433)	0.4155 (0.2949)	-0.1474 (0.2280)
Age	-0.1896E-01 (0.1017E-01)	0.1081E-02 (0.1913E-01)	0.4252E-01* (0.1095E-01)	-0.4779E-01* (0.1122E-01)	0.2315E-01* (0.7772E-02)
Aggregate demand	0.8377E-02* (0.3554E-02)	-0.1098E-02 (0.6501E-02)	-0.4474E-02 (0.3377E-02)	0.8195E-02* (0.3731E-02)	-0.1100E-01* (0.2575E-02)
Share of local employment	-3.7993 (2.1040)	3.377 (3.554)	0.2093 (2.030)	-3.415 (2.253)	3.608* (1.497)
REST OF COUNTRY					
Constant term		-6.996* (0.8027)	-5.900* (0.4459)	-1.615* (0.3622)	-2.948* (0.3108)
Sex (female=1)	0.2489* (0.8589E-01)	-0.5049* (0.1977)	-0.1792E-01 (0.9736E-01)	-0.3937E-01 (0.9582E-01)	0.3133* (0.7274E-01)
Age	-0.5612E-01* (0.3257E-02)	0.2489E-01* (0.7228E-02)	0.5641E-01* (0.4084E-02)	-0.4528E-01* (0.3562E-02)	0.2010E-01* (0.2723E-02)
Aggregate demand	-0.3445E-02 (0.8065E-01)	0.5463E-02* (0.1553E-02)	-0.8260E-03 (0.8506E-03)	0.1276E-02 (0.8566E-03)	-0.2458E-02* (0.6379E-03)
Share of local employment	-0.9291 (0.5250)	1.086* (0.4613)	0.5388* (0.2585)	-0.5664 (0.3069)	-0.1293 (0.2042)
TEXTILE AND CLOTHING					
Constant term		-7.378* (1.482)	-3.553* (0.7772)	-1.570* (0.6919)	-0.2165E-01 (0.5552)
Sex (female=1)	0.7769* (0.1675)	-0.5034 (0.3050)	-0.3228* (0.1537)	-0.8274E-01 (0.1765)	0.132 (0.1224)
Age	-0.0511* (0.4901E-02)	0.2767E-01* (0.1180E-01)	0.5392E-01* (0.6471E-02)	-0.4217E-01* (0.5540E-02)	0.1172E-01* (0.4286E-02)
Aggregate demand	-0.3812E-02* (0.1514E-02)	0.1106E-01* (0.3190E-02)	-0.3563E-02* (0.1728E-02)	0.4556E-02* (0.1666E-02)	-0.8241E-02* (0.1291E-02)
Share of local employment	-1.6780* (0.6979)	0.5350 (0.9318)	-0.4139 (0.6599)	0.5119 (0.5926)	1.045* (0.4393)
PULP AND PAPER					
Constant term		-4.975* (1.551)	-5.899* (0.9048)	-2.418* (0.7611)	-2.893* (0.6525)
Sex (female=1)	-0.5558 (0.3409)	-1.250 (0.8223)	0.2645 (0.3178)	0.8705* (0.2859)	0.6708* (0.2458)
Age	-0.4217E-01 * (0.6029E-02)	0.3253E-01* (0.1104E-01)	0.6398E-01* (0.7584E-02)	-0.6671E-01* (0.6622E-02)	0.1237E-01* (0.4557E-02)
Aggregate demand	-0.2854E-02* (0.8413E-03)	0.2348E-02 (0.1216E-02)	-0.1318E-02 (0.7277E-03)	0.1478E-02 (0.8669E-03)	0.3456E-03 (0.5359E-03)
Share of local employment	0.7736* (0.2530)	-0.9210* (0.3933)	-0.1155 (0.2297)	0.8060* (0.2717)	-0.5431* (0.1714)

Table 6.12 (continued)

	Big cities	Forest counties	Rest of the country	Textile and clothing	Pulp and paper
Log likelihood	-1149	-446	-3884	-1729	-1299
Degrees of freedom	3864	1508	12990	5804	4508
Log likelihood (at zero)	-1563	-615	-5234	-2343	-1822
Likelihood ratio index	0.2646	0.2751	0.2580	0.2620	0.2871
Likelihood ratio statistic	827	338	2700	1228	1046

* Significant at a five per cent level.

The effect of the number of individuals laid off as a share of total local employment is ambiguous. The expectation that the probability of remaining unemployed increases with a higher share is confirmed for the big cities, the forest districts and the textile and clothing industry. The probability of getting training or relief work was also expected to increase with the relative size of the closure, but a positive coefficient was only obtained for the pulp and paper industry. In addition, the model for this sector is the only one for which a relatively large closure does not result in a higher probability of sheltered employment.[1,2]

[1] This might be related to the time period studied for the pulp and paper sector. Sheltered jobs were less common in the late 1960's and early 1970's.

[2] The likelihood ratio indices do not differ much between regions and sectors. On the whole these models appear to have lower explanatory values than the migrational models.

6.8 CONCLUDING COMMENTS

Most of the earlier studies in this field have been based on only one or a few plant closures. A main advantage of this work is that more than 10,000 individuals from over 100 industrial plants are included in the data base. This means that about half of the individuals laid off in connection with larger plant closures in Sweden during the period of observation, 1975-1979, are studied.

The results confirm some of the conclusions drawn in earlier studies. Age is generally regarded as important for the future labour market prospects of individuals laid off when plants close down. In almost all the models estimated, age had broad and significant effects. A lower age substantially increases both the probability of becoming employed locally and of migrating. In addition, it has a positive effect on the probability of enrolling in labour market training or getting a relief job.

Earlier studies have also concluded that sex plays a role for the future of individuals laid off when plants close down. Women tend to remain unemployed or withdraw to a larger extent. On the whole, this is confirmed by the results in this study. However, it is worth observing that sex plays a significant, but in most cases numerically small, role for the probabilities of becoming employed locally. Much greater is the effect on the probability of migrating. This seems to indicate that the relatively high share of women in unemployment, and in different activities organized by the labour market authorities, is, to a substantial extent, a consequence of a lower rate of migration, a fact from which policy conclusions could perhaps be drawn.

In this study a higher level of aggregate demand seems to significantly increase the probability of becoming employed locally. In addition, in most of the models estimated, it has a significantly positive effect on the probability of migration. The last observation could be particularly interesting from a policy point of view. It seems to indicate that demand

"pull" is more important for migration than "push". If this is true, a higher level of demand will increase mobility.

The last explanatory variable included in the estimations is the size of the plant closed down in relation to the size of the local labour market. This is a variable which has rarely been used in earlier studies of plant closures. In the few cases when a similar variable has been included it has not been significant. Judging from the results in this chapter, the share of local employment is important, not only for the probability of becoming employed locally but also for the probability of migration.

To conclude, in the models explaining the probabilities of becoming employed and migrate, the explanatory variables included, sex, age, aggregate demand and the share of local employment, are significant. Less unambiguous are the effects on the probabilities of different non-employment labour market states. The reason for this is probably that public policy is partially designed to counteract decisions made by the employers and the individuals laid off.

It was mentioned before that a major advantage with this study, compared to most previous studies of plant closures, is the large sample utilized. On the one hand, the set of independent variables available in this data sample was very limited. It is certainly not difficult to think of many variables one would have wanted to include in the analysis. It is natural in economics to concentrate on returns to various activities. The housing situation is probably also of great importance for the behaviour of the unemployed. The analysis of these variables should also, preferably, be done at the household level. In addition, variables catching differences in skill levels and motivation would be valuable in a model explaining what happens to individuals who become unemployed when plants close down. Finally, the interplay between all these factors, the labour market behaviour and the social and medical situation for the unemployed ought to be studied more closely. It is probably in this latter area that the major problems caused by plant closures occur.

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