Anders Björklund

Studies in the Dynamics of Unemployment

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PREFACE

The present piece of research is the main output of my graduate studies at the Department of Economics at the Stockholm School of Economics during 1973-1981. The work on the studies presented here started in 1976.

During this time the department has developed into a very stimulating working place, both professionally and socially. Most of all I want to thank all those who, in different ways, have contributed to this development.

At various formal and informal seminars I have in particular benefited from comments by my thesis adviser, Karl-Göran Mäler, but also by Sören Blomquist, Lars Heikensten, Lars Hörngren, Karl G. Jungenfelt, Mats Persson, Erik Ruist and Anders Vredin. Whenever faced with statistical problems of different kinds I have never hesitated to consult Håkan Lyckeborg, whose pedagogical skills have been most useful.

I have also benefited from several external contacts outside the Stockholm School of Economics. My cooperation with Bertil Holmlund at the Industrial Institute for Economic and Social Research (IUI) has been very stimulating. He is the co-author of Chapter 3 but has also made constructive comments on the other chapters.

Since 1977 I have, in different ways, been associated with the Expert Group for Labour Market Research at the Swedish Ministry of Labour (EFA). The stimulating cooperation with Curt Canarp, Jan Johannesson and Inga Persson-Tanimura at EFA has increased my knowledge about the Swedish labor market and labor market policy.

A preliminary version of Chapter 5 was presented at the conference "Ekonometridagarna" ("Econometric Days") in Gothenburg in May, 1981. Siv Gustavsson, Arbetslivscentrum, Stockholm, and Linda Leighton, Columbia University, contributed with valuable comments.

Finally I want to acknowledge that it has been a privilege to have had my manuscripts typed by Margareta Blomberg, Kerstin Niklasson and Monica Peijne.

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Stockholm in October, 1981

Anders Björklund

CONTENTS

CHAPTER 1 SUMMARY AND MAIN CONCLUSIONS

The point of departure for the collection of studies presented in the following is the message delivered by American economists during the beginning of the 70's that a proper understanding of the unemployment problem requires a *dynamic view* of the labor market in general and unemployment in particular. The "dynamic view" should emphasize the *flows* into and out of unemployment. By analyzing these flows a better understanding should be obtained of (i) the causes of unemployment and (ii) the welfare consequences of unemployment.

The first study, presented in *Chapter 2*, aims at giving an empirical picture of "the dynamics of unemployment" in Sweden. Several decompositions of unemployment, which highlight the causes and welfare implications of unemployment, are made. It has been possible to make these decompositions empirically thanks to more detailed presentations of the data from the Labor Force Surveys, which have recently become available. The pure measurement problems connected with this work are documented in appendices and footnotes.

The first decomposition of unemployment presented is into the inflow of unemployed persons and the average duration of unemployment spells. This has been done for the period 1965-1980.

It appears that a structural change has taken place during this period; the duration of unemployment spells has been longer during the 1970's than during the second part of the 1960's. The opposite pattern is found for the inflow component.

Furthermore, this structural change seems to have been a general phenomenon in the Swedish labor market; it can be found for all age groups and regions and for both sexes.

The cyclical pattern of the two unemployment components is also investigated. The available data reveal that a marked cyclical pattern can be found in the duration component. On the other hand it is very difficult to find such a pattern in the inflow component. This is rather surprising since it can be expected that the behavior of layoffs should contribute to such a pattern. Some possible explanations of this inflow behavior are discussed.

Next, unemployment is disaggregated according to the reason for having become unemployed. Data are available for (i) entrance and reentrance to the labor force, (ii) job undertaken completed, (iii) layoffs (permanent and temporary) and (iv) other and unspecified reasons, during 1975-1980.

During this period the first group has been slightly larger than the other ones. However, the duration of unemployment spells for this group has been quite short.

Thereafter a presentation of unemployment which probably is more relevant for welfare-oriented purposes is made. By looking at the number of individuals who have been hit by unemployment during a longer period (in this case a year) and the total unemployment experiences during this period, one can take into account that many individuals suffer from *multiple* spells of unemployment. It appears that between 250,000 and 400,000 persons have been unemployed any time during a year in the period 1970--1980. The average number of unemployment weeks per year has been between 12.5 and 16.1.

The dispersion around these average figures is great. This is shown by estimating how much of the total unemployment level during a year (between 60,000 and 120,000 during the decade) can be ascribed to persons with 1-13, 14-26, 27-39 and 40-52 unemployment weeks, respectively. It appears that if the borderline between short-term and long-term unemployment is drawn at

13 weeks, less than 25 per cent of total unemployment is short-term. Consequently, if one argues that short-term unemployment, defined in this way, should be excluded from a welfare-oriented unemployment measure, almost 80 per cent of total unemployment would still be left.

Several of these findings are subject to more detailed empirical analysis in the following chapters.

In *Chapter 3* one possible explanation to the longer unemployment spells during the seventies is examined, namely the unemployment benefits which were extended in different ways for different groups both in 1968 and in 1974. The analytical approach in the chapter is to analyze the "surviving rates" of the unemployed, i.e. the probability of remaining unemployed from one period (quarter) to the next. The survival rate is an indirect measure of the duration of unemployment. In addition, separate survival rates for short-term, medium-term and long-term unemployed are analyzed.

The main result is that the structural change towards longer unemployment duration cannot be explained by extended unemployment benefits. In some cases the shifts go in the opposite direction to the one expected. However, a minor effect for older unemployed can be found.

In *Chapter 4* the same analytical approach is applied to the analysis of the cyclical fluctuations of unemployment spells. The search theoretic literature has suggested two different explanations of these cyclical fluctuations; one has emphasized the importance of inflationary surprises and the other the quantity-rationing constraints facing the unemployed.

In the chapter the empirical importance of these comparative explanations are analyzed using Swedish and U.S. data. A model of the "transition rate" for the unemployed[1], which captures both mechanisms, is specified.

The results indicate that the U.S. unemployment duration is more or less unaffected by unexpected wage inflation, whereas this factor is more important in Sweden at least for short--term unemployed. However, in both countries the quantity constraints facing the unemployed (the probabilities of receiving job offers) seem to be the most important determinant of the cyclical fluctuations of unemployment spells.

The study in *Chapter 5* aims at giving an improved empirical picture of unemployment as a welfare and distributional problem. The first issue analyzed is whether unemployment has deleterious effects on individuals' subsequent labor market prospects, in particular the subsequent wage level. If so, there are welfare losses of unemployment in addition to the income losses during the unemployment period.

A distinction is made between "occurrence effects" and "duration effects" of unemployment. The former are once-and-for-all effects on the wage level which arise as soon as a person becomes unemployed. The latter effects depend on the duration of unemployment.

The empirical methodology has exploited the potential of longitudinal data. A before-after-comparison reveals that there were negative duration effects of unemployment during 1973 on the subsequent wage level in 1974, i.e. the longer a person has been unemployed the lower his subsequent wage turns out to be. However, it is also found that the relationship between unemployment duration and subsequent wages was different during the sixties, which casts some doubts on the reliability of the estimated duration effect.

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[1] The transition rate is simply the complement to the "survival rate". The reason for using the transition rate in this chapter is that comparisons with other studies of the same issue were made easier.

The second issue analyzed is whether unemployment tends to hit the relatively low-paid in the labor force. It appears that, given age and sex, persons with past unemployment experiences have lower wages than those without such experiences. However, the role played by unemployment occurrence and unemployment duration in this context is different during different periods. Consequently it cannot be concluded that those who are hit by long-term unemployment have a weaker position in the labor market than those who are hit by short-term unemployment.

Finally, the issue whether unemployment duration rather than the stock of unemployed should be the guideline for labor market policy is discussed.

In *Chapter 6*, finally, some important topics for future research in this field are discussed.

CHAPTER 2 THE DYNAMICS OF UNEMPLOYMENT IN SWEDEN *
- An Empirical Picture

2.1 Introduction

Around 1970 a basic message from leading labor economists was that the traditional labor market analysis which only focused on the *stocks* of employed, unemployed and persons outside the labor force was unsatisfactory. Much more emphasis must be placed on the dynamics or the turnover in the labor market, i.e. the *flows* into and out of these stocks.

In particular, it was argued, such an analysis should be applied to the unemployment problem. This message was delivered in several articles in the now famous Phelps-volume (Phelps, 1970) and in articles in Brookings Papers on Economic Activity by Hall (1970, 1972) and Perry (1972). The ideas were introduced in Sweden by Persson (1973) and Siven (1974).

The first attempts to provide an empirical picture of unemployment in these dynamic terms encountered a lot of measurement problems since the data relevant for such an analysis are not easily available.[1] As a consequence, much of the literature in this field during the seventies has treated measurement problems. The economic issues which the dynamic analysis of unemployment could shed light on have not always been explicitly stated.

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* This is an extended, revised and updated version of "Spells and Duration of Unemployment in Sweden 1965-1978", IIM-papers 79-17, International Institute of Management, Berlin (1979).

[1] Compare the discussion regarding Sweden between Barrett (1975), Axelsson/ /Löfgren/Holmlund (1977) and Björklund (1978, chapter 3 in this book). In the U.S. it turned out that even the interpretation of the data was difficult. In a famous article Clark and Summers (1979) argue that many economists had drawn the wrong conclusion that most unemployment was of short duration and consequently no severe welfare problem.

In my view a dynamic analysis of unemployment can be fruitful for two reasons.

First of all it can contribute to a better *causal* analysis of unemployment. A certain level of unemployment can either be due to high probabilities of becoming unemployed or low probabilities of leaving unemployment, i.e. long duration of unemployment spells. These "unemployment components" represent different decisions by the agents in the labor market. High probabilities of becoming unemployed can both be due to the behavior of the employed who have a high propensity to quit and become unemployed and the decisions of employers to lay off workers. In the same way the duration of unemployment spells can be influenced both by the decisions of the unemployed to reject or accept job offers and the hiring behavior of the employers.

A common feature of the theoretical development during the seventies has been to derive these decisions of the central agents in the labor market from conventional behavioral postulates. In so doing special emphasis has been placed on the economic incentives of the agents (like unemployment benefits for the unemployed and lay off costs for the employers), the expectations about future wages and prices and the high information costs which characterize the labor market.

This approach has been applied to both the *cyclical fluctuations* and the *long run level* (or the "natural rate") of unemployment. As far as the cyclical fluctuations are concerned it has been the ambition among macro economists to improve the micro theoretical underpinning of macro phenomena like the Phillips-curve. To analyse the cyclical fluctuations of unemployment in a realistic way one clearly needs information about the way these fluctuations occur. Is it the quit rate, the lay off rate, unemployment duration or some other unemployment component which is responsible for these fluctuations? The behavioral responses behind, and hence the determinants of, these unemployment components are obviously likely to differ.

The same arguments apply to the analysis of the long run level of unemployment. Consequently the potential to reduce overall unemployment by means of different policy measures depends on the relative importance of different types of unemployment.

The *second* reason to emphasize the dynamics of unemployment is that one can obtain a better picture of unemployment as a welfare problem. This proposition rests on the common view that the welfare losses from unemployment are related to the duration of unemployment. Obviously a certain level of unemployment can either be ascribed to many persons who are unemployed for short periods or to a few persons who are almost permanently unemployed. In the former case the burden is widely shared and no individuals suffer greatly whereas the opposite will be true in the latter case.

Even among the unemployed there might be a high dispersion. Some might experience only brief spells of unemployment while others are hit by long and frequent spells. In that case it is important to be able to "sort out" the "problem" unemployment and see how high it is in different phases of the business cycle. Perhaps it also is possible to design labor market policy measures in such a way that priority is given to reduction of the "problem" unemployment.

The purpose of this chapter is to provide an empirical picture of unemployment dynamics in Sweden during 1965-1980. After a short section about the measurement of unemployment in Sweden we will decompose unemployment into components that represent different "causes" or decisions by the agents in the labor market. Here we are especially interested in finding out how the cyclical fluctuations of unemployment arise in order to evaluate the empirical basis for different attempts to construct micro theories of the Phillips-curve. But we will also look at the trendwise development of unemployment.

It must be emphasized that the purpose is purely descriptive. The importance and behavior of different unemployment components will be presented. On the other hand no real causal analysis will be done here. However the chapter can be seen as preparatory work to such anlyses which will be presented in later chapters.

Next we turn to a description of the distribution of unemployment among individuals. Here we first look at the number of individuals who are hit by unemployment during a certain period (a year) and the average duration of unemployment during a certain period (a year). Then we look at the distribution of unemployment duration among those who are hit by unemployment in order to find out how much of aggregate unemployment that can be attributed to short-term and long-term unemployment.

The discussion of the measurement problems which arise when one wants to describe unemployment in these dimensions are mostly placed in appendices and footnotes.

2.2 The Measurement of Unemployment in Sweden

Since the purpose of the dynamic analysis is to give a better understanding of the stock of unemployment, the empirical analysis clearly has to be based on a relevant measure of unemployment. How shall unemployment be measured? Of course there is no single measure of unemployment which is relevant for all purposes, rather the measure will depend on the purpose of the analysis. A distinciton can be made between two different purposes. First, it is common to try to construct a measure of *unused labor reserves*. Second, one often wants a measure of *social hardship* due to welfare losses from not having a job, like social isolation, loss of income etc. Furthermore, a distinction must be made between *short run* and *long run* unemployment analysis. Short run refers to cyclical analysis and focus on unemployment which is sensitive to changes in aggregate demand. The long run analysis goes beyond the cyclical perspective and includes unemployment which only can be affected by "structural" changes in the labor market.

The source of unemployment statistics which is most frequently used in Sweden is the Labor Force Surveys (Arbetskraftsundersökningarna, AKU). These surveys have been performed since 1959 with quarterly surveys until 1969 and monthly surveys from 1970 onwards. The sample size has been enlarged at diffe-

rent occasions and is now, in 1981, 22,000.[1] The reference-period in AKU is one week, generally located in the middle of the month. The respondents are counted as either employed, unemployed or inactive during the reference-week. A respondent is counted as employed if he has been working at least one hour during the week and as unemployed if he has not been working at all during the week and been "actively" searching for a job during the week. By "actively" searching is meant e.g. visiting the employment office or contacting employers. Persons who are temporarily laid off without pay from the employer during the week are also counted as unemployed, even if they are not actively searching.

In the Swedish debate it is often argued[2] that open unemployment, measured in this way, gives an incomplete picture of the "true" unemployment problem. Even though the purpose of the measure seldom is explicitly stated it is common to construct unemployment measures which include several types of "hidden" unemployment.

One type of hidden unemployment is explicitly measured in the Labor Force Surveys by means of the two questions: "Would you have liked to have had work last week?" and "Could you have taken on work last week, or could you not possibly have done so?" Those who answer "yes" to these two questions are generally referred to as "hidden" unemployed. Before 1976 the counterpart to these two questions was: "Would you have been searching for a job last week if you had thought that you could have found one in the area?"

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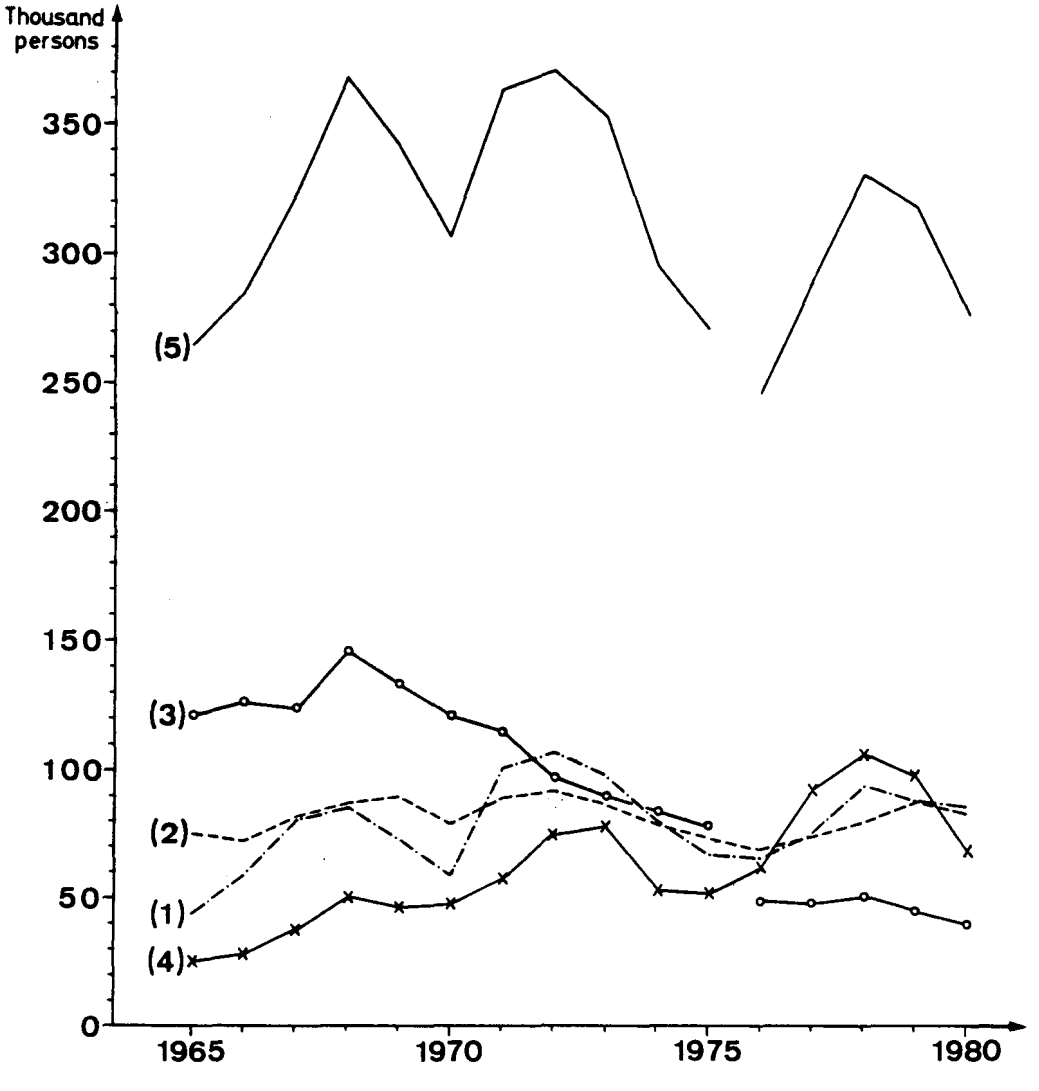
[1] A more complete account of AKU can be found in Björklund (1979).

[2] See, for example, Bergström et.al. (1977).

Figure 1. Open unemployment (1), partial unemployment (2), hidden unemployment (3), persons employed via labor market policy measures (temporary jobs, retraining, inplant training (4), 1+2+3+4 (5). Thousand persons.



Note: The breaks in (3) and (5) indicate the change of the definition of hidden unemployment from 1975 to 1976.

In Figure 1 it can be seen that this type of hidden unemployment was higher than open unemployment during the sixties but has declined during the seventies.[1] A characteristic of hidden unemployment is also that no cyclical pattern can be found. Most of the hidden unemployed report "no suitable job in the area" as the main reason for not searching actively.

Another type of unemployment - often called "partial" unemployment - can be found among those who are working part-time but are able to and want to work more. It appears from the figure that these are as many as the openly unemployed. However, in terms of hours, partial unemployment is much lower than open unemployment (see Björklund, 1979). Some cyclical fluctuations can be found but these are smaller than for open unemployment.

But most of all it is argued that no complete picture of unemployment can be obtained without taking into account all those who are employed by means of labor market policies like temporary jobs (earlier called relief works), retraining and inplant training. As seen in the figure these policies have been expanded during the seventies and follow a marked cyclical pattern.

Unfortunately, the data needed for an empirical description of unemployment dynamics in Sweden are available only for open unemployment. Consequently we have to consider the relevance of this measure. To what extent is it a good measure of unused labor reserves and social hardship? Can it be used for both short run and long run purposes?

As a measure of unused labor reserves it is clear that open unemployment has some deficiencies especially in the long run perspective. Those who are hiddenly unemployed can probably be employed if special efforts are made to meet their special wishes for jobs. On the other hand, the absence of cyclical pattern indicate that this group can´t be recruited simply by means of expansive aggregate demand policies.

All the time most of the hidden unemployed have been women. The declining number of hidden unemployed during the seventies is consistent with the rising employment rate for women.

Partial unemployment constitute an important type of unused labor reserves too. But the cyclical fluctuations are quite low especially in hours.

Those who are employed via labor market policy measures do not constitute unused labor reserves in a strict sense since they are either working or occupied by training. On the other hand they can quite quickly be transferred to "ordinary jobs". Moreover, there might be a productivity gap between ordinary jobs and those (inclusive training) created by labor market policy. This productivity gap does in that case represent a type of unused labor reserves. However, it is hard to say how big this gap is.

If we instead look at open unemployment as a measure of welfare losses or social hardship we can first conclude that it might be a bad measure of the structural level. The welfare losses for many of the hiddenly unemployed might be as severe as those for the openly unemployed.

But what about the cyclical fluctuations? The partially unemployed will to some extent suffer from income losses but the worst consequences from open unemployment like social isolation etc. are probably avoided for this group. Consequently the exclusion of this group is not that serious from this point of view.

Finally, how serious is it to omit the labor market policies from a welfare-oriented measure of unemployment? This depends on how good substitutes the temporary jobs and the retraining courses are for ordinary jobs. This is something we know very little about.

To sum up, it seems as though open unemployment, as measured in AKU, excludes some types of unemployment which probably should be included in a measure of the total level of unused labor reserves or of the welfare losses from not having a job.

On the other hand the measure captures more of the cyclical fluctuations which are sensitive to aggregate demand. The weaknesses of the measure in this respect depends on how the labor market policies are evaluated.

In the absence of more detailed data, open unemployment will still be used in these studies. However, the weaknesses of the measure must be kept in mind and when possible the measure will be complemented by other information.

2.3 Inflow and Duration of Unemployment Spells

The relationship between the stock of unemployed, the inflow of unemployed persons and the average duration of spells is generally summarized in the familiar "unemployment = inflow × duration" equation.

(1) $U = F \times D$

where U = the number of unemployed
F = the inflow of unemployed persons (per week)[1]
D = the average duration of spells (in weeks)

Obviously equation (1), which is derived in appendix 1a, says that a given level of unemployment can arise *either* from a high inflow of spells and short duration of the spells *or* from a low inflow and long duration.

In terms of rates, (1) is often written

(2) $\frac{U}{L} = \frac{F}{L} \times D$ or $u = f \times D$

where L = the labor force.

[1] Properly the length of the period is arbitrary but since the reference-period in AKU is one week this time-period will be used in the following.

Now the inflow component is interpreted as the probability of becoming unemployed in a given week for the average labor force participant.

Empirical estimation of the two unemployment components encounters at least two problems. First, there is a data problem since direct data on the duration of *completed* spells of unemployment seldom are available. Unemployment statistics only contain information about the duration of the spells until the time of the survey (*incompleted* spells), which generally differs from the duration of completed spells.[1] In the case of the time of the Swedish AKU this problem can be avoided since it is possible to obtain direct data on the inflow to unemployment. As demonstrated in appendix 2a the weekly inflow of unemployed persons can be estimated by the number of unemployed who at the time of the survey are counted as unemployed for one week.[2] Since this estimator of the weekly inflow is subject to some uncertainty, primarily due to the sampling variance, some alternative methods to estimate the weekly inflow and average duration of spells of unemployment have been applied and on the whole they seem to give similar results as far as the cyclical and structural development are concerned (see appendix 2).

The second problem is an analytical one, since equation (1) only holds in a stationary situation when the inflow and the duration of unemployment is constant from period to period. When this is not the case the "D" computed from (1) will in general differ from the average duration of spells which are

[1] See e.g. Löfgren/Puu (1975) and Frank (1978) for formal analyses of the relationship between the duration of completed and incompleted spells of unemployment. It should also be noted that several methods to infer the distribution of the duration of completed spells from the distribution of incompleted spells have been developed. A survey and thorough discussion of these methods can be found in Freiburghaus (1978)

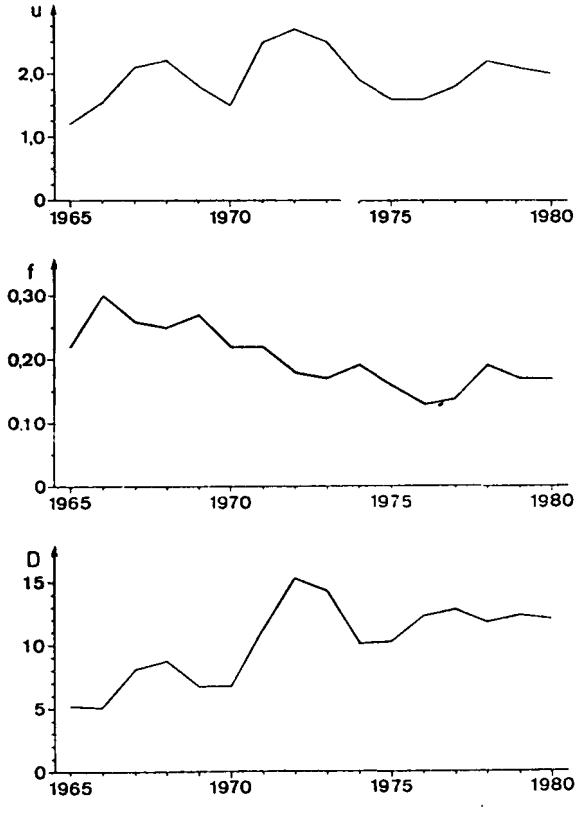
[2] These data were unfortunately not presented in the tables published by the Central Bureau of Statistics until 1978, but thanks to a special working-up of the data from the Labor Force Surveys ordered by me and financed by the Ministry of Labour, these data have become available. From 1979 onwards the data are published in the tables from the Bureau.

started during the period considered as well as the average duration of the spells which are terminated during the period. The magnitudes of these discrepancies are discussed in appendix 1b. It is seen that when (1) is applied to the average unemployment during a period as long as one year and the average weekly inflow during a year the discrepancies are quite low.[1]

An Aggregate Display of Inflow and Duration

An aggregate display of the rate of unemployment, the rate of inflow and the average duration of spells of unemployment is given in Figure 2.

Figure 2. The unemployment rate, u, inflow rate, f, and average duration of unemployment, D, 1965-1980.



[1] However, the discrepancies were non-negligible for a separate age-group (55-64 years) during some years when the stock of unemployed changed drastically.

The figure reveals that some structural changes have taken place during the period.[1] The inflow component has decreased and the duration component has increased according to the trend.

These structural changes seem to have been a general phenomenon in the labor market. According to the data presented in Table 1 (on page 30) the same pattern can be found for all age-groups (16-24, 25-54 and 55-64 years), both sexes and the three main regions in Sweden. On the other hand there are big differences between the groups as far as the relative importance of the two components is concerned. It appears e.g. that the high unemployment rates for youngsters in relation to older and for women in relation to men can be attributed to the inflow-component.

The regional unemployment differentials have always been high in Sweden; in particular the nothern region has always had higher unemployment than the rest of the country. From the table it appears that the higher unemployment mainly can be attributed to the inflow rate.[2]

Unemployment and the Aggregate Demand for Labor

A better picture of both these structural changes and the cyclical fluctuations is obtained when unemployment and its components are related to the aggregate demand situation in the economy. Several indicators of the demand situation are in this case possible to use; the GNP-gap, the vacancy rate or some index from the business tendency surveys. Here I have chosen the vacancy rate but probably the picture would be approximately the same with some other indicator since the vacancy rate has been strongly correlated with the other indicators.[3] However, the vacancy rate is of great interest

[1] The duration of unemployment for 1972 and 1973 might be a little overestimated according to a comparison with some alternative measures of the duration. See appendix 2b.

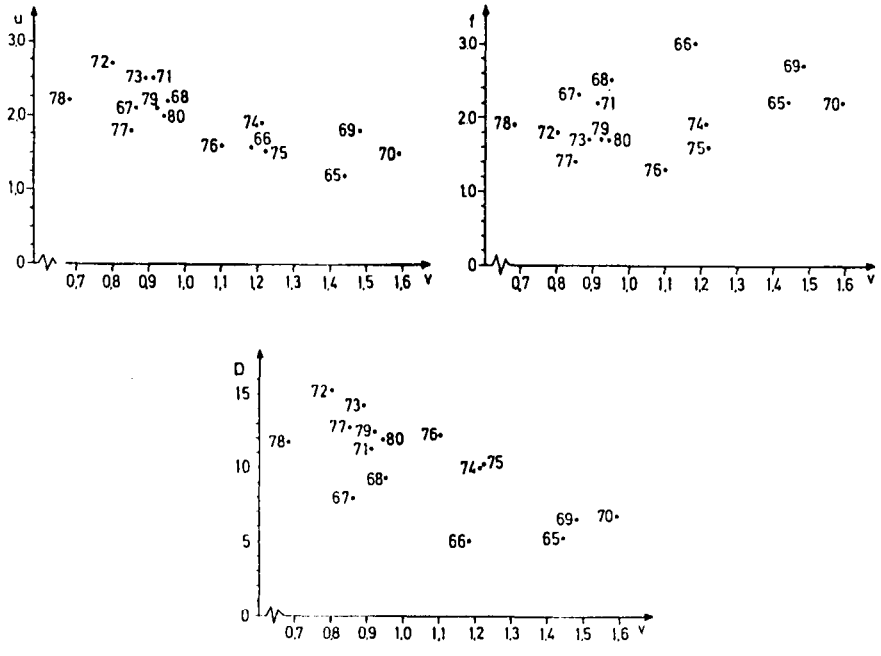
[2] This is perhaps surprising. However, this regional differential might be changed if account could be taken to hidden unemployment which is much higher in the northern region.

[3] This is not to say that the use of the Swedish vacancy statistics is without problems. A critical and penetrating discussion of the statistics can be found in Wadensjö (1978). Furthermore, from October 1976 to October 1980, compulsory notification of vacancies has gradually been introduced in Sweden. The figures have been crudely adjusted to this according to estimates of the effects of this reform. The method used is described in an appendix available at request from the author.

in this case since the location of the relationship between the vacancy rate and the unemployment rate generally reflects the efficiency of the search processes in the labor market (see among others Holt (1970)).

In Figure 3 we present the relationships between on the one hand the vacancy rate and on the other the unemployment rate and its inflow and duration components.

Figure 3. The relationship between the vacancy rate (v), and the unemployment rate (u), inflow rate (f) and average duration of unemployment spells (D).



The first panel of the figure displays the expected negative relationship between the unemployment and vacancy rates. A closer glance at the data reveals some structural changes in the relationship.

The observations for the period 1965-68 are closer to the origin than those for 1969-74. A structural shift around 1968 in this relationship in the unfavorable direction has also been found by Holmlund (1978). But something seems to have happened around 1974-75 too, because during 1975-80 the observations are closer to the origin again. Of course the main reason for this is the massive labor market policy measures (and industrial policy measures too) which were implemented these years, especially 1977-78.[1] Consequently this improvement in the relationship cannot be taken as an improvement in the "spontaneous" working of the labor market, i.e. the efficiency of the search processes and the matching between unemployed and vacancies.

How do these cyclical and structural variations appear in the two unemployment components? To start with the duration component,a clear negative relationship can be found. This cyclical pattern becomes still more apparent if one takes into account a structural shift around 1968-69. It seems as though the duration of unemployment spells, for a given level of vacancies, increased at this time. During the late seventies 1978 is something of an outlier, indicating that the massive labor market policy measures have affected the duration component of unemployment this year.

The relationship between the inflow component and the vacancy rate is much more erratic. Clearly the inflow rate was higher during the sixties than during the seventies. Furthermore, the observations for 1977-78 lie closest to the origin. Hence the labor market policy measures seem to have affected primarily the inflow rate even though also the duration component was quite low during 1978.[2]

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[1] See Björklund/Johannesson/Persson-Tanimura (1979) for a documentation of these measures and Holmlund (1980) for some econometric tests.

[2] Actually this pattern is not surprising since the main emphasis on the labor market policies (and industrial policy measures) until the middle of 1978 was to prevent layoffs, i.e. the inflow of unemployment spells. From then on, and especially during the second half of 1978, the emphasis has changed to stimulating hirings (see Björklund/Holmlund (1980)). Such measures are to a greater extent likely to affect the duration of unemployment spells.

It is very difficult to find any cyclical pattern. This is surprising since one could expect that a cyclical pattern in the lay off rate would turn up in the aggregate inflow rate. Of course it is not easy to find such a pattern if it is hidden behind rather complicated structural changes. If these could be taken into account it might be possible to find a cyclical pattern. However, the conclusion which can be drawn this far is that the cyclical fluctuations in unemployment primarily can be ascribed to the duration component.

The reason for unemployment

Still better insight into the dynamics of unemployment can be obtained if unemployment is disaggregated according to the background to or reason for having become unemployed. Since 1975 the unemployed are asked about this in the regular Labor Force Surveys. In addition such questions were asked in the November surveys 1971-73.

Information about the following reasons for unemployment is available:

(i) *Entrance* to the labor force. Those who are included here have entered the labor force for the first time. Consequently young people leaving school are likely to dominate.

(ii) *Reentrance* to the labor force, i.e. those who have withdrawn from the labor force for some time[1] and decided to reenter.

(iii) *Job undertaken completed*. This group includes those who have had a job with limited duration and become unemployed.

(iv) *Permanent layoff*. Those who belong to this group have lost their former job permanently.

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[1] This time period must be longer than one month; otherwise the person will be included in some other group.

(v) *Temporary layoff*. Those who belong to this group have not lost their jobs permanently but are laid off during the week of the survey.[1]

(vi) *Other and unspecified reasons*. This is a "miscellaneous group" including several types of reasons for unemployment plus those who did not report any reason at all.

The background of unemployment is presented in Figure 4. To improve the precision of the estimates of unemployment inflow (and hence also duration) I have aggregated entrants and reentrants to one group and temporary and permanent layoffs to another group.

We are now going to look at the relative importance of these different reasons for unemployment. We also present decompositions into inflow and duration and briefly discuss possible causes behind these components.

Entrants and reentrants have during this period accounted for 25-30 per cent of total unemployment. Almost 50 per cent of the inflow can be ascribed to this group. On the other hand the duration of the unemployment spells is relatively short. However, the short duration does not prove that entrance and reentrance to the labor force is in general frictionless. It might be that many in this group only can get jobs with short duration to begin with. In that case they might soon become unemployed again and appear in the unemployment group "job undertaken completed". The total unemployment duration before getting a stable job might consequently be long. The data from the AKU do not tell us anything about this. However, some information about multiple unemployment spells from an alternative data source will be presented in section 2.4.

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[1] Only those who are temporarily laid off during the *whole* week *without* pay from the firm are included in the unemployment statistics. The average number of permanently laid-off unemployed was 3.000 during 1975-80, which was 3.5 per cent of total unemployment.

Those who are temporarily laid off during the *whole* week *with* pay from the firm are counted as "temporarily absent" from work in the AKU. This type of layoffs have only been published separately since January 1981. During the first half year they amounted to 2,800.

However, layoffs also appear in a third way in the AKU, namely as reduced working-time during the week (with or without pay from the firm). In the AKU these layoffs are included among the partially unemployed. Unfortunately this type of layoffs is not published separately,

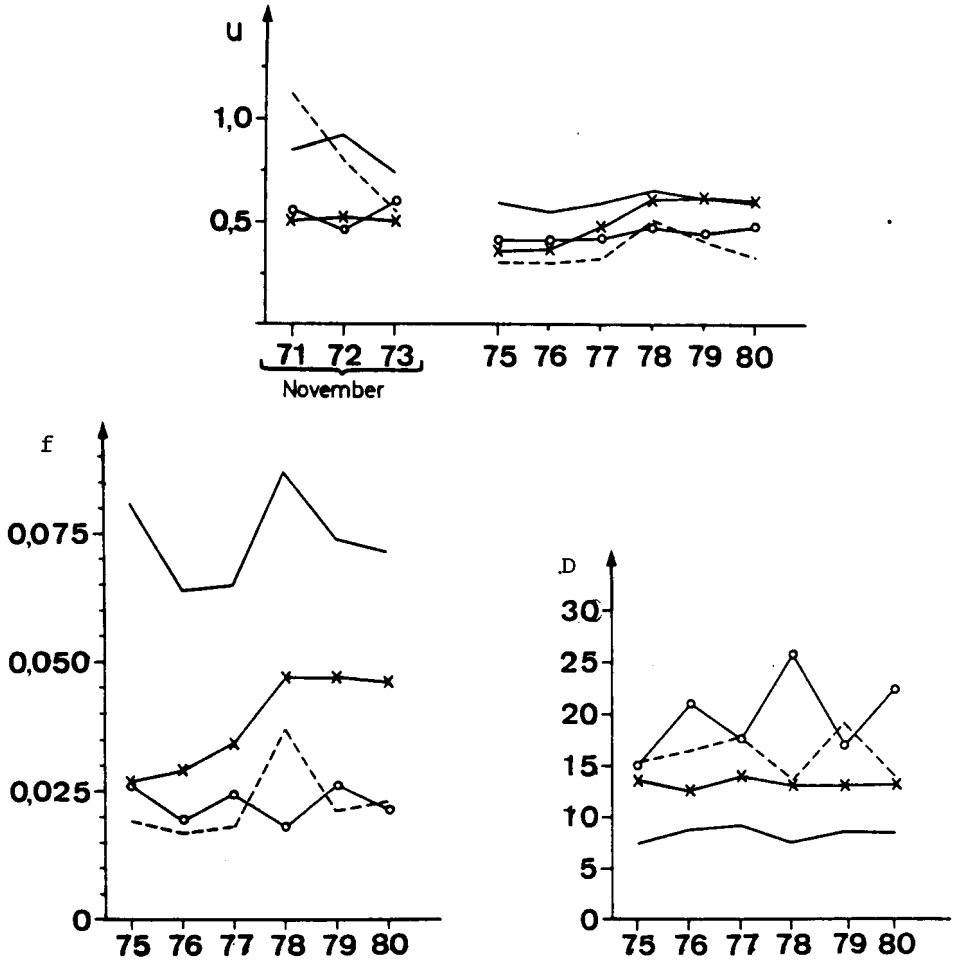
Figure 4. Unemployment rate (u), inflow rate (f), and duration (D), according to reason for unemployment.

——— = entrants/ reentrants

-x-x-x = job undertaken completed

------ = layoffs

o-o-o- = others



There are several important determinants of this type of unemployment. The inflow rate for entrants is likely to depend critically on the information about job openings which is given to young people who are to leave school. The duration of unemployment is, on the other hand, likely to depend on the economic incentives facing the unemployed and the employer´s propensity to hire inexperienced people.

An important determinant of "reentrance unemployment" is the turnover in the labor force. Each time a person enters the labor force he faces a "search problem" and a certain risk of becoming unemployed. The higher the mobility into and out of the labor force the higher this type of unemployment will be.

Next we have *permanent and temporary layoffs*. These types of unemployment have amounted to about 20-25 per cent of total unemployment during 1975-80. This is perhaps a surprisingly low figure since discussions about unemployment often are about layoffs. However, the main reason for this low figure must be the emphasis of the policy measures these years to prevent layoffs. These measures have probably in the first place affected the inflow of layoffs rather than the duration given that the layoffs have occurred. This hypothesis is clearly supported by the low inflow rate during 1975-77.

The inflow of layoffs to unemployment might also have been affected by the *employment security act* from 1974 (see Björklund, Johannesson, Persson-Tanimura (1979)), which probably increased the layoff costs for the firms. This act also contains rules about advance notification of layoffs. These rules may have increased the possibilities to find a new job before the layoff has been implemented. Consequently the probability of becoming unemployed conditional on having been laid off might have decreased.

Finally it must be remembered that the relatively low number of unemployed with a layoff as immediate background may underestimate the impact of layoffs on the unemployment rate. It might be that many of those who have been laid off

only can find jobs with short duration and soon become unemployed again and appear in the group "job undertaken completed".

The third reason for unemployment in Figure 4 is "*job undertaken completed*". This type of unemployment increased significantly in 1978 and has during 1978-80 contributed to almost 30 per cent of total unemployment. The figure also reveals that this increase can be ascribed to the inflow component.

Several hypotheses about the reasons for this increase may be put forward. First it might be that increased possibilities to be on leave from a position (because of studies or child care) have increased the number of jobs with limited duration. Another possible explanation is that the higher layoff costs have made employers more reluctant to supply jobs with long duration.

The importance of jobs with limited duration in the Swedish labor market is also demonstrated in the vacancy statistics. According to data published by the National Labor Market Board (See Meddelanden från Utredningsenheten 1980:15 and 1981:5) between 25 and 50 per cent of all vacancies are jobs with limited duration.

Finally we have the group "*unspecified reasons*" which includes several different reasons for unemployment. In this group voluntary quits are included, i.e. those who have become unemployed voluntarily in order to search for a new job as unemployed. However, such quits probably contribute only to a fraction of this group.[1] Consequently the micro theories of unemployment which have emphasized the quit decision seem to have a limited relevance for the Swedish unemployment phenomenon.

The disaggregation of unemployment according to reason may also give a better picture of the cyclical fluctuations of unemployment. It may, for example, turn out that the

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[1] The available data indicate that at least 50 per cent of those in the group "unspecified reasons" report other reasons than quits as the reason for having become unemployed. Consequently quits cannot contribute to more than 10 per cent of total unemployment.

cyclical behavior of the duration of unemployment which was documented above at least to some extent is a "composition-effect"; the inflow of e.g. entrants and reentrants, whose duration is short, is dominating in periods of high economic activity and inflow of laid-off, whose duration is longer, are dominating in recessions. However, the data have been available for too short time to shed light on this hypothesis.

2.4 The Distribution of Unemployment Among Individuals

The analysis of enumployment in terms of inflow of unemployed persons and the duration of spells, which is possible to apply to data from the regular Labor Force Surveys, has one important drawback when it comes to the analysis of unemployment as a welfare problem. It does not take into account that some individuals may suffer from *multiple* spells of unemployment. Of course it might be that the welfare losses from several short spells during for instance a year are as high as the welfare losses from one longer spell.

In order to measure the existence of multiple spells one clearly needs information about unemployment experience over longer periods of time. To see what information is needed we start by discussing what we can mean by the distribution of unemployment among individuals.

The total unemployment, which appears over a longer period of time, can be distributed among individuals in several ways. If the average unemployment rate during the period is x per cent there are two extreme distributions; all persons can be unemployed x per cent of the period each and x per cent of the labor force can be unemployed all of the time. The real situation is likely to be somewhere between these two extremes. Within a specific group the total dispersion of unemployment duration over a longer period can be decomposed into two parts. The first part refers to the number of individuals who have been unemployed during the period. A certain level of unemployment can *either* be distributed among many individuals who are unemployed for a short time *or* among a few individuals who are unemployed for a long time.

Second, there can also be a dispersion among those who are hit; some might be unemployed for a large fraction of the time whereas others only for a very short time.

In the following we start by looking at the first part of the dispersion of unemployment between individuals. Then we add some information about the dispersion among the unemployed. This will make it possible to describe how much of the unemployment stock that can be ascribed to short-term and long-term unemployment.

Suppose we are interested in the total unemployment during a longer period (say a year since we have data for this time period). Then we have the following identity:

(3) $52 \times U = N \times W$

where U = the average stock of unemployed during the year

N = the number of persons who have been unemployed any time during the year

W = average unemployment weeks during the year per unemployed person

Here, the duration measure, W, includes the total unemployment weeks from all spells during the year. Consequently it can be decomposed further into a certain number of spells per person and the average duration per spell. By combining (1) and (3) we get[1]

[1] A somewhat surprising result of this decomposition is that the number of spells started during the year per person, S or $\frac{52 \times F}{N}$, can be lower than one. Intuitively this can quite easily be explained. Suppose all the N persons, who have been unemployed any time during the year, only have one spell during the year. Then the average number of unemployment weeks during a year, W, will be lower than the average duration of unemployment spells, D. The reason is that some persons only will have a fraction of their spell during the year considered; some fraction will be experienced during the year before, or the year after, the year considered.

A more appealing *interpretation* of the component can be given by noting that we have a "truncated" measure of what we actually are interested in. Suppose first that we have the ideal information from a very long time period; the whole active time for a cohort denoted T. Then, under stationary conditions, the counterpart to (4) will be $T \times U = N \times \left(\frac{T \times F}{N}\right) \times D$

It can be shown (see Appendix 3) that the second component will be $\frac{T}{D+E}$ where E is the average duration of the non-unemployment period subsequent on the unemployment period; D + E will be the average duration of the "unemployment/non-unemployment cycle".

When we instead only have information from *one* year, all non-employment periods which in reality are longer than or equal to 51 weeks will get the value 51. Consequently our "S" in (4) will be $\frac{52}{D+E}$ where $E \leq 51$.

Obviously this can be lower than one since D is higher than one.

$$(4) \quad 52 \times U = N \times \left(\frac{52 \times F}{N}\right) \times D = N \times S \times D$$

This decomposition of unemployment can be regarded as more welfare-oriented since it includes information about *multiple* spells of unemployment. The duration of unemployment spells, (D), for a specific group might be short but the total duration, (W or S x D), might still be long if it is common to experience several spells. Furthermore, a trend towards longer unemployment spells, and lower inflow of unemployed persons, which has happened in Sweden, need not mean that the total unemployment burden hits less people who are unemployed longer time; it might be that the same number of persons, (N), are hit by unemployment but the number of spells per person, (S), has decreased.

In Sweden the unemployment components in (3) and (4) can be estimated by means of data from some additional questions in the regular February survey of the AKU. These questions are retrospective and refer to the preceding year. Information is available about (i) the number of individuals who have been unemployed any time during the whole preceding year, (N), (ii) the average weeks of unemployment per unemployed, (W), (iii) the inflow of unemployed persons[1] during the year, (52 x F).

The unemployment components in (3) and (4) are presented in Table 2.[2] It appears that the total unemployment level from 65,000 to 120,000 has been distributed among 245,000 to 405,000 persons. The average unemployment weeks per year have been between 12.5 and 16.1 weeks.[3]

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1 See in Appendix 2 how the inflow of unemployed persons can be estimated from the information in these surveys.

2 The additional retrospective questions have been asked since 1967 (i.e. for 1966). Unfortunately, the information about W is available only from 1970 onwards and the weekly inflow can only be estimated from 1976 onwards.

3 It must be mentioned that the level of unemployment measured by the retrospective surveys was higher during the first part of the seventies in comparison with the unemployment data from the regular surveys (about 12,000 per year or almost 10 per cent higher. During 1975-1980 the two surveys give similar results. See Björklund (1981) for a presentation and some discussion.

Furthermore, as documented in Appendix 1, the *levels* of the inflow and duration components differ between the two surveys.

Table 2. The distribution of unemployment among individuals, 16-64 years.

	U	N	S	D	W = S x D
1970	68,000	282,900	-	-	12.5
1971	116,800	405,000	-	-	15.0
1972	119,900	386,100	-	-	16.1
1973	110,900	391,000	-	-	14.7
1974	80,600	325,600	-	-	12.9
1975	67,300	249,100	-	-	14.0
1976	62,900	246,000	1.03	12.9	13.3
1977	75,800	269,000	1.01	14.5	14.7
1978	94,600	325,700	1.10	13.7	15.1
1979	88,500	319,900	1.10	13.1	14.4
1980	88,400	310,800	1.13	12.9	14.6

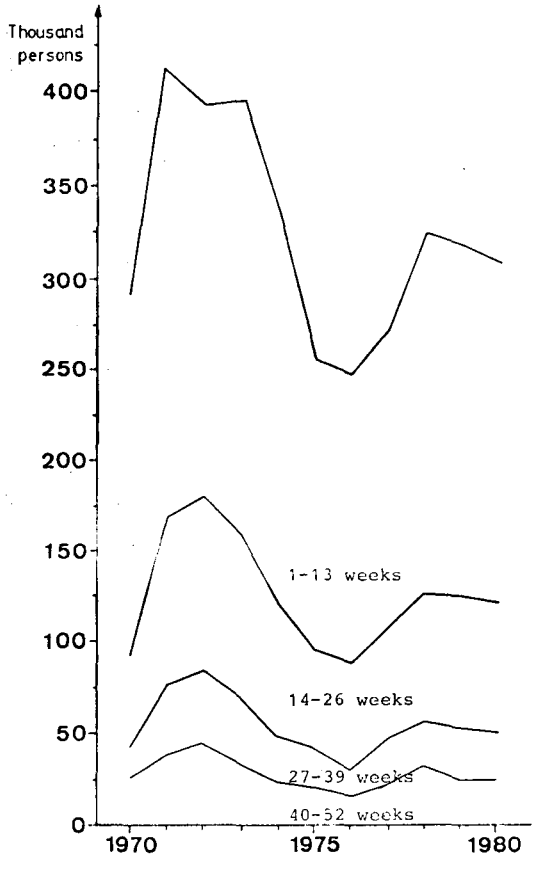
During the decade no trend towards longer duration of unemployment (total weeks per year) can be found. The lower level of unemployment during the second half of the seventies can mainly be ascribed to fewer persons having been hit by unemployment.

In section 2.3 above, a shift towards lower inflow and longer duration of unemployment *spells* from the sixties to the seventies was found. Does this mean that the number of *persons* who have become unemployed has decreased and the total unemployment duration has increased? Unfortunately the data have been available for too short time to answer this question.

In Table 3 (on p. 31-32) we also present data for three age groups, e.g. sexes and three regions. It appears that the duration differential between prime-aged and older people is reduced when account is taken to multiple spells. Moreover unemployment duration in the northern regions exceeds that in the rest of the economy if account is taken to multiple spells.

The second part of the dispersion of unemployment duration within a group is that between those who have been unemployed. Even if the average unemployment duration is long there might be many who only are unemployed very short time. It might of course be argued that the welfare consequences from short-term unemployment are more or less negligible. In that case it becomes an important task to find out how much of the unemployment stock that can be ascribed to short-term unemployment and hence more or less can be neglected from the welfare point of view.

Figure 5. The number of persons who have been unemployed any time during a year 1970-1980, 16-74 years. Division according to number of unemployment weeks.



The information from the retrospective questions can be used to describe this too. In Figure 5 we present data on the number of individuals who have been unemployed any time during a year according to the number of weeks of unemployment during the year. The figure reveals that the majority (about 60 per cent) of the unemployed have had short unemployment duration if the borderline 13 weeks is used. Around 20 per cent have been unemployed more than 27 weeks and around 10 per cent more than 40 weeks. On the whole the distribution of the unemployed on the four duration categories has been quite stable during the decade.

In order to describe how much of the unemployment stock that can be ascribed to short-term and long-term unemployment one has to take into account that the long-term unemployed contribute more to the stock than the short-term unemployed. In terms of the notation above we have:

$$(5)\quad U = \sum_{i=1}^{N} \frac{W_i}{52}$$

where i represents individual i.

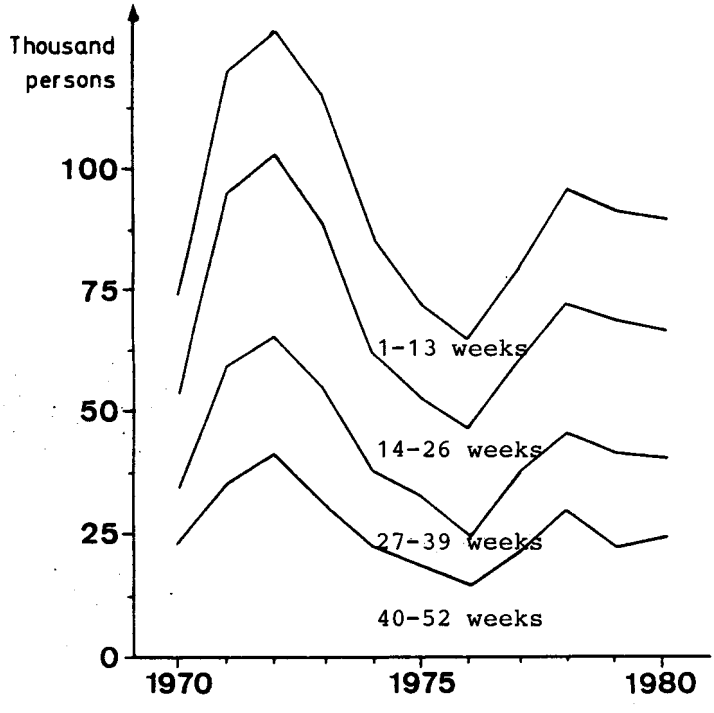
If this formula is applied to the data from the retrospective surveys we instead obtain Figure 6. Here we can see how much of total unemployment which can be ascribed to[1] persons who have been unemployed for 1-13 weeks, 14-26 weeks, 27-39 weeks and 40-52 weeks.[2]

Now the picture becomes quite different. *Short-term unemployment - less than three months - now only accounts for 20-25 per cent of total unemployment.* Those who are unemployed for more than six months account for 40-45 per cent of total unemployment.

[1] This means that we look at the unemployment experiences of a person who is unemployed at a random point of time during a calender year. The figure shows the probabilities of having 1-13 weeks, 14-26 weeks, etc., during the year for such a person.

[2] In reality data on the number of persons with 1, 2-4, 5-13, 14-26, 27-39, 40-49, 50-52 weeks are available. The middle of the classes have been used in the computations.

Figure 6. The stock of unemployed 1970-1980, 16-74 years. Division according to unemployment weeks during a year.



The conclusions which can be drawn from this figure depends on how the welfare losses from unemployment are related to the duration of unemployment. If the welfare consequences from being unemployed more than 3 months are serious it can be argued that we have a *general* unemployment problem in the Swedish labor market because only a small part of total unemployment can be ascribed to unemployment shorter than three months. Then policies which improve the behavior of the labor market in general seem to be called for. On the other hand, if the borderline can be drawn at six or nine months or more, the real unemployment problem (from the individual welfare point of view) can be

localized to a smaller group of the unemployed. In that case selective policies which are directed to this group might be enough and no general policies are needed.

Finally it must be emphasized that these data are likely to underestimate long-term unemployment for at least two reasons. First, there is a drawback with the limited period, one year, in the retrospective surveys. Some of those who have been unemployed during the year might have experienced a long spell of unemployment but only a small fraction of it has been during the year from which we have information. Still the total unemployment duration for these persons might have been long.

Second, as mentioned in section 2.2 the measure of unemployment used here might be incomplete. It might be that some of the unemployed move frequently between open unemployment and hidden unemployment. In that case the total unemployment duration (open plus hidden) will be underestimated. Unfortunately no data are (easily)[1] available which can shed light on this phenomenon. However, Clark and Summers (1979) argue that transitions from open to hidden unemployment are common on the U.S. labor market.

2.5 Summary and Outline of the Next Chapters

The starting point for this study was that a dynamic analysis of unemployment in terms of flows into and out of unemployment can serve two purposes. First, it can help to explain the level of unemployment in a better way since the determinants of different "unemployment components" like the inflow of unemployed persons and the duration of spells are likely to differ. Second, it can give a better picture of unemployment as a welfare problem since it is likely that the welfare losses from unemployment are related to the duration of unemployment.

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[1] It would be possible to get some information about this from the Labor Force Surveys if a special investigation of the transitions from open unemployment to hidden unemployment is made. However, within this study no resources have been available for such an investigation.

As far as the first purpose is concerned we have been interested in finding the unemployment components that are generating the cyclical fluctuations of unemployment.

It turned out that most of the fluctuations could be ascribed to the duration of unemployment spells. It is perhaps surprising that no cyclical fluctuations can be found in the inflow rate since a cyclical pattern in the layoff rate can be expected. However it might be that there is a "composition-effect" behind the aggregate pattern, namely that the inflow during recessions mainly consists of layoffs with long duration, whereas the inflow during business peaks is of another type with shorter duration. Unfortunately, the data about the background of unemployment have been available for too short time to shed light on this hypothesis.

The empirical analysis also showed that the duration of unemployment spells has been longer during the seventies than during the second part of the sixties. The opposite pattern could be found for the inflow rate.

Since 1975 data about the background of unemployment have been available in Sweden. In a separate section the relative importance of (i) entrance and reentrance to unemployment, (ii) layoff unemployment and (iii) unemployment because of "job undertaken completed", and (iv) a residual group is presented. Decompositions into inflow rate and duration are also presented.

In the final section a picture of the distribution of unemployment among individuals during a year is provided. It is shown that the turnover among the unemployed is quite high. During a year between 250,000 and 400,000 persons have been unemployed, whereas the stock of unemployed has been 65,000--120,000.

Still short-term unemployment only accounts for a small fraction of total unemployment. Less than 25% of the stock of unemployed can be ascribed to persons with up to 13 unemployment weeks during a year.

In the following chapters some of the issues raised here will be subject to more detailed analysis

In chapter 3 one possible determinant of the shift to longer unemployment spells during the seventies is examined, namely extended unemployment benefits.

Chapter 4 is about the cyclical fluctuations of unemployment. Two competing theoretical explanations of the cyclical fluctuations of the duration of unemployment spells are tested. One is emphasizing the availability of jobs whereas the other relies on misperceptions of the wage level by the unemployed.

Chapter 5 aims at giving a better picture of unemployment as an individual welfare problem or as a distributional problem. The main purpose of this chapter is to test if there are any negative effects of unemployment on the subsequent wage path. A distinction between "occurence"- and "duration"-effects is made. By occurence-effects we mean once-and-for-all effects on the subsequent wage which arise as soon as a person becomes unemployed. If there are big effects of that kind even the short-term unemployed can make big welfare losses and it becomes an important task to reduce the number of people who are hit by unemployment (the "N" according to the notations above). By duration-effects we mean effects on the wage path that increase with the duration of unemployment. If these dominate the main emphasis should be on reducing unemployment duration (the "W" according to the notations above) and perhaps especially the long-term unemployment.

Table 1 Unemployment rate, inflow and duration for different age-groups, sexes and regions

	16-24 years			25-54 years			55-64 years			Men			Women			The northern region			The big city-areas			The rest of the country		
	u	f	D	u	f	D	u	f	D	u	f	D	u	f	D	u	f	D	u	f	D	u	f	D
1965	2.3	0.51	4.6	0.8	0.15	5.6	0.8	0.11	7.6	0.8	0.16	4.9	1.8	0.32	5.6	2.1	0.28	7.6	0.8	0.17	4.6	1.1	0.24	4.4
1966	2.7	0.73	3.7	1.3	0.21	5.9	1.2	0.11	10.8	1.2	0.21	6.0	2.1	0.46	4.5	2.3	0.39	6.0	1.2	0.30	4.0	1.5	0.23	6.2
1967	3.9	0.55	7.1	1.6	0.17	9.1	2.0	0.27	7.5	2.0	0.20	9.7	2.4	0.37	6.4	3.1	0.31	10.0	1.6	0.31	5.4	2.0	0.22	9.3
1968	3.9	0.67	5.9	1.7	0.15	11.2	2.1	0.14	14.8	2.2	0.16	13.5	2.2	0.39	5.5	4.0	0.41	9.7	1.6	0.25	6.6	1.8	0.16	11.4
1969	3.4	0.70	4.8	1.4	0.20	7.0	1.8	0.06	30.5	1.7	0.22	8.1	2.0	0.35	5.6	3.0	0.26	11.8	1.4	0.29	4.7	1.8	0.24	7.3
1970	2.9	0.53	5.5	1.1	0.16	6.5	1.4	0.11	13.4	1.3	0.17	7.6	1.8	0.30	5.8	2.3	0.29	8.0	1.2	0.24	5.3	1.4	0.17	8.1
1971	5.1	0.60	8.5	1.8	0.15	12.3	2.4	0.11	21.1	2.3	0.17	13.2	2.8	0.30	9.4	3.6	0.28	12.9	2.2	0.21	10.5	2.4	0.20	11.7
1972	5.7	0.50	11.3	2.0	0.12	16.8	2.3	0.06	35.6	2.5	0.16	15.1	3.0	0.21	14.6	3.8	0.23	16.6	2.4	0.16	15.4	2.4	0.16	14.7
1973	5.4	0.49	10.6	1.8	0.11	16.5	2.2	0.09	24.6	2.2	0.13	16.9	2.8	0.24	11.8	3.9	0.25	15.3	2.0	0.12	16.2	2.2	0.16	14.0
1974	4.1	0.50	8.1	1.3	0.14	9.7	2.0	0.08	26.1	1.6	0.15	11.0	2.4	0.26	9.3	3.0	0.28	10.8	1.6	0.17	9.6	1.8	0.18	10.0
1975	3.7	0.43	8.7	1.1	0.10	10.9	1.5	0.11	13.7	1.3	0.12	10.4	2.0	0.20	10.0	2.7	0.20	13.7	1.2	0.15	8.0	1.5	0.14	11.2
1976	3.7	0.36	10.2	1.1	0.09	11.8	1.5	0.05	30.0	1.2	0.10	12.5	2.0	0.17	12.0	2.5	0.18	14.0	1.2	0.11	10.7	1.5	0.12	12.7
1977	4.3	0.44	9.7	1.3	0.08	15.3	1.3	0.07	20.0	1.5	0.11	14.2	2.2	0.19	11.7	2.7	0.21	12.8	1.5	0.12	12.4	1.7	0.13	12.9
1978	5.5	0.60	8.9	1.6	0.11	13.7	1.9	0.08	23.5	2.1	0.17	12.6	2.5	0.22	11.1	3.2	0.29	11.2	1.7	0.16	10.8	2.2	0.17	13.1
1979	7.8	0.49	9.9	1.4	0.12	12.2	2.0	0.06	32.5	1.9	0.14	13.5	2.3	0.21	11.2	3.0	0.23	13.3	1.6	0.15	10.6	2.0	0.15	13.4
1980	4.9	0.51	9.8	1.4	0.11	12.2	1.6	0.05	35.0	1.7	0.13	13.3	2.3	0.21	11.0	3.0	0.23	13.2	1.5	0.14	10.7	1.9	0.16	12.2

Table 3. The distribution of unemployment among individuals, age-groups, sexes and regions. Notations explained in the text.

Year	16-24 years					25-54 years				
	U	N	S	D	W=SxD	U	N	S	D	W=SxD
1970	17,300	104,700	-	-	8.6	37,400	141,300	-	-	13.8
1971	38,100	161,400	-	-	12.3	60,200	198,200	-	-	15.8
1972	41,500	152,000	-	-	14.2	61,800	196,000	-	-	16.4
1973	35,800	157,600	-	-	11.8	56,200	186,100	-	-	15.7
1974	29,000	149,300	-	-	10.1	37,200	144,800	-	-	13.6
1975	26,800	116,900	-	-	11.9	32,000	111,100	-	-	15.0
1976	20,800	106,900	1.03	9.8	10.1	32,900	114,800	1.13	13.2	14.9
1977	28,600	127,000	1.04	11.3	11.7	37,060	120,100	1.01	15.8	16.0
1978	35,300	148,000	1.12	11.1	12.4	46,400	149,900	1.08	15.0	16.1
1979	31,800	147,800	1.06	10.6	11.2	47,400	150,200	1.14	14.4	16.4
1980	32,000	139,900	1.11	10.7	11.9	43,200	143,900	1.18	13.2	15.6

Year	55-64 years					Men 16-64 years				
	U	N	S	D	W=SxD	U	N	S	D	W=SxD
1970	13,800	36,500	-	-	19.7	30,100	135,800	-	-	11.5
1971	18,600	45,200	-	-	21.4	58,300	210,000	-	-	14.4
1972	18,800	39,300	-	-	24.9	56,500	202,000	-	-	14.5
1973	18,700	47,400	-	-	20.6	54,000	199,500	-	-	14.1
1974	14,500	32,000	-	-	23.5	32,800	150,500	-	-	11.3
1975	8,700	21,000	-	-	21.4	30,700	117,700	-	-	13.6
1976	9,300	24,100	0.75	26.8	20.1	28,600	103,200	1.09	13.2	14.4
1977	10,000	22,100	0.88	27.0	23.6	34,200	121,000	1.02	14.4	14.7
1978	13,200	27,400	0.92	27.2	25.0	43,900	154,400	1.02	14.5	14.8
1979	10,000	21,300	0.71	34.5	24.4	37,900	140,900	1.01	13.9	14.0
1980	12,400	26,800	0.98	24.5	24.1	39,600	145,200	1.13	12.6	14.2

Year	Women 16-64 years				
	U	N	S	D	W=SxD
1970	38,500	147,100	-	-	13.6
1971	58,500	195,000	-	-	15.6
1972	63,400	184,100	-	-	17.9
1973	56,900	191,500	-	-	15.4
1974	47,800	175,100	-	-	14.2
1975	36,600	131,400	-	-	14.5
1976	34,300	142,800	0.99	12.6	12.5
1977	41,600	148,000	0.99	14.7	14.6
1978	50,700	171,300	1.12	13.7	15.4
1979	50,600	179,000	1.18	12.5	14.7
1980	47,800	165,600	1.13	13.3	15.0

Year	Northern regions 16-74 years				
	U	N	S	D	W=SxD
1970	24,200	90,000	-	-	14.0
1971	34,400	102,800	-	-	17.4
1972	33,800	97,200	-	-	18.1
1973	35,100	110,500	-	-	16.5
1974	29,200	95,600	-	-	15.9
1975	25,200	82,400	-	-	15.9
1976	22,200	76,900	1.08	13.9	15.0
1977	21,300	72,800	0.99	15.3	15.2
1978	27,900	90,800	1.09	14.7	16.0
1979	28,300	92,100	1.24	13.0	16.0
1980	26,400	89,700	1.23	12.4	15.3

Year	Big city areas 16-74 years				
	U	N	S	D	W=SxD
1970	20,000	90,300	-	-	11.5
1971	39,900	138,800	-	-	14.6
1972	45,300	147,100	-	-	16.0
1973	39,000	138,000	-	-	14.7
1974	24,900	112,500	-	-	11.5
1975	20,300	72,200	-	-	14.6
1976	18,000	80,700	1.17	10.3	12.1
1977	29,300	102,200	1.02	14.6	14.9
1978	28,800	104,700	1.11	12.9	14.3
1979	26,300	105,100	1.12	11.6	13.0
1980	25,200	90,200	1.07	13.6	14.5

Year	The rest of the country 16-74 years				
	U	N	S	D	W=SxD
1970	28,000	111,800	-	-	13.0
1971	47,100	171,100	-	-	14.3
1972	47,600	151,900	-	-	16.3
1973	40,800	149,500	-	-	14.2
1974	30,300	124,900	-	-	12.6
1975	26,100	102,000	-	-	13.3
1976	23,700	91,900	0.93	14.4	13.4
1977	27,100	97,300	1.02	14.1	14.5
1978	38,000	130,900	1.10	13.7	15.1
1979	35,900	123,500	0.97	15.5	15.1
1980	36,500	131,700	1.11	13.0	14.4

Appendix 1.

Derivation of the average duration of a spell of unemployment

1 a. The stationary case

In discrete time the unemployment in a given period, t, can be written as

$$\text{(A1)} \quad U_t \equiv F_t + F_{t-1} \times p^1_{t-1} + F_{t-2} \times p^1_{t-2} \times p^2_{t-1} + F_{t-3} \times p^1_{t-3} \times \times p^2_{t-2} \times p^3_{t-1} + \text{etc.}$$

where F_t = inflow of unemployed persons during t

p^i_t = the proportion of the unemployed which, during t, survives their i:th period of unemployment given that they have been unemployed i-1 periods before.

In a stationary situation, with constant inflow and survival-rates from period to period, (A1) will be reduced to:

$$\text{(A2)} \quad U = F(1 + p^1 + p^1 \times p^2 + p^1 \times p^2 \times p^3 + \text{etc.})$$

We can also write the average duration of spells of unemployment, denoted D, as

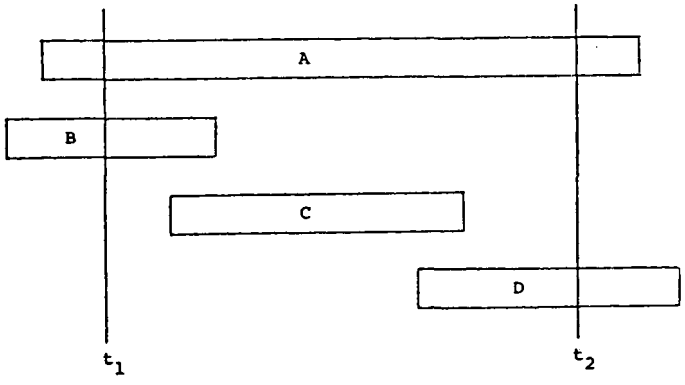
$$\text{(A3)} \quad D = 1 \times (1-p^1) + 2 \times p^1 \times (1-p^2) + 3 \times p^1 \times p^2 \times (1-p^3) \quad \text{etc.}$$
$$= 1 - p^1 + 2 \times p^1 - 2 \times p^1 \times p^2 + 3 \times p^1 \times p^2 - 3 \times p^1 \times p^2 \times p^3 \quad \text{etc.}$$
$$= 1 + p^1 + p^1 \times p^2 + p^1 \times p^2 \times p^3 \quad \text{etc.}$$

By combining (A2) and (A3) we have the familiar "unemployment = inflow × × duration" equation U = F × D.

1 b. The non-stationary case

In a non-stationary situation the problem to compute the average duration of unemployment becomes more complicated. Since the total outflow and inflow can differ, the average duration of unemployment during a certain period can

refer to the spells which are terminated during the period (the outflow) as well as the spells which are started during the period (the inflow). To illustrate the information which is needed to compute the duration for both the outflow and the inflow the following figure can be used.[1)]



In the figure, A represents all spells of unemployment which were started before the time t_1 and terminated after the time t_2; B represents all spells which were started before t_1 but terminated during the period t_1-t_2; C represents all spells which were both started and terminated during the period t_1-t_2; D, finally, represents all spells which were started during the period t_1-t_2 but terminated after t_2.

Let us first consider the average duration for the spells of unemployment which were started during the period (i.e. the average duration for the inflow during the period), denoted D(I). D(I) is equal to the total number of weeks of unemployment for the spells which were started during the period divided by the number of spells. In terms of the figure, this means the unemployment which is represented by C and D divided by the total inflow during the period. Introducing notations this can be written:

1) See also: U. Cramer/F. Egle (1976).

$$\text{(A4)} \quad D(I) = \frac{(t_2-t_1) \times \bar{U} - U_1 \times \overrightarrow{d_1} + U_2 \times \overrightarrow{d_2}}{(t_2-t_1)\ F}$$

where $\bar{U}$ = the average stock of unemployed during the period

F = the average weekly inflow during the period

U_1 and U_2 = the stock of unemployed at t_1 and t_2

$\overrightarrow{d_1}$ and $\overrightarrow{d_2}$ = the average remaining duration of unemployment for those who are unemployed at t_1 and t_2.

The average duration for the outflow, denoted D(O), is in the same way equal to the total number of weeks of unemployment for the spells which were terminated during the period divided by the total number of spells which were terminated during the period. In terms of the figure this means the unemployment which is represented by B plus C divided by the total outflow during the period.

$$\text{(A5)} \quad D(O) = \frac{\bar{U} \times (t_2-t_1) + U_1 \times \overleftarrow{d_1} - U_2 \times \overleftarrow{d_2}}{(t_2-t_1) \times F + U_1 - U_2}$$

where $\overleftarrow{d_1}$ and $\overleftarrow{d_2}$ = the average interrupted duration of unemployment for those who are unemployed at t_1 and t_2 (the "cross-section" measure)

Actually all information which is needed for (A5) is available, the stock and inflow data are available and the average interrupted duration of unemployment too. However, in order to compute (A4), information about the average remaining duration of unemployment is needed. One way to obtain this information is to compute "survival rates" for those who are unemployed at t_1 and t_2. Unfortunately only quite crude (quarterly) and uncertain survival rates can be computed with Swedish data. An alternative is to rely on a theorem which says that in a stationary situation the average remaining duration of unemployment is equal to the average interrupted duration.[1)]

1) See e.g. Robert H. Frank (1978).

Although this alternative might seem unlogical since we are interested in a non-stationary situation, it will be used in the computations below in order to get at least a crude approximation.

The relative errors which arise when the formula

$$\text{(A6)} \qquad D = \frac{\bar{U}}{F}$$

is used instead of (A4) or (A5) will be the following:

$$\text{(A7)} \qquad \frac{D(I)}{D} = \frac{((t_2-t_1) \times \bar{U} - U_1 \times \overrightarrow{d_1} + U_2 \times \overrightarrow{d_2}) \times F}{(t_2-t_1) \times F \times \bar{U}} = 1 + \frac{U_2 \times \overrightarrow{d_2} - U_1 \times \overrightarrow{d_1}}{(t_2-t_1) \times \bar{U}}$$

$$\text{(A8)} \qquad \frac{D(0)}{D} = \frac{((t_2-t_1) \times \bar{U} + U_1 \times \overleftarrow{d_1} - U_2 \times \overleftarrow{d_2})}{((t_2-t_1) \times F + U_1 - U_2) \times D} = \frac{((t_2-t_1) \times \bar{U} + U_1 \times \overleftarrow{d_1} - U_2 \times \overleftarrow{d_2}}{((t_2-t_1) \times \bar{U} + U_1 \times D - U_2 \times D)}$$

A close inspection of (A7) and (A8) reveals that everything else equal, the relative errors will be smaller, (i) the longer the periods (t_2-t_1) are, (ii) the smaller the changes of the stock of unemployed are and (iii) the smaller the changes of the duration of interrupted and remaining spells of unemployment are. Because these changes are likely to be bigger the longer the periods are it is hard to say which time-period should be used in empirical applications of (A6). However, the effect of the seasonal variations of the stock of unemployed and the duration of completed and remaining spells of unemployment can be avoided by using a period of one year. Because in addition the available inflow-data (see appendix 2) are quite uncertain at the monthly and quarterly levels, the period one year (the calendar year) will be used in this study.

In order to illustrate the magnitude of the discrepancies between D, D(I) and D(0) which arise when the time-period one year is used, these variables have been computed for the aggregate unemployment and the age-group 55-64 years. The results are presented in the following table.[1)]

1) U_1 and U_2 have been approximated by the average value for the December and January surveys. $\overleftarrow{d_1}$ and $\overleftarrow{d_2}$ have been computed in the same way.

	16-74 years			55-64 years		
	D	D(I)	D(0)	D	D(I)	D(0)
1971	11.6	13.8	10.3	21.1	n.a.	n.a.
1972	15.5	15.2	15.4	35.6	31.5	33.8
1973	14.6	13.7	14.8	24.6	27.1	24.7
1974	10.4	9.0	10.7	26.1	17.9	27.4
1975	10.7	11.0	10.6	13.7	14.6	13.5
1976	12.3	12.4	12.3	30.0	32.1	24.4
1977	12.7	13.8	12.2	20.0	20.4	21.0
1978	11.8	12.3	11.5	23.5	29.4	20.6

The discrepancies for the aggregate must be regarded as quite low when a time-period of one year is used. For the age-group 55-64 years the discrepancy is higher for some years. During 1974 when unemployment decreased rapidly,D is equal to 26.1 weeks but D(I) is only 17.9.

Appendix 2.

Estimation of the inflow and duration components of unemployment

2 a. Estimation of the inflow of unemployed persons from the Labor Force Surveys

From the Swedish Labor Force Surveys it is possible to compute the weekly inflow to unemployment in two ways. The first way is to use data from the monthly surveys (before 1970 the quarterly surveys) and the second way is to use data from the yearly retrospective survey which has been performed in February each year since 1967.

Because of the definition of unemployment in the Swedish Labor Force Surveys the weekly inflow can be computed from the monthly surveys as the number of individuals who are counted as unemployed one week. This is due to the fact that a reference period of one week is used in the surveys; the individuals are classified as either employed, or unemployed or not in the labor force during the reference week but counted as employed or not in the labor force during the week before.

The most important cases which can appear are presented in the following figure. The solid lines display the actual periods of unemployment. The labor force status and duration of unemployment according to the principles used in the Surveys[1)] are presented too. The figure shows that the weekly inflow to unemployment as defined in the surveys can be computed as the number of individuals who are counted as unemployed one week. The reason is that all those who are counted as unemployed during the week for the first time will be counted as unemployed exactly one week.

Consequently, this inflow estimator is consistent with the stock of unemployment used in the AKU.

---

1) See Arbetskraftsundersökningarna, Huvudinstruktion, Statistiska Centralbyrån (The main instructions for the interviewers in the Labor Force Surveys).

	Week 1	Reference-week Week 2	Week 3
From outside labor force			
Case 1a			
Actual unemployment			
Labor force state in the survey	Outside l.f.	Unemployed	
Duration of u-ment in the survey		1	
Case 2a			
Actual unemployment			
Labor force state in the survey	Outside l.f.	Unemployed	
Duration of u-ment in the survey		1	
Case 3a			
Actual unemployment			
Labor force state in the survey	Unemployed	Unemployed	
Duration of u-ment in the survey	1	2	
From employment			
Case 1b			
Actual unemployment			
Labor force state in the survey	Employed	Employed	
Case 2b			
Actual unemployment			
Labor force state in the survey	Employed	Unemployed	
Duration of u-ment in the survey		1	
Case 3b			
Actual unemployment			
Labor force state in the survey	Employed	Unemployed	
Duration of u-ment in the survey		1	

However, some unemployment, like 1b where the individual has been employed at least some hour during the reference week, will not be included in the unemployment figures. Probably this kind of unemployment is of negligible magnitude as far as the stock of unemployed is concerned. However, the weekly inflow and hence the duration of unemployment might be affected to a greater extent. A simple example can illustrate this. Suppose that the weekly inflow and the stock of unemployed according to the surveys are 6,000 and 80,000 respectively. The average duration of unemployment will then be 13.33 weeks. If there are in addition 4,000 spells of unemployment per week like 1b with an average duration of half a week, the

"true" stock of unemployed will be 82,000 and the "true" weekly inflow will be 10,000. The average duration will decrease to 8.2 weeks. Consequently the treatment of short-time-unemployment in the unemployment statistics is extremely important for the levels of the inflow- and duration-components. In general, the relative magnitudes of the inflow and duration components are likely to be very sensitive to the definition of the stock of unemployed. This must be kept in mind when comparisons are made between different countries and different sources of unemployment statistics. If, for example, the decomposition of unemployment from the statistics from the unemployment benefit societies were made, quite different results could be obtained since the reference-period is different in those statistics.

Even though the one-week-measure is an unbiased estimator of unemployment inflow during the reference week it cannot be applied uncritically.

One problem arises because the surveys in general are conducted during one or two weeks in the middle of the month. If these weeks are not representative for the whole month the estimator will not be correct for the whole month.[1] For example, if the inflow is concentrated to the first or last weeks of the month, the inflow will be underestimated. However, this drawback is probably not serious as far as the structural and cyclical development of the inflow is concerned.

Another problem is that the sampling variance of the estimator becomes quite high since the sample size is quite low. The standard errors of the inflow estimates (S(F)) for different age groups are the following for 1979-1980:

---

1) This problem arises in a special way in June. Most years the surveys have been conducted during two weeks whereof one before the school terminations and one after. However, during 1973 all interviews were made before and 1974, 1979 and 1980 after the school terminations. This has highly affected the inflow for youth during these years. Therefore some corrections have been made. See Björklund: Correction of inflow and unemployment data for June 1973, 1974, 1979 and 1980. Mimeo 1981.

	16-64			16-24			25-54			55-64		
	F	S(F)	S(F)/F	F	S(F)	S(F)/F	F	S(F)	S(F)/F	F	S(F)	S(F)/F
1979	7100	500	0.070	3400	345	0.101	3300	340	0.103	400	120	0.297
1980	7100	500	0.070	3600	355	0.099	3200	335	0.105	300	100	0.333

Of course the relative errors become very high for groups with low inflow since the number of observations is low.

Summarizing this discussion we can conclude that this estimator of unemployment inflow is likely to give a reasonable picture of the cyclical and structural development but the precision of single observations is low, especially for subgroups of unemployed.

The second way to estimate the weekly inflow of unemployed persons is to use data from the yearly retrospective questions which are asked in February each year.[1] In this survey the individuals are asked if they were unemployed any time during the preceding year. Let us denote the number of individuals who have been unemployed any time during a year by N. The survey also yields information about how many times these individuals have been (not become) unemployed during the year. Let us denote the average number of periods of unemployment per individual by P.

In order to compute the average number of individuals who have become unemployed during an average week (the weekly inflow) we conclude that the total number of unemployment periods during a year equals the number of unemployed during the first week of the year (denoted U_1) plus the number of new spells during the subsequent 51 weeks (equals 51 × F). We obtain:

(A9) $$N \times P = U_1 + 51 \times F$$

which can be solved for F:

$$F = \frac{N \times P - U_1}{51}$$

1) The information from these questions from 1970 onwards are available in tables which have been obtained from the Central Bureau of Statistics.

Complete data about N and P from the retrospective surveys are only available from 1976 onwards. For the years 1973-1975 there only exist frequency tables with 1 period, 2 periods and 3 or more periods. Consequently only a minimum value of P can be computed for these years. This in turn means that we only have a minimum value of inflow (F) and maximum value of duration (D) for these years.

In the following table the unemployment components from the regular Labor Force Surveys (LFS) and the retrospective "February Survey" (FS) are presented.[1)]

	LFS			FS		
	U	F	D	U	F	D
1973	99.000	6.800	14.6	115.000	8.100	14.2
74	80.000	7.700	10.4	85.000	6.400	13.3
75	67.000	6.300	10.7	72.000	5.400	13.3
76	66.000	5.400	12.3	65.000	5.000	13.1
77	75.000	5.900	12.7	78.000	5.300	14.6
78	94.000	8.000	11.8	95.000	6.900	13.7
79	87.000	7.100	12.3	91.000	6.800	13.4
80	85.000	7.100	12.0	88.000	6.800	13.0

As seen from the table there seems to be a systematic difference in the levels of the unemployment components. Except for 1973, inflow is higher and duration lower in the regular surveys. On the other hand the development during 1974-1980 is similar in the two surveys. The rising unemployment during 1978-80 can in both surveys be ascribed to higher inflow.

However, 1973 diverges from the pattern. Since it is not possible to say which survey is most reliable, the unemployment components for this year must be taken with great care.

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1) The levels of unemployment are not equal in the two surveys. See Björklund (1981) for a discussion.

U_1 in (A9) has been estimated as the average unemployment in December and January.

2 b. The duration- and inflow-components according to an alternative method

Because of the inconsistency between the two data sources during 1973 and lack of possibilities to test for consistency before 1973 it is appealing to use some more method to estimate the unemployment-components. Especially the two years 1972 and 1973, when the average duration attained the highest value during the period 1965-1980 according to the inflow-data from the monthly surveys, should be compared with some alternative measure.

One easily available method to compute the average duration has been proposed by Barron (1975) and applied to Swedish data by Axelsson/Löfgren (1977). This method relies on the - in itself rather strong - assumption that the weekly survival-rate, P, is constant during the whole spell of unemployment. Given this assumption, suppose that, at t, U_t^{ab} persons have been unemployed at least a weeks but not more than b weeks. Suppose further that b-a = T. After 2·T weeks some of these are still unemployed, namely $U_{t+2T}^{c,d}$, where d = 2·T+b and c = 2·T+a.

With the available data from the AKU, this method can be applied in the following two ways.

(A10) $U_t^{1,4} x(P)^8 = U_{t+8}^{9,12}$

(A11) $U_t^{1,13} x(P)^{26} = U_{t+26}^{27,39}$

Since it is unlikely that the assumption of a constant survival-rate will hold in reality, the survival-rates computed from A10 and A11 will be a geometric average of the survival-rates in the respective intervals. Therefore different notations will be used for the survival-rates implied by A10 and A11:

(A12) $P_1 = \left(\frac{U_{t+8}^{9,12}}{U_t^{1,4}}\right)^{\frac{1}{8}}$

(A13) $P_2 = \left(\frac{U_{t+26}^{27,39}}{U_t^{1,13}}\right)^{\frac{1}{26}}$

From these survival-rates the average duration of unemployment spells can be computed as

(A14) $D_1 = \frac{1}{1-P_1}$

(A15) $D_2 = \frac{1}{1-P_2}$

These measures can not be taken as reliable estimators of the level of the average duration of unemployment, since they only capture the survival-rates in limited intervals. On the other hand the intervals ought to be long enough to capture most of the cyclical and the structural variations of the duration of unemployment.

In Table A1 the four different measures are presented. Except for the levels the most striking discrepancies are 1972 and 1973. The two measures from Barron´s method, D_1 and D_2, do not reveal as drastic peaks these years as the duration measure based on inflow-data does. This need not be an inconsistency since it might be that the high duration these years are due to the survival-rates for the very long-term unemployed (more than 39 weeks). However, the estimates for 1972 and 1973 presented in the text must be taken with some care.

Otherwise the cyclical pattern and the structural change from the sixties to the seventies can be found in all series.

Table A1. Unemployment duration according to four different measures. 16-74 years.

	D	D_1	D_2	D_{FS}
1965	5.4	5.3	6.6	-
1966	5.3	5.3	7.9	-
1967	8.0	7.1	10.0	-
1968	9.0	7.0	9.7	-
1969	7.1	6.8	9.0	-
1970	6.9	5.2	9.0	-
1971	11.6	7.7	12.0	-
1972	15.5	8.8	12.0	-
1973	14.5	8.7	11.6	-
1974	10.3	7.0	10.3	-
1975	10.7	7.0	10.3	-
1976	12.3	6.9	10.5	13.1
1977	12.7	8.2	12.2	14.6
1978	11.8	8.0	12.3	13.7
1979	12.3	8.0	12.1	13.4
1980	12.0	8.5	11.1	13.0

D = estimated from the weekly inflow from the regular surveys

D_1 : estimated from A12

D_2 : estimated from A13

D_{FS} : estimated from the retrospective "February Surveys"

Appendix 3.

The purpose of this appendix is to provide a simple framework within which the unemployment components in section 2.4 can be interpreted. We only consider a stationary situation with constant unemployment, inflow and duration. We first consider a cohort of individuals over their active life time, denoted T. Suppose each individual can be characterized by the duration of their unemployment spells, d, and their employment spells, e (or rather non-unemployment spell since no distinction is made between employment and being outside labor force). Some will never be unemployed but the others will have unemployment/employment cycles, d + e, during their life time.

Each period (week) F persons will become unemployed. But how many in the cohort will ever be hit by unemployment? This will depend on the length of the unemployment/employment cycle for those who become unemployed. If the average duration of the unemployment spell is D and the average duration of the subsequent employment period is E, new persons will become unemployed during D+E weeks but during the D+E+1 week those who become unemployed will have been unemployed before. Consequently we get:

(A16) $N = F \times (D+E)$

Now we turn to the case with a limited time period like a year. We are interested in finding the relationship between the number of persons who are unemployed anytime during the year, N, and the weekly inflow to unemployment, F.

For a given unemployment and inflow the maximum number of persons who are unemployed any time during a year is the number of persons who are unemployed during the first week of the year plus the total inflow during the other 51 weeks:

(A17) $N = U_1 + 51 \times F$

where U_1 = unemployment stock during the first week of the year

However, those who have been unemployed several times during the year must be subtracted. To show how this can be done we introduce the following notations:

$g(t)$ = proportion of those who become unemployed a certain week whose employment period lasts t weeks

F_t = inflow of unemployed persons during week t

We now have:

$$
\begin{aligned}
\text{(A18)}\quad N = {} & U_1 + F_2 \\
& + F_3\,(1 - g(1)) \\
& + F_4\,(1 - g(1) - g(2)) \\
& + F_5\,(1 - g(1) - g(2) - g(3)) \\
& \;\;\vdots \\
& + F_{52}\,(1 - g(1) - g(2) - g(3) - \ldots\ldots\ldots\ldots\ldots\ldots - g(50))
\end{aligned}
$$

Collecting terms and assuming stationarity we have:

$$\text{(A19)}\quad N = F\,\left[D + 51 - 50 \times g(1) - 49\,g(2) - \ldots\ldots\ldots - g(50)\right]$$

Adding and subtracting g(1), 2 x g(2) etc. we obtain:

$$\text{(A20)}\quad N = F\,\left[D + g(1) + 2 \times g(2) + 3 \times g(3) + \ldots\ldots\ldots + 50 \times g\,(50) + 51 \times g(\leq 51)\right]$$

Consequently $\left(\frac{F}{N}\right)$ can be interpreted as a truncated measure of the unemployment/employment cycle since all employment spells which last longer than or equal to 51 weeks will get the value 51:

$$\text{(A20)}\quad \frac{F}{N} = \frac{1}{D+E}$$

where $E \leq 51$.

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ON THE DURATION OF UNEMPLOYMENT IN SWEDEN, 1965–1976

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Abstract

The structural changes in the duration of unemployment in Sweden during the period 1965–1976 are analyzed in this paper. Thanks to recent working-up of the Labor Force Surveys in Sweden, it has been possible to analyze the duration of unemployment in terms of quarterly survival rates. An econometric test of the structural changes in the survival rates reveals that extensions of the unemployment benefit system in 1968 and 1974 have not contributed to the rising survival rates, at least not to any great extent. Furthermore, the composition of the inflow of unemployment in terms of demographic groups has been rather stable during the period, which indicates that the structural changes have had equal effects on all four of the groups considered.

I. Introduction

During the last decade, unemployment in Sweden has displayed some important structural changes. In particular, it seems as though fewer persons have become unemployed during each period, although the duration of their unemployment spells has risen.

The welfare implications of these structural changes are far from clear. However, to the extent that unemployment is primarily involuntary, the burden of unemployment might have become more unequally distributed during the last decade. Furthermore, Barrett & Södersten (1975) have argued that the long expected duration of unemployment spells tends to lock Swedish workers into their existing jobs. This *captive worker effect*, they argue, is a welfare loss in addition to the income foregone by the unemployed.

Unfortunately, the analysis of the *welfare implications* as well as the *causes* of these structural changes has been complicated by some *measurement* problems and lack of relevant data; see Axelsson, Holmlund & Löfgren (1977), Barrett (1975), (1977) and Flanagan (1975).

By using data which have become available thanks to working-up of the data from the Labor Force Surveys (*Arbetskraftsundersökningarna*, AKU),

this paper presents an analysis of the duration of unemployment in terms of quarterly survival rates. Two hypotheses about the structural changes in the survival rates are tested. First, we study whether the changes in the survival rates are consistent with the changes which, according to search theory, should have taken place when the unemployment-benefit system was extended in 1968 and 1974. Second, we study whether changes in the demographic composition of the inflow of the unemployed can explain the rising survival rates for the aggregate.

II. The Average Duration of Unemployment in Sweden, 1965–1976

The *measurement* problem mentioned above concerns the question of measuring the average duration of a completed spell of unemployment. Available statistics only provide estimates of the average duration until the time of the survey, the so-called cross-section measure.[1]

One way of measuring the average duration of a completed spell of unemployment is to use the following decomposition of unemployment, which holds in a steady-state situation:

$$U = f \cdot D \tag{1}$$

where U = number of unemployed, f = weekly inflow to unemployment, and D = average duration (in weeks) of a completed spell of unemployment.

If an estimate of the weekly inflow is available, the average duration of a completed spell of unemployment can also be estimated.

The Swedish AKU-surveys can be used to estimate the weekly inflow as the number of individuals who have been unemployed less than one week at the time of the survey. Axelsson, Holmlund & Löfgren had to rely on approximate estimates of the inflow.[2] Thanks to improvements in the data, it has been possible to obtain more reliable data on the weekly inflow.[3]

Diagram 1 shows that the difference is indeed quite remarkable, especially after 1971. Actually, the cross-section measure of average duration used by Barrett & Södersten seems to come closer to the new estimates of the average duration of unemployment.

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[1] See also the discussion between Axelsson, Holmlund & Löfgren (1977) and Barrett (1977).
[2] Axelsson et al. also present what they call the maximum duration based on an estimate of the minimum inflow. However, this estimate appears to be conceptually wrong. The number of people experiencing unemployment during a year times the average number of periods of unemployment during the year cannot be equal to the yearly inflow, since part of the unemployed must have *become* unemployed during the preceding year.
[3] Of course, there remains some sampling variance in the estimator, since the AKU only is a sampling survey. In addition, the estimator is biased if the inflow to unemployment is unevenly distributed during the month, since the surveys are usually conducted during one or two weeks in the middle of the month.

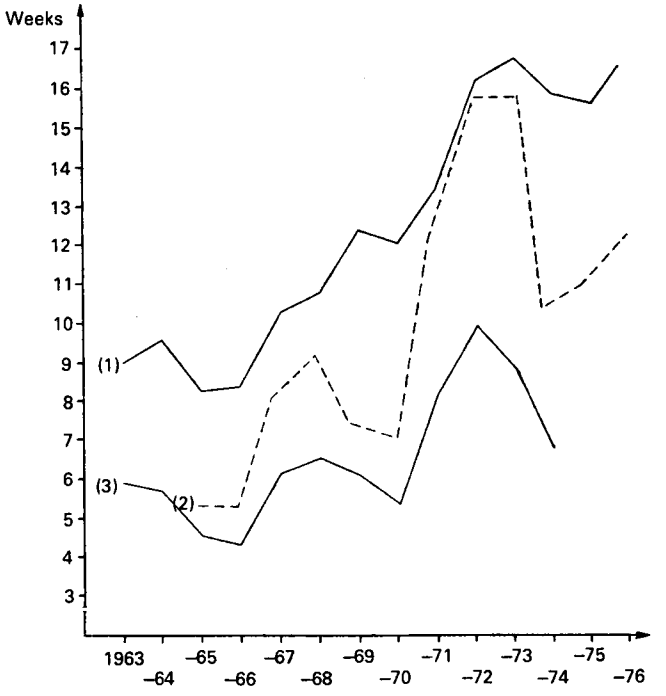

Diagram 1. The duration of unemployment according to different measures; 16–74 years. (1) The cross-section measure. (2) The average duration according to recently available inflow data. (3) The average duration according to the earlier approximate inflow data.

III. Data

Unemployment at the end of a period t, U_t, can always be written:

$$U_t = f_t + f_{t-1} \cdot p^1_{t-1} + f_{t-2} \cdot p^1_{t-2} \cdot p^2_{t-1} + f_{t-3} \cdot p^1_{t-3} \cdot p^2_{t-2} \cdot p^3_{t-1} + \dots \quad (2)$$

where f_t = inflow during period t, p^i_t = proportion of the unemployed that have been unemployed during i periods who remain in a state of unemployment in the next period (the survival rate).

In a steady-state, when inflow and survival rates are constant, unemployment can be reduced to (1).

When analyzing the cyclical and structural changes in the duration of unemployment, it is advantageous to use survival rates rather than the average duration. First, the steady-state assumption can be relaxed. Second, the distribution of the duration of unemployment can be estimated and analyzed. This is crucial for obtaining a picture of the welfare loss which consists of income foregone. In addition, we can see whether the structural changes have appeared in all the survival rates or only in those for e.g. who have been unemployed for a long time.

In the labor force surveys (AKU) the unemployed report the number of weeks they have been unemployed until the day of the survey. This informa-

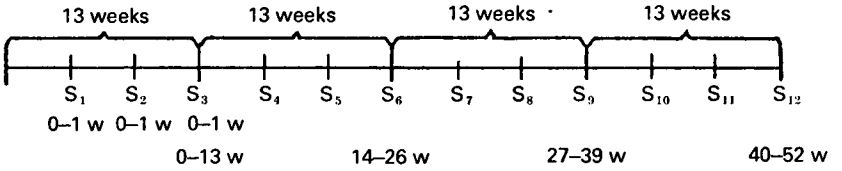

Fig. 1

tion allows us to estimate the survival rate as the ratio of the number who have been unemployed during $X+Y$ periods to the number who had been unemployed during X periods, Y periods earlier. This requires the duration groups of the unemployed to have the same width as the length of the period between the two surveys. However, it seems plausible that the precision of such estimates becomes quite low unless the same individuals appear in the two surveys.

The rotating system of the samples in the AKU is constructed in such a way that almost 90 % of those who are interviewed in one survey are interviewed again after three months. On the other hand, different individuals are interviewed in two subsequent months. Consequently, only quarterly survival rates were computed.

The principles for the estimation of the survival rates are illustrated in Fig. 1.

First, an estimate of the average weekly inflow during a quarter was obtained from the number of unemployed with one week or less of unemployment at the time of surveys S_1, S_2, S_3.[1]

Then, the survival rates were computed in the following way:[2]

$$P_t^{0/1\text{w}-13\text{w}} = \frac{U_t^{0/13\text{w}}}{13 f_t}$$

$$P_t^{0/13\text{w}-14/26\text{w}} = \frac{U_{t+13}^{14/26\text{w}}}{U_t^{0/13\text{w}}}$$

$$P_t^{14/26\text{w}-27/39\text{w}} = \frac{U_{t+13}^{27/39\text{w}}}{U_t^{14/26\text{w}}}$$

$U_t^{14/26\text{w}}$ denotes the number who have been unemployed for 14–26 weeks at the time of the survey.

It should be noted that the first survival rate is somewhat different from the others.[3]

[1] During the 1960s, when only quarterly surveys were conducted, the average number of unemployed with one week or less of unemployment in *two subsequent quarters* were taken as an estimator of the weekly inflow during the period.

[2] Unfortunately, the actual estimates had to be based on the number of unemployed for 0–12 weeks and 13–26, respectively, due to data restrictions.

[3] In addition, it should be noted that the survival rates during the 1970s are quarterly averages of quarterly survival rates. For example, $P^{14/26\text{w}-27/39\text{w}}$ in the figure above is the ratio of the number of unemployed for 27/39 weeks at the time of surveys S_7, S_8, S_9 and the number for 14/26 weeks at the time of surveys S_4, S_5, S_6. The precision of the estimates could be improved in this way.

IV. Survival Rates and Extended Unemployment Benefits

One plausible cause of the longer duration of spells of unemployment can be the extended unemployment benefits (UB) which were introduced during the period. This section is devoted to testing whether the structural changes in the survival rates are compatible with this hypothesis.

IV. 1. *Specification of the Survival Rates*

Choice of Variables. The survival rate for the unemployed, denoted P_t^{uu}, is the complement of the flows from unemployment to employment (e) and out of the labor force (n). We have the identity:

$$P_t^{uu} = 1 - P_t^{ue} - P_t^{un} \tag{3}$$

P_t^{ue} and P_t^{un} consist of the following components:

$$P_t^{ue} = P_t^r \cdot P_t^o \cdot P_t^a \tag{4}$$

$$P_t^{un} = 1 - P_t^r \tag{5}$$

where P_t^r = the probability of remaining in the labor force, P_t^o = the probability of receiving a wage offer, and P_t^a = the probability of accepting the wage offer. Consequently, P^r, P^o and P^a have to be specified.

At the beginning of every period, suppose the unemployed first considers the alternative of remaining in the labor force or not. Abstracting from risk, the unemployed chooses to remain in the labor force if the expected pay-off from remaining in the labor force is higher than the value of the non-market activity available to him. The expected pay-off from remaining in the labor force is in turn a weighted average of the pay-off from getting a job and the pay-off from continued search with the probabilities of obtaining a job ($P_t^o \cdot P_t^a$ using the notations above) and its complement ($1 - P_t^o \cdot P_t^a$) as weights. Consequently the unemployed has to calculate the wage offer probability as well as the acceptance probability and the expected wage, given that he accepts before he decides to remain in the labor force or not.

The probability of receiving an offer, P^o, is assumed to be a function of the number of vacancies, V, and unemployed, U:

$$P_t^o = f(\underset{+}{V_t}, \underset{-}{U_t}). \tag{6}$$

The unemployment variable can be motivated by the potential competition for available vacancies which is created by the increased supply.

Turning to the acceptance probability, P_t^a, search theory implies that the optimal rule for the unemployed searching from a known wage distribution is to choose an acceptance wage, $\hat{w}_t$, which maximizes the expected pay-off.

A simple specification of this optimization problem,[1] with a finite horizon $t+N$ and with zero discount rate, yields the following solution:

$$\hat{w}_t = \frac{C_t + V^u_{t+1}}{N} \tag{7}$$

where C_t = unemployment benefit and V^u_{t+1} = expected pay-off from starting the next period as unemployed.

Consequently P^a_t becomes

$$P^a_t = \int_{\hat{w}_t}^{\infty} f(w)\,dw = 1 - F(\hat{w}_t) = 1 - F\left(\frac{C_t + V^u_{t+1}}{N}\right) \tag{8}$$

where $f(w)$ and $F(w)$ are the density and distribution functions, respectively.

Finally, we regard the value of the non-market activity, h_t, which is available for the unemployed in the beginning of the period as a stochastic variable. The acceptance level for this activity, h_t, below which the unemployed decides to remain in the labor force will be

$$\hat{h}_t = \frac{P^o_t \cdot P^a_t[N \cdot E(w|w > \hat{w})] + (1 - P^o_t \cdot P^a_t)[C_t + V^u_{t+1}]}{N} \tag{9}$$

and P^r_t becomes

$$P^r_t = G(\hat{h}_t) \tag{10}$$

where $G(h)$ is the distribution function of the non-market activity.

It follows from equations (7) and (9) that an increase in the unemployment benefit will increase the acceptance wage and the acceptance level for the non-market activity. The same holds for an increase in the future benefit, e.g. an increased *duration* of the benefit, via V^u_{t+1}. Consequently the survival rate for the unemployed will increase when the unemployment benefit is extended.

On the other hand, the sign of $\partial P^{uu}_t / \partial P^o_t$, through more vacancies and/or less unemployed, is ambiguous. Ignoring the possible effect of an increase in P^o_t on V^u_{t+1} via expectations,[2] we have

$$\frac{\partial P^{ue}_t}{\partial P^o_t} = \frac{\partial P^r_t}{\partial P^o_t} P^o_t \cdot P^a_t + P^r_t \cdot P^a_t \tag{11}$$

$$\frac{\partial P^{un}_t}{\partial P^o_t} = -\frac{\partial P^r_t}{\partial P^o_t} \tag{12}$$

From (9) and (10) we have

$$\operatorname{sgn} \frac{\partial P^r_t}{\partial P^o_t} = \operatorname{sgn}\,[P^a_t\{N \cdot E(w|w > \hat{w}) - C_t - V^u_{t+1}\}] \tag{13}$$

Since the pay-off from employment is likely to be higher than from unemployment, the sign will probably be positive. Consequently an increase in the

[1] For further details see Björklund (1977).
[2] This effect is discussed by Barron (1975).

offer probability will increase the flow into employment and decrease the flow out of the labor force. The sign of $\partial P_t^{uu}/\partial P_t^o$ will be ambiguous.

Summarizing, the number of vacancies, V_t, and unemployed, U_t, as well as the present and future UB, $C_t, C_{t+1}, \ldots, C_{t+B}$ (where B denotes the remaining duration of the UB) enter as reasonable explanatory variables in the survival rate functions.

$$P_t^{uu} = P(\underset{?}{V_t}, \underset{?}{U_t}, \underset{+}{C_t}, \underset{+}{C_{t+1}}, \ldots, \underset{+}{C_{t+B}}) \tag{14}$$

The Unemployment Benefit System. The Swedish UB system has been extended twice during the last decade. The first time, 1968, the UB for older unemployed (primarily older than 60 years of age) was extended. The insured unemployed—i.e. participants in the unemployment funds—could receive UB until the age of retirement. Earlier, the maximum duration was 30 weeks. Also, the older uninsured unemployed could now receive benefits until the age of retirement, although after a waiting period of two months. An important condition for both the insured and uninsured to receive UB is that they are registered with the Employment Service and are ready to accept a "suitable" job offer.

Several extensions were made in 1974. Most older unemployed persons over 55 years of age could receive UB until the age of retirement. The duration of the benefits was increased from 30 to 60 weeks for the insured unemployed. Finally, a new kind of UB (called KAS), primarily designed for labor force entrants, was introduced. After a waiting period of three months, entrants could receive benefits for 30 weeks. However, the level has been rather low and far below the market wage. This benefit also requires that the unemployed are registered with the Employment Service and are ready to accept a "suitable" job offer.

In addition to these extensions of the UB system, the benefit level has been changed several times. However, these changes have primarily kept the benefit level for the insured at approximately 90% of the wage foregone.

In order to ascertain whether these extensions can at least partially explain the rising survival rates for the unemployed, aggregate unemployment has to be disaggregated. Unfortunately, the precision of the data does not permit disaggregation into more than about four groups. Obviously, the older unemployed have to be treated separately. In addition it is appealing to place young people in a separate category. Finally, the "prime"-aged were divided into insured and uninsured. This gave the following groups:

1. Youth, 16–24 years. Insured and uninsured.[1]
2. "Prime"-aged, 25–54 years. Insured.
3. "Prime"-aged, 25–54 years. Uninsured.
4. Older, 55–66 years. Insured and uninsured.[2]

[1] The majority are uninsured.
[2] The majority are insured.

For the first three groups, the UB variables in (14) have been changed only once, in 1974. This is equivalent to using a dummy variable which takes on the value of one from 1974 and onward. For the last group, 55–66 years of age, the UB variables were changed in 1968 for those who are over 60 and in 1974 the same benefit was given to almost the whole group. These changes are also specified by means of two dummy variables which take on the value of one, beginning in 1968 and 1974, respectively.

Functional Form. The choice of functional form is complicated by the dependent variable which only takes on values between zero and one. The most common approach in such cases is to choose a functional form which automatically imposes this restriction. The "logit model" is often proposed:[1]

$$P = \frac{\exp(f(x))}{1 + \exp(f(x))} \Rightarrow \ln\left(\frac{P}{1-P}\right) = f(x)$$

This functional form has at least two attractive properties. First, the dependent variable can only take on values between zero and one. Second, by transforming the function to the natural logarithm of the odds $(P/(1-P))$, the function can be linearized if the expression $f(x)$ is linear, and straightforward estimation procedures are applicable.

However, the functional form *per se* might be implausible. For example, the second derivatives with respect to the explanatory variables are positive when P is below 0.5 and negative otherwise. A log-linear functional form such as

$$P = \alpha \cdot X^{\beta} \Rightarrow \ln P = \ln \alpha + \beta \ln X$$

has negative second derivatives as soon as β is less than one and might be more plausible in this sense. As long as the explanatory variables cannot take on negative values (which actually is the case here) the dependent variable must be greater than zero. On the other hand, the upper limit might be exceeded. But in many cases most observations are far from one and this drawback might be negligible.

Since the results below might be sensitive to the choice of functional form both the logit and log-linear form will be used.

The variance of the disturbances. An estimation problem arises because the dependent variable in itself is an estimate of the "true" probability or survival rate. The estimator of the survival rate is subject to sampling variation and this variation obviously enters in the survival rate function as a stochastic disturbance. Since this variation is not constant, the assumptions of ordinary least squares are violated.

Theil (1967, pp. 71–75) has derived the following variance of the disturbances for the logit model:

$$\mathrm{Var}(\varepsilon_t) = \frac{1}{n_t \hat{P}_t \cdot (1 - \hat{P}_t)}$$

[1] See Theil (1967).

where $\hat{P}_t$ are the estimates of the survival rates and n_t the number of observations.

By using the same procedure as Theil, the following variance for the log-linear model can be derived:[1]

$$\mathrm{Var}\,(\varepsilon_t) = \frac{1 - {}_t\hat{P}}{n_t \cdot \hat{P}_t}$$

The estimation procedure used was to multiply the right and left-hand sides of the functions by the square root of the inverse of the variance of the disturbances and apply ordinary least squares to the—in this way—"weighted" functions.[2]

IV.2. *Empirical Results*

A selection of the regressions which were run is presented in Table 1. In most cases the two functional forms gave the same result concerning the effect of unemployment benefits. In these cases only the logit specification is presented.[3] Furthermore, the unemployment and vacancy variables were tried separately but the results were not altered.

16–24 years. Diagram 2. The results for this group are shown in rows 1–3 in Table 1. The original data (seasonally adjusted) plus the estimated survival rates are presented in Diagram 2. The broken lines reveal the estimated survival rates when the cyclical variable (V/U) was fixed at one. The structural changes are consequently isolated in the broken lines.

The survival rates for both the short-time[4] and medium-time[5] unemployed reveal a highly significant positive trend. However, the changes which seem to have occurred in 1974 are *not* compatible with the hypothesis about the importance of the UB. The survival rates have declined rather than risen, although the t-value for the medium-time[6] unemployed is only -1.375. The survival rate for the long-time unemployed revealed a negative trend, but according to the very low t-values this relation seems to be uncertain.[7]

One explanation for the adverse effects might be that the introduction of the KAS created incentives to register at the Employment Service to a larger

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[1] See Björklund (1977).

[2] Unfortunately, the number of observations, n_t, for each observation could not be computed. Instead the sample sizes of the entire AKU were used. (1965–1969: 12 000, 1970–1975: 18 000, 1976: 23 000). In addition, the sample sizes from 1970 and onward were multiplied by three since quarterly averages could be used from this year.

[3] The logit specification was generally superior according to the following measure of association: $1 - \Sigma(\hat{P} - P)^2/\Sigma(P - \bar{P})^2$. Of course the R^2-measure cannot be used since the dependent variables are not defined in the same way.

[4] $P_t^{0/1w-13w}$.

[5] $P_t^{0/13w-14/26w}$.

[6] $P_t^{14/26w-27/39w}$.

[7] This uncertainty is due to the fact that very few in the youth category remain unemployed longer than 27 weeks.

Table 1. *Results from some selected regressions*[a]

Group	Fcn-form	Intercept	V/U	Trend	S^{74f}	S^{68f}	R^{2b}	D/W
16–24 years								
1.* 0/1 w–	Logit	−0.456	−0.385	0.04	−0.563		0.6168	1.900
13 w		(1.24)[c]	(−3.05)**	(3.74)**	(−2.37)**			
2.*[d] 13 w–	Logit	−1.869	−0.363	0.0255	−0.218		0.7710	2.166
14/26 w		(−7.48)**	(−4.09)**	(3.628)**	(−1.375)			
3.* 14/26 w–	Logit	0.062	−0.282	−0.020			0.1699	2.108
27/39 w		(0.133)	(−1.24)	(−1.75)*				
25–54 years. Uninsured								
4.* 0/1 w–	Logit	0.288	−0.47	0.0195	−0.562		0.4797	2.156
13 w		(0.728)	(3.41)	(1.713)	(2.20)			
5. 0/13 w–	Logit	−0.67	−0.51		0.261		0.5273	2.026
14/26 w		(−6.51)**	(−5.99)**		(2.78)**		(0.4015)[e]	
6.*	Logit	−1.12	−0.423	0.014			0.5478[e]	2.166
		(−6.19)**	(−5.26)**	(3.135)**			(0.5070)[e]	
7.	Log-linear	−1.72	−0.325	0.0095			0.8055	1.940
		(−13.5)**	(4.05)**	(2.53)**			(0.4305)[e]	
8.	Log-linear	−1.49	−0.423		0.214		0.8081	1.930
		(−31.9)**	(−4.75)**		(2.655)**		(0.3295)[e]	
9.* 14/26 w–	Logit	−0.249	−0.49		−0.298		0.3751	2.040
27/39 w		(−1.17)	(−2.664)**		(−1.44)			
25–54 years. Insured								
10. 0/1 w–	Logit	0.40	−0.719	0.117	−2.915	−1.04	0.4047	1.300
13 w		(0.703)	(−3.41)**	(3.54)**	(−4.67)**	(−1.55)		
11.* 0/13 w–	Logit	−0.01	−0.223	0.012	−0.238		0.4853	2.142
14/26 w		(−3.35)**	(−2.06)*	(1.38)	(−1.27)			
12. 14/26 w–	Logit	−0.306	−0.509		0.253		0.1489	1.707
27/39 w		(−1.20)	(−2.22)*		(1.11)			
13.*	Logit	−0.785	−0.423	0.0146			0.1600	1.804
		(−1.80)*	(−1.992)*	(1.33)				
55–66 years								
14.* 0/1 w–	Logit	1.28	−0.64	−0.028		1.46	−0.0201	1.577
13 w		(1.96)*	(−2.39)*	(−1.62)		(2.27)*	(0.1615)[e]	
15. 0/13 w–	Logit	−1.04	0.032		0.3777	0.72	0.4413	1.934
14/26 w		(−3.72)**	(0.33)		(3.09)**	(2.90)**		
16.	Logit	−1.228	0.13	0.028			0.4703	2.109
		(−5.44)**	(1.38)	(5.18)**				
17.*	Logit	−1.38	0.133	0.024		0.278	0.4831	2.144
		(−5.02)**	(1.44)	(3.66)**		(0.97)		
18.* 14/26 w–	Logit	−0.217	−0.322	0.019	−0.362		0.2227	2.075
27/39 w		(−0.35)	(−1.73)*	(1.03)	(−1.01)			

[a] The seasonal coefficients are not presented. Results from more regressions can be found in Björklund (1977). [b] Not adjusted for degrees of freedom.
[c] Values within parenthesis (* = sign. 10 % level; ** = sign. 1 % level).
[d] * The equation has been selected for the group.
[e] $1-(\Sigma(P-P)^2/\Sigma(P-P)^2)$. [f] Dummy variables.

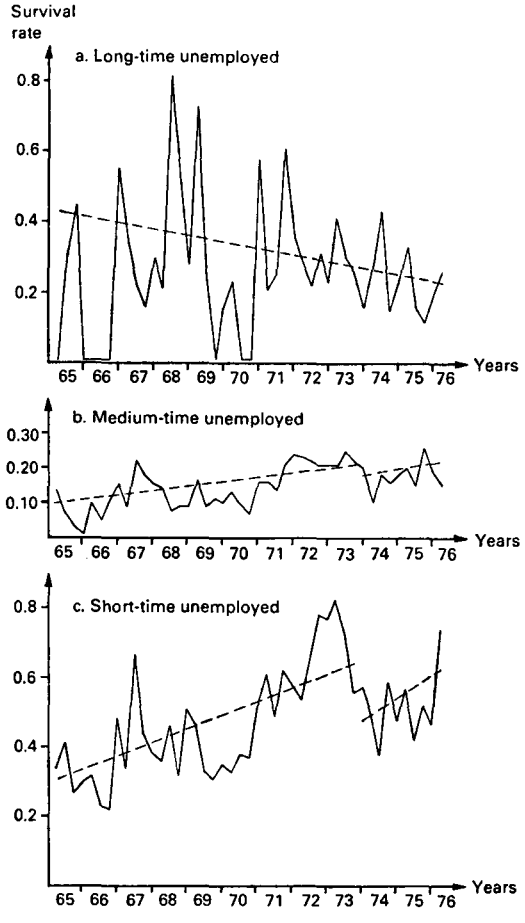

Diagram 2. Survival rates, 16–24 years.

extent, which in turn might provide more information about job openings than earlier. This "information effect" might have worked against and even exceeded the effects discussed above.

Uninsured 25–54 years. Diagram 3. This group also became eligible for the KAS in 1974. The structural shifts for both the short-time and long-time unemployed were negative for this group as well, although the t-value for the long-time unemployed was quite low (row 9). For the medium-time unemployed, the logit form gave a slightly better fit with a trend than a structural shift (rows 5 and 6), while the log-linear form gave the opposite result. Since the logit form was superior according to a comparable measure of association, this specification has been chosen in the diagram. But this choice was made on very weak grounds and, of course, it cannot be ruled out that a shift has occurred or that the introduction of the KAS has contributed to the positive trend.

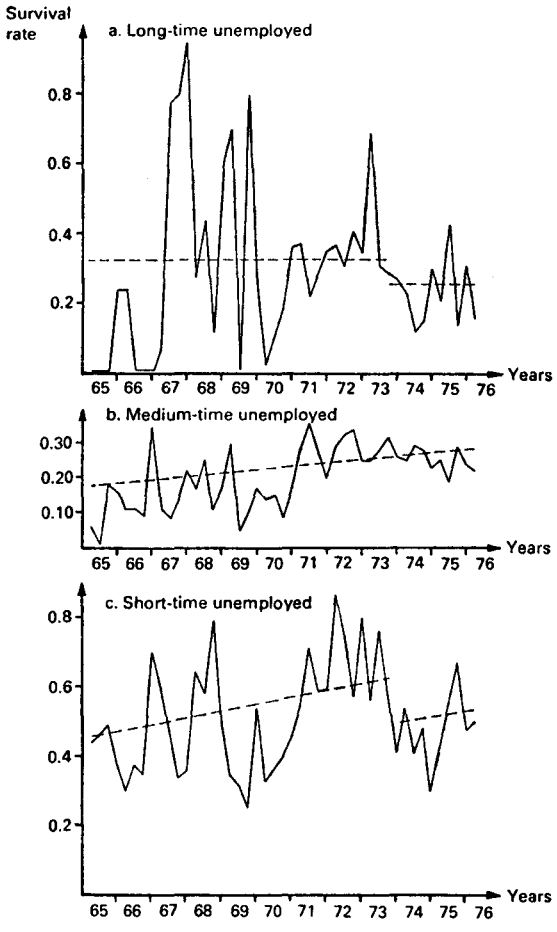

Diagram 3. Survival rates, 25–54 years. Uninsured.

Insured 25–54 years. Diagram 4. The maximum duration of unemployment benefits for the insured was increased from 30 to 60 weeks in 1974. It seems reasonable that the greatest effects can be expected on the survival rates for the long-time unemployed. As seen from rows 12 and 13, a positive trend gave better fit than a structural shift. However, both variables had quite low t-values. In this case too, it cannot be ruled out that there is an effect in the expected direction; but it seems safe to conclude that no drastic structural change occurred in 1974. For the medium-time unemployed, the structural change was opposite to that which was expected. The equations for the short-time unemployed seemed to be very poorly specified (low D/W). Only the original observations are presented in the diagram and the pattern is rather erratic.

55–66 years. Diagram 5. The older unemployed became eligible for extended unemployment benefits both in 1968 and 1974.

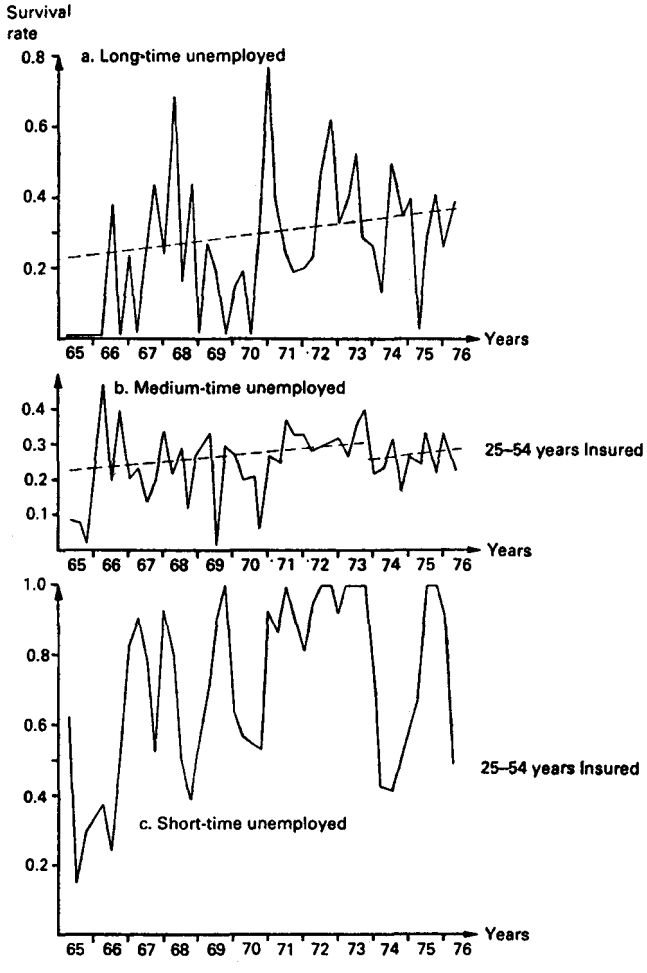

Diagram 4. Survival rates, 25–54 years. Insured.

A considerable structural change in the expected direction might have occurred for the short-time unemployed in 1968. However, this equation seems to be poorly specified (row 14)[1] so that it is difficult to draw any firm conclusions. The change for the medium-time unemployed went in the expected direction (1968), but the t-value was very low. In addition, the extended unemployment benefit might have contributed to the positive trend.

The most reasonable specification for the long-time unemployed (row 18) indicated a positive trend and a negative structural shift in 1974.

Summarizing the results for the older category, there is some evidence in

[1] Note that a negativ e R^2 might appear when the regressions are run without an intercept, which was done here due to the weighting procedure. The measure of association based on the original dependent variables was positive.

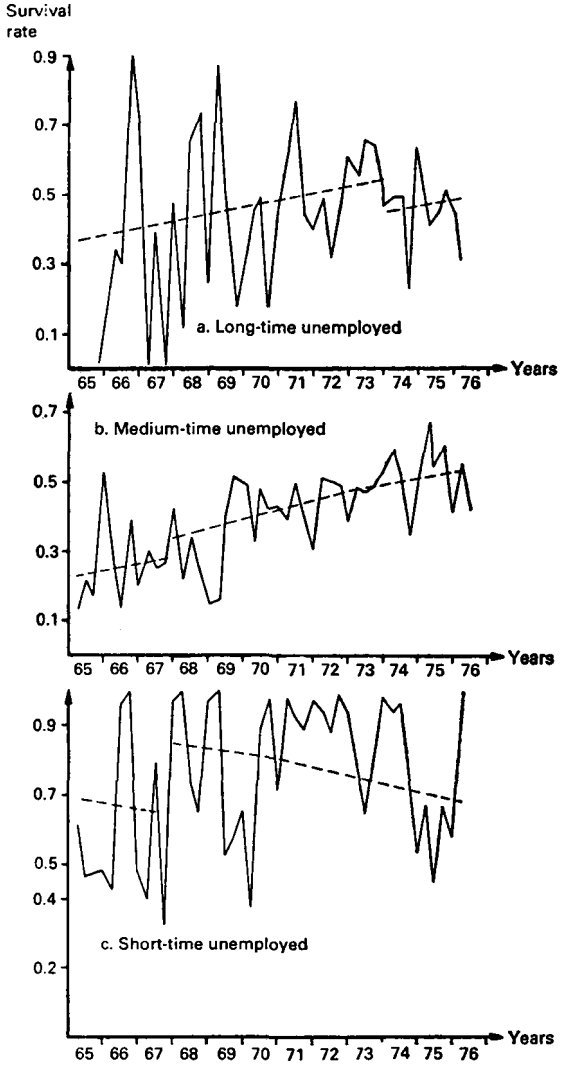

Diagram 5. Survival rates, 55–66 years.

favor of an effect of the extended UB in 1968 for the short-time and medium-time unemployed. On the other hand, it is difficult to find any changes in expected direction in 1974. It is also interesting to note that the cyclical variable has a positive sign for the medium-time unemployed. This indicates that a large supply of jobs prevents older persons from leaving the labor force. Since the scarce evidence which is available about the flows out of unemployment indicates that the flow out of the labor force predominates in relation to the flow into employment for older unemployed, it might be that

Table 2. *Composition of the inflow, 1965–1975*

	1965–69	1970	1971	1972	1973	1974	1975
16–24 years	0.475	0.462	0.478	0.476	0.463	0.483	0.468
25–54 years. Insured	0.124	0.113	0.123	0.160	0.142	0.180	0.115
25–54 years. Not insured	0.302	0.337	0.299	0.292	0.289	0.278	0.309
55–66 years	0.101	0.088	0.100	0.073	0.106	0.058	0.107

extended UB for the older group has primarily prevented labor force withdrawal instead of increasing the refusal of job offers. This is no doubt very important from the policy viewpoint.

V. Composition of Inflow and the Aggregate Survival Rate

Another possible cause of the rising aggregate survival rates could be changes in the *composition* of the inflow to unemployment. Suppose the survival rates are constant for every group during a period but the groups with high survival rates (e.g. older) increase their share of the total inflow to unemployment. The aggregate survival rate and duration of unemployment would rise.

The composition of the inflow during the 1960s and each year between 1970 and 1975 is presented in Table 2.

At first glance, it seems as though the composition of the inflow has been almost constant during the period.

In order to find out if any "composition effects" could be found, we proceeded in the following way. The group survival rates which, according to the estimated equations, would have prevailed when the cyclical variable V/U was fixed at one were computed. Then the aggregate survival rates

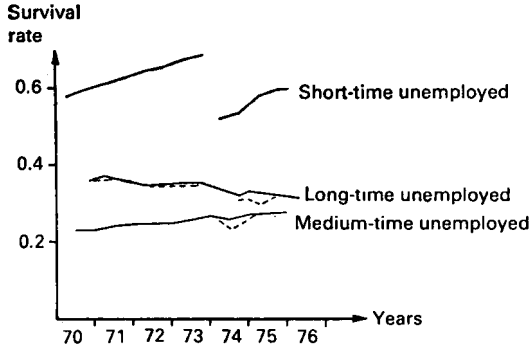

Diagram 6. Average survival rates implied by the actual composition (continuous) and the composition during the 1960s (dashed).

Table 3. *Inflow and duration*

	Total inflow	Number (share) who remain unemployed after			
		< 13 w.	< 27 w.	< 40 w.	< 53 w.
1965					
16–66	399 800	153 300 (38.4 %)	17 200 (4.3 %)	2 100 (0.5 %)	
16–24	191 100	61 700 (32.3 %)	3 500 (1.8 %)	1 000 (0.5 %)	
Insured 25–54	50 700	15 400 (30.4 %)	2 800 (5.4 %)	0 (0 %)	
Uninsured 25–54	125 600	56 500 (45 %)	5 500 (4.4 %)	100 (0.1 %)	
55–66	32 400	19 700 (60.8 %)	5 400 (16.8 %)	1.000 (3.1 %)	
1966					
16–66	596 700	192 600 (32.3 %)	37 700 (6.3 %)	8 300 (1.4 %)	
16–24	295 100	74 700 (25.3 %)	7 200 (2.5 %)	2 100 (0.7 %)	
Insured 25–54	83 200	30 000 (36 %)	9 300 (11.1 %)	1 600 (1.9 %)	
Uninsured 25–54	180 700	67 000 (37.1 %)	16 000 (8.9 %)	3.200 (1.8 %)	
55–66	40 300	23 500 (58.2 %)	5 200 (13 %)	1 400 (3.5 %)	
1967					
16–66	479 700	254 200 (53 %)	46 000 (9.6 %)	17 700 (3.7 %)	
16–24	198 900	95 300 (47.9 %)	15 200 (7.6 %)	4 900 (2.4 %)	
Insured 25–54	52 000	39 400 (75.7 %)	8 700 (16.7 %)	4 200 (8.0 %)	
Uninsured 25–54	140 400	91 300 (65.0 %)	9 700 (6.9 %)	8 500 (5.8 %)	
55–66	88 400	41 200 (46.6 %)	12 400 (14 %)	3 100 (3.5 %)	
1968					
16–66	487 500	257 000 (52.7 %)	41 900 (8.6 %)	13 800 (2.8 %)	
16–24	254 800	95 700 (37.5 %)	9 400 (3.7 %)	4 900 (1.9 %)	
Insured 25–54	67 600	37 800 (55.8 %)	8 800 (13 %)	2 300 (3.4 %)	
Uninsured 25–54	115 700	85 000 (73.5 %)	14 700 (12.7 %)	1 400 (1.2 %)	
55–66	52 000	41 100 (79.1 %)	9 000 (17.2 %)	5 200 (9.9 %)	
1969					
16–66	504 400	213 900 (42.4 %)	37 700 (7.5 %)	7 700 (1.5 %)	
16–24	235 300	82 600 (35.1 %)	13 800 (5.9 %)	1 500 (0.6 %)	
Insured 25–54	54 600	36 800 (62.7 %)	8 500 (15.5 %)	1 200 (2.2 %)	
Uninsured 25–54	184 600	72 800 (39.4 %)	6 800 (3.7 %)	1 600 (0.9 %)	
55–66	32 500	24 300 (74.7 %)	8 600 (26.5 %)	3 400 (10.3 %)	
1970					
16–66	427 700	179 300 (42 %)	32 200 (7.5 %)	10 200 (2.6 %)	8 100 (1.9 %)
16–24	197 600	69 600 (35.2 %)	9.500 (4.8 %)	3 200 (1.6 %)	
Insured 25–54	48 200	28 000 (58.2 %)	5 600 (11.6 %)	1 600 (3.3 %)	
Uninsured 25–54	144 300	56 700 (39.2 %)	6 700 (4.6 %)	600 (0.4 %)	
55–66	37 700	25 100 (66.6 %)	10 400 (27.5 %)	4 800 (12.9 %)	
1971					
16–66	443 300	286 100 (64.5 %)	76 000 (17.2 %)	24 900 (5.6 %)	20 800 (4.7 %)
16–24	211 900	114 000 (53.8 %)	22 600 (10.5 %)	8 200 (3.9 %)	
Insured 25–54	54 600	50 000 (91.7 %)	16 200 (29.7 %)	3 500 (6.4 %)	
Uninsured 25–54	132 600	84 400 (63.7 %)	22 400 (16.9 %)	5 500 (4.1 %)	
55–66	44 400	37 900 (85.4 %)	14 800 (33.3 %)	7 700 (17.3 %)	

	Total inflow	Number (share) who remain unemployed after			
		< 13 w.	< 27 w.	< 40 w.	< 53 w.
1972					
16–66	374 400	271 900 (72.6 %)	77 500 (20.7 %)	29 900 (8.0 %)	21 000 (5.6 %)
16–24	178 100	112 000 (62.9 %)	15 500 (13.8 %)	6 900 (3.9 %)	
Insured 25–54	59 800	55 500 (92.9 %)	15 900 (26.6 %)	7 700 (12.9 %)	
Uninsured 25–54	109 200	79 000 (72.3 %)	35 200 (32.2 %)	9 800 (9.0 %)	
55–66	27 300	25 400 (93.0 %)	11 900 (43.6 %)	5 500 (20 %)	
1973					
16–66	319 900	243 400 (76.1 %)	67 800 (21.2 %)	30 200 (9.4 %)	16 500 (5.2 %)
16–24	148 200	100 800 (68 %)	22 200 (15 %)	5 200 (3.5 %)	
Insured 25–54	45 600	45 100 (98.9 %)	13 100 (28.7 %)	3 600 (7.9 %)	
Uninsured 25–54	92 300	73 100 (79.2 %)	19 000 (20.5 %)	14 100 (15.3 %)	
55–66	33 800	27 200 (80.4 %)	13.500 (40.1 %)	7 300 (20.8 %)	
1974					
16–66	425 100	213 100 (50.1 %)	50 300 (11.8 %)	14 900 (3.6 %)	12 900 (3 %)
16–24	205 400	95 000 (46.3 %)	14 300 (7 %)	3 800 (1.9 %)	
Insured 25–54	76 700	40 300 (52.5 %)	19 200 (25.1 %)	2 600 (3.3 %)	
Uninsured 25–54	118 300	55 900 (47.3 %)	5 600 (4.7 %)	3 900 (3.3 %)	
55–66	24 700	21 900 (88.7 %)	11 200 (45.3 %)	4 600 (18.4 %)	
1975					
16–66	327 700	172 800 (52.7 %)	43 000 (13.1 %)	9 300 (2.8 %)	8 800 (2.7 %)
16–24	153 400	75 100 (49 %)	15 000 (9.8 %)	4 200 (2.8 %)	
Insured 25–54	37 800	9 000 (23.7 %)	9 600 (25.5 %)	2 600 (7.0 %)	
Uninsured 25–54	101 400	68 700 (67.8 %)	7 400 (7.3 %)	2 000 (2.0 %)	
55–66	35 100	20 000 (57 %)	11 000 (32.3 %)	4 500 (12.8 %)	
1976[a]					
16–66	135 200	85 400 (63.2 %)			
16–24	59 800	38 100 (63.8 %)			
Insured 25–54	22 100	15 200 (69 %)			
Uninsured 25–54	39 000	22 100 (56.7 %)			
55–66	14 300	10 000 (69.9 %)			

[a] Only the first two quarters.

corresponding to the composition of the inflow during the 1960s and the actual composition were computed.

In Diagram 6 the continuous lines describe the aggregate survival rates computed from the actual composition of the inflow and the broken lines indicate the aggregate survival rates implied by the composition which prevailed during the 1960s. The differences are negligible except possibly during 1974 when the inflow of the older unemployed was very low.

Consequently, we can conclude that changes in the composition of the inflow to unemployment—with this disaggregation—has not contributed to the rising survival rates during the period.

VI. The Distribution of Unemployment by Duration

In order to evaluate the welfare consequences of the longer duration of unemployment spells, it is crucial to get a picture of the extent to which the unemployed are compensated for foregone income. This may be achieved by studying the *distribution* of spells of unemployment by duration as presented in Table 3. The estimated total inflow during a year is shown in the first column in the table. The actual survival rates were used to estimate the number of (and share of) unemployed who remain unemployed at the end of the quarter when they became unemployed (<13 weeks), at the end of the subsequent quarter (<26 weeks), etc.

Table 3 indicates that a surprisingly large share of the total spells happen to groups that are not eligible for UB. Since probably most of those in the youth category are not insured, while most of those in the older group are, it seems as though about two-thirds of all unemployment spells happen to individuals who are not insured. We can also see how well the insured are compensated by comparing the duration of the spells with the benefit period.

The "prime"-aged who are insured were eligible for UB for 30 weeks up until 1973. The number of spells which might exceed this duration are presented in the column <40 weeks.[1] Only during recession years, 1967 and 1971–1973, did a non-negligible number of spells reach this duration. These years with 4 200 (8.0 % of the inflow), 3 500 (6.4 %), 7 700 (12.9 %) and 3 600 (7.9 %), respectively, might have exceeded the benefit period and consequently lacked the compensation for income foregone. From 1974 and onward, the benefit period was increased to 60 weeks so that probably very few of the insured have suffered in this respect after 1974.

The older unemployed are also compensated very well for the direct cost of unemployment. The benefit period was 60 weeks until 1973 and 90 after 1974. In addition, those who exceed this period receive continued state-financed compensation.

The other groups, youth and uninsured "prime"-aged, might have suffered heavy losses to the extent that the spells of unemployment are long. It seems as though these groups experienced long spells, especially during the recession of 1971–73. At least 45 000, 50 000 and 41 000 spells exceeded one quarter (<27 weeks in the table) for these groups, which implies a substantial loss of income. The state-financed KAS, which was introduced 1974, has probably relieved this burden to some extent, but the compensation is low and the qualifying period three months.

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[1] The individuals in this column must have been registered as unemployed for at least 27–39 weeks.

VII. Conclusions and Final Remarks

The drastic changes in terms of inflow and duration of the unemployment in Sweden during the last decade have been described in this paper. It is an important task to *explain* and *evaluate* these processes.

The analysis has revealed that the extension of the unemployment benefit system in Sweden does not seem to have contributed to the structural changes towards longer duration of spells of unemployment. A minor effect for the older group is an exception in this respect. It might be that the condition "accept a suitable job offer" in order to receive the benefit has effectively prevented the unemployed from refusing job offers to a larger extent.

Nor does it seem as though any substantial changes in the composition of the inflow to unemployment have occurred during the last decade.

Since all the groups seem to have displayed almost the same pattern, it might be that some general changes on the demand side of the labor market have caused the structural changes. One plausible explanation is that rising turnover costs, such as hiring and training costs, as well as the costs of layoffs and dismissals, have created more stable jobs and consequently lower inflow and longer optimal search periods. However, the reverse side of such a coin might be a *captive worker effect* as discussed by Barrett & Södersten (1975).

Finally, it seems as though the duration of benefits to the insured is long enough to compensate most of the insured unemployed for income foregone. The greatest welfare losses in terms of income foregone seem to affect the youth category and the uninsured "prime"-aged, who experience quite long spells of unemployment in recessions and receive a low compensation after a waiting period of three months.

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The Duration of Unemployment and Unexpected Inflation: An Empirical Analysis

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A distinguishing message of the theory of search unemployment is that short-run unemployment fluctuations are explainable by inflationary surprises. Unemployment is basically viewed as productive investment in job search, chosen by employees in order to enhance their lifetime earnings. An increase in aggregate demand will imply a temporary fall in unemployment due to short-run deviations between actual and expected wages; workers are fooled into accepting more employment.

This information-lag interpretation of changes in unemployment might be compared to an alternative view, where the quantity-rationing rules of the labor market are emphasized. A rising flow of labor from unemployment is, according to this theory, caused by the relaxation of job-rationing constraints rather than unanticipated inflation.

In this paper we address ourselves to the question of the empirical importance of the two competitive explanations. The two stories are, of course, not mutually exclusive; we try, via a fairly simple specification, to capture both views in one equation. The principal contribution of our study lies in its ability to provide information about the relative importance of unexpected inflation and job opportunities as explanations of the duration of unemployment.[1] Another interesting feature of our paper is its comparative perspective; we apply the same model to both Swedish and *U.S.* data, thereby being able to reveal certain important differences between the labor markets in the two countries. We find, for example, perhaps somewhat surprisingly, that the *U.S.* unemployment duration is more or less unaffected by unexpected inflation, whereas the results for Sweden, on the other hand, give some support for the information-lag hypothesis. A third novelty of our study is the disaggregated data used (for Sweden only). By focusing the analysis on transition probabilities for workers with different lengths of (incompleted) spells, some interesting behavioral differences are observed; one finding is that the simple information-lag story is more valid for the short-term unemployed.

The paper is organized as follows: Section I introduces the basic theoretical framework that guides our empirical estimation procedures; the latter are described in Section II. Section III presents the data employed and Section IV the empirical results. Some interpretations of our findings are discussed in the final section.

I. Optimal Search Policies and the Duration of Unemployment

Micro-economic explanations of unemployment have focused on the behavior of the household, whereas the demand side generally has been considered as exogenous. We will follow that partial-equilibrium approach, using a simple job search model as our theoretical framework.

Consider the behavior of an unemployed worker according to the search model. His problem is to choose an acceptance wage which assures him an income greater than what he might have received by continued search. The decision is affected by the perceived location of the wage offer distribution. If a monetary contraction produces a leftward shift of the wage offer distribution —or a lower rate of wage inflation—this

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[1]The question has earlier been addressed by John Barron and Putte Axelsson and Kalle Löfgren. Their methods differ from ours.

change in general market conditions is assumed to be imperfectly detected by job seekers, who mistakenly blame local circumstances rather than changes in aggregate demand. Unemployed workers will search for a longer time causing the length of spells of unemployment to rise.

A common assumption in standard search models is that the number of job offers received per period equals one. The probability of leaving unemployment—the transition probability—is then solely determined by the job seeker's offer-acceptance probability. The simplifying job offer assumption is, however, not inherent in search theory per se; by a modest generalization the case with random number of job offers is easily incorporated into the basic search-theoretic framework. Consider the job seeker's transition probability, which—in the absence of labor force exits—equals the hiring probability. Decomposing the transition probability (μ) into two components, the job offer probability (θ) and the acceptance probability (P) we have

$$(1) \qquad \mu=\theta P=\theta[1-F(a)] \qquad \theta \leqslant 1$$

where a is the reservation wage and $F(\cdot)$ the distribution function of wage offers. If the transition probability is constant during search, the expected duration of unemployment (D) is

$$(2) \qquad D=1/\mu=1/\theta[1-F(a)]$$

What then are the characteristics of an optimal search policy? In the simple case of infinite time horizon and discount rate r, the optimal policy implies a certain time invariant reservation wage obtained as the solution to

$$(3) \qquad C+a=\frac{\theta P}{r}[E(w|w>a)-a] = \frac{\theta}{r}\int_a^{\infty}(w-a)f(w)\,dw$$

where C is the (constant) marginal search cost and $f(\cdot)$ the known density function of wage offers.[2] Equation (3) implies that the reservation wage declines as the job offer probability θ decreases. Likewise, a known leftward shift of the wage offer distribution will also reduce the reservation wage.

We have so far briefly outlined the basic search story, strictly valid only in a stationary world. Now consider the possibility of fluctuations in aggregate demand, influencing the job seeker's transition probability via the job offer probability (more vacancies) and/or via imperfect reservation wage adjustments. Three different effects may be identified:

1) *The pure availability effect.* An increasing number of vacancies means a higher job offer probability, thereby reducing the duration of unemployment.

2) *The supply effect.* A permanent increase of the job offer probability will increase the expected returns from search, thus increasing the worker's reservation wage. It follows that the unemployment effect of a rising number of vacancies is ambiguous a priori. Robert Feinberg has, however, demonstrated that the availability effect will outweigh the supply effect under certain reasonable assumptions.

3) *The detection-lag effect.* Changes in aggregate demand will affect the location of the wage offer distribution. Assuming a lag in the discernment of a rising rate of inflation, reservation wages will be unaffected in the short run, implying a rising flow of new hires from the pool of unemployed.

Summarizing these three effects we have

$$(4) \qquad \mu=\theta\Big(\underset{+}{V}\Big)P\Big(\underset{-}{V},\underset{+}{w/w^*}\Big)=g(V,w/w^*)$$

where V is the number of vacancies, w the actual average wage, and w^* the expected average wage.

We would argue that equation (4) represents the kernel of the search theory of cyclical unemployment. The standard search model outlined does rely on some very restrictive assumptions, for example, a stationary wage offer distribution, fixed leisure time, and a constant job offer probability. More complex search models, for example, those of Claes-Henric Siven and John Seater (1977, 1978, 1979) are, however, fairly con-

[2]For a proof of (3), see, for example, Steven Lippman and John McCall.

sistent with the simple search model in their emphasis on unexpected inflation and vacancy contacts.[3] We are suppressing other plausible determinants of unemployment duration, for example, variations in unemployment compensation and the discount rate. These simplifications should not be too severe, since the cyclical fluctuations are dominating in the data. We have also excluded changes in the price level from consideration, perhaps a more questionable simplification. Unexpected *price* inflation does affect unemployment in some models within the micro foundations literature, although it is absent in the standard search model. The interpretation of this candidate regressor is, however, quite different in, for example, the Lucas-Rapping model compared to the Siven model (misperception of *future* prices vs. misperception of *current* prices) and the theoretical predictions are completely opposite; a higher rate of unexpected price inflation will *increase* unemployment in Siven's model and *decrease* unemployment in the Lucas-Rapping model.[4] It is also interesting to note an important result from Seater's "unified model": unexpected wage changes affect unemployment duration irrespective of how workers perceive accompanying price changes.[5] We decided to exclude the price inflation variable from the regressions, thereby avoiding troublesome problems of interpretation.

II. Empirical Analysis

A straightforward method of investigating the validity of the detection-lag hypothesis is to specify explicit transition probability equations with vacancies and unexpected wage increases as explanatory variables, that is, to represent equation (4) above by a suitable functional form. The basic specification used will be

$$(5) \quad ln\mu_t = \alpha_1 + \alpha_2 lnV_t + \alpha_3 ln(w_t/w_t^*)$$

The obtained α_2 estimate reflects the net result of the positive availability effect and the negative supply effect; intuition and some theoretical predictions suggest that α_2 (the net availability effect) will have a positive sign.[6]

The main problem with the approach chosen is, of course, that it requires an analysis of perceived as well as actual wages. Since no direct data about expected wages or wage changes are available, some model of the formation of expectations must be used. The expanding literature about the formation of expectations give several alternatives which all are quite plausible. However, no model which can be made operational can be considered "correct" in all

[3]The worker in Siven's and Seater's models is maximizing his lifetime utility by using search in the labor market as one important choice variable. Siven also considers search in the goods market but assumes leisure to be fixed; maximization of the utility function is therefore equivalent to maximization of lifetime earnings. Seater, on the other hand, takes account of variable leisure but ignores search in the goods market.

[4]Unexpected price inflation in the Siven model implies a reallocation of time from search in the labor market to search in the goods market thereby causing a decline of the job offer probability. The reservation wage will also increase, reinforcing the effect on unemployment duration. The Lucas-Rapping model is hardly suitable for analyzing the length of spells of unemployment since it disregards job search and considers unemployment as pure leisure, resulting as a difference between actual and normal employment. Michael Darby and Jonathan Kesselman and N. Eugene Savin have run unemployment regressions for the United States including unanticipated price increases as an explanatory variable. The results turn out to be unsatisfactory; the coefficients are as a rule insignificantly different from zero and the signs are unstable across different regressions.

[5]See Seater (1978).

[6]The crucial element in Barron's approach—followed by Axelsson and Löfgren—is to construct a model which gives an explicit specification of the relationship between the number of vacancies (V) and the job offer probability (θ). Given such a relationship, $\theta = f(V)$, the acceptance probability is obtained as $P = \mu/f(V)$. The procedure is interesting since it can validate a procyclical reservation wage pattern (i.e., P and V are inversely correlated). The approach requires, however, some fairly restrictive assumptions regarding the relationship between θ and V; Barron assumes that $\theta = k \cdot V$, implying that the elasticity $\partial ln\theta/\partial lnV$ equals one, an implication from the assumption that each firm has only one vacancy in each occupation. It can be shown that less restrictive assumptions produce an elasticity lower than one. Barron's procedure is, moreover, unable to separate the supply effect from the detection-lag effect. Our approach, on the other hand, can quantify the detection-lag effect but captures only the net availability effect.

respects. Our approach has been to try three different models in order to investigate how robust the information-lag hypothesis is with respect to the different specification. Two of the applied forecasting functions are consistent with the idea that workers learn from past errors, reestimating the parameters of their forecasting equations when more information is obtained.

A. *Adaptive Expectations*

The first model used is a type of adaptive expectations. These expectations are formed according to a finite distributed lag of past wage changes, that is, with quarterly data (which is used for Sweden):

$$\left(\frac{w_t^*}{w_{t-4}}\right) = \sum_{i=1}^{4} l_i \left(\frac{w_{t-i}}{w_{t-4-i}}\right) \tag{6a}$$

where

$$\sum_{i=1}^{4} l_i = \frac{1}{10} \sum_{i=1}^{4} (5-i) = 1 \tag{6b}$$

and with monthly data (which is used for the United States):

$$\left(\frac{w_t^*}{w_{t-12}}\right) = \sum_{i=1}^{12} l_i \left(\frac{w_{t-i}}{w_{t-12-i}}\right) \tag{7a}$$

where

$$\sum_{i=1}^{12} l_i = \frac{1}{78} \sum_{i=1}^{12} (13-i) = 1 \tag{7b}$$

Models like these—where the sum of the weights has been constrained to one—are often used in empirical work even though it has been pointed out that the theoretical basis is quite weak. (See, for example, Mats Persson, where it is shown that the sum should equal one only in very special cases if the forecast is to be optimal.)

B. *Expectations from an* ARMA *Process*

Even though the simplicity of the simple adaptive model is appealing—since it might be argued that workers form their expectations in a simple and cheap way—it could also be argued that individuals have some knowledge about historical regularities of wage changes, and that they use this information when forming their expectations. One possible way to represent these regularities is to apply a time-series approach. The assumption is that people have in their mind an autoregressive moving-average process (ARMA) which is generating forecasts from period to period. Both the specification and the parameters of this process are, however, likely to be revised when people receive more information about wage changes. Therefore we have proceeded as follows: The process has been reestimated each period and reidentified each fourth period (with quarterly data) and each twelfth period (with monthly data).[7] For Sweden, the character of the process changed over time; when observations from 1960 onwards were used the appropriate process changed from an $AR(1)$ to an $AR(1)MA(2)$, back again to an $AR(1)$ and finally—during the past two years (1976–77)—an $MA(10)$ on the first differences of the variable (i.e., the process was nonstationary). All the time autoregressive seasonal terms had to be used.

For the United States, the process was stationary when data from 1960 to 1969 were used—$AR(1)$ with first a seasonal autoregressive term and then a seasonal moving-average term. From then on the process became nonstationary with an $MA(1)$ term and a seasonal moving-average term on the first differences.

C. *Expectations from an Estimated Wage Equation*

It could, finally, be argued that workers are still more rational than using information only from an ARMA process of wage changes. They might even have in mind an empirical model incorporating different economic variables. An unemployed worker forming his expectations may, for example, use a wage equation of the Phillips curve

[7]A Box-Jenkins program called *T*-series available at the Stockholm School of Economics has been used. For identification criteria, see Charles Nelson.

type. We have therefore estimated wage equations (quarterly data) as:

$$(8)\quad WCH_t = \beta_1 + \beta_2 \cdot (V_{t-1} + V_{t-2} + V_{t-3} + V_{t-4}) + \beta_3 WCH$$

where $WCH = (w_t - w_{t-4})/w_{t-4}$

Again, the model was reestimated each fourth period and with data from the last five years. On the whole, the estimated equations performed reasonably well for Sweden according to standard statistical criteria. This approach was less successful for the United States; the available vacancy indicators turned out to be bad predictors of wage inflation. We decided to exclude this expectations-formation scheme for the *U.S* regressions.

III. The Data

Swedish transition probabilities have been estimated as follows: The rotating system of the "Swedish Labor Force Surveys" is constructed so that almost 90 percent of those who are interviewed in one survey are interviewed again three months later, whereas different individuals are interviewed in two subsequent months. In order to improve the estimates we decided to compute quarterly transition probabilities.

Denoting the number of unemployed for at least a weeks but less than b weeks at time t by $G_t^{a,b}$, and the weekly inflow into unemployment by f, we can describe the estimates as follows:

$$(9)\quad G_t^{1,14} = f \sum_{i=0}^{12} (1-\mu_1)^i$$

$$(10)\quad G_{t+13}^{14,27} = G_t^{1,14}[1-\mu_2]^{13}$$

$$(11)\quad G_{t+26}^{27,39} = G_{t+13}^{14,27}[1-\mu_3]^{13}$$

Three transition probabilities are obtained (μ_1, μ_2, and μ_3) which can be regarded as conditional upon the length of the spell of unemployment. By using available data on f, $G_t^{1,14}$, $G_{t+13}^{14,27}$, etc., we obtain μ_1 from

$$(12)\quad \frac{(1-\mu_1)^{13}-1}{(1-\mu_1)-1} = \frac{G_t^{1,14}}{f}$$

whereas μ_2 and μ_3 are calculated as

$$(13)\quad \mu_2 = 1 - \left[\frac{G_t^{14,27}}{G_t^{1,14}}\right]^{1/13}$$

$$(14)\quad \mu_3 = 1 - \left[\frac{G_{t+26}^{27,39}}{G_{t+13}^{14,27}}\right]^{1/13}$$

The Swedish vacancy statistics are from "Labor Market Statistics," published by Arbetsmarknadsstyrelsen (the National Labor Market Board). Quarterly wage data are obtained from the labor market issues of Statistical Reports, published by Statistiska Centralbyrån (the National Bureau of Statistics). All data used refer to manufacturing industry.

The *U.S.* transition probabilities refer to the labor market as a whole. They were computed by using the method proposed by Barron. The essential idea is to compare the number of people in one week who have been unemployed less than five weeks with the number of people four weeks later who have been unemployed five to eight weeks. The difference consists of people who have left the pool of unemployed. The duration data reported in *Employment and Earnings* are grouped in the classes one to four weeks, five to fourteen weeks, etc., which requires a slight modification of the method outlined above; for details, see Barron.

The *U.S.* wage data are average hourly earnings in manufacturing industry, reported in *Employment and Earnings*.[8] As vacancy data for the period 1965–75 we used the Help-Wanted Advertising Index (*HWA*) published in *Main Economic Indicators*. For the period 1969.4–1973.10, manufacturing vacancies (*Vm*) according to establishment data were also tried (see

[8]In some regressions we also tried average hourly earnings for the total private nonagricultural sector. The results were basically the same.

Employment and Earnings); the latter series are available only for (approximately) this period.

IV. Empirical Results

The results from alternative estimations are presented in Tables 1 and 2. The estimation method is weighted least squares and the appropriate weights are derived in an appendix which is available from us upon request.

Let us first look at the results obtained for Sweden, shown in Table 1. We observe, in the first place, that the detection-lag variable is significant both for the short-term unemployed (one to thirteen weeks) and for the medium-term unemployed (fourteen to twenty-six weeks). These results hold for all models of expectations.[9] For the long-term unemployed, on the other hand, no significant detection-lag effect is revealed; the coefficient has even a wrong sign. The job availability variable (V) is significantly positive in all regressions, even for the long-term unemployed. Dropping this variable produces in most cases a marked decrease in the *D.W.* value, indicating the presence of specification errors.

What then are the economic interpretations of the different results for the three groups of unemployed? No straightforward answer is available, partly because the "hypothesis-testing includes a joint test of the underlying model and the expectations-generating mechanism" (see Anthony Santomero and Seater, p. 525). The absence of any significant detection-lag effect for the long-term unemployed may have at least two explanations. There are arguments in favor of both these interpretations. First, it makes sense to hypothesize that the long-term unemployed (more than six months in our data) are better informed about the actual wage offer distribution, simply because they have experienced a longer period of "learning" through full-time job search. This argument implies that the parameters of the forecasting function might differ across workers with different unemployment histories.

The second interpretation may be elucidated by recalling some familiar results from search theory: The reservation wage of a job seeker with finite search horizon will, under some stationary conditions, fall with the duration of unemployment, a theoretical prediction which has been given empirical support.[10] Eventually the reservation wage will coincide with the minimum value of the wage offer distribution, implying an acceptance probability equal to one. In that extreme case, all job offers are accepted and there is no detection-lag effect.

Both of the hypotheses outlined are consistent with the results obtained. Intuition would suggest that both of the mechanisms are in operation to some extent, reinforcing each other and thereby producing the observed results.

Since both the (net) availability effect and the detection-lag effect are significant, it is important to find out the relative importance of these variables as determinants of the cyclical variations of the duration of unemployment. To do this we must take the *size* of the parameters as well as the *variation* of the independent variables into account. The question might be illuminated by comparing the predicted transition probabilities using estimates from regressions in the table:

$$\hat{\mu}_t = \alpha_1 \cdot V_t^{\alpha_2} \cdot \left(\frac{w_t}{w_t^*}\right)\alpha_3 \tag{15}$$

with the transition probabilities obtained when inflation is perfectly foreseen ($w_t = w_t^*$):

$$\tilde{\mu}_t = \alpha_1 \cdot V_t^{\alpha_2} \tag{16}$$

Using the results from the adaptive model Figure 2 demonstrates the relative unimportance of the detection-lag effect for the

[9]We have also tried logit specifications in some cases, as well as adaptive expectations with shorter lags. The results turned out to be fairly robust with respect to these changes.

[10]See articles by Reuben Gronau, Hirschel Kasper, and Nicholas Kiefer and George Neumann.

TABLE 1—TRANSITION PROBABILITY EQUATIONS FOR SWEDEN
(Quarterly data 1968.1–1977.3)

	V	w/w^*	$\bar{R}^2$	$D.W.$
Adaptive Expectations				
Short-Term Unemployed (μ_1)				
(1)	0.81	10.30	0.60	1.75
	(4.29)	(4.10)		
(2)	1.11	–	0.42	1.57
	(5.36)			
(3)	–	14.51	0.41	1.05
		(5.18)		
Medium-Term Unemployed (μ_2)				
(4)	0.34	1.97	0.33	2.27
	(3.24)	(1.69)		
(5)	0.41	–	0.30	2.29
	(4.11)			
(6)	–	3.42	0.16	1.84
		(2.83)		
Long-Term Unemployed (μ_3)				
(7)	0.39	−3.35	0.09	2.16
	(2.19)	(−1.57)		
(8)	0.31	–	0.05	2.28
	(1.78)			
(9)	–	−1.99	0.004	2.03
		(−0.93)		
ARMA Expectations				
Short-Term Unemployed (μ_1)				
(10)	0.98	7.47	0.50	1.43
	(4.94)	(2.59)		
(11)	–	11.00	0.18	0.79
		(3.08)		
Medium-Term Unemployed (μ_2)				
(12)	0.36	2.21	0.33	2.19
	(3.56)	(1.64)		
(13)	–	3.56	0.11	1.72
		(2.41)		
Long-Term Unemployed (μ_3)				
(14)	0.36	−2.16	0.05	2.27
	(1.94)	(−0.81)		
Expectations from Wage Equations				
Short-Term Unemployed (μ_1)				
(15)	1.13	8.43	0.51	1.66
	(5.93)	(2.79)		
(16)	–	7.76	0.06	0.65
		(1.85)		
Medium-Term Unemployed (μ_2)				
(17)	0.40	3.10	0.37	2.27
	(4.23)	(2.38)		
(18)	–	3.37	0.09	1.63
		(2.14)		
Long-Term Unemployed (μ_3)				
(19)	0.30	−3.20	0.07	2.20
	(1.72)	(−1.31)		

Note: $\bar{R}^2$ is the fraction of the weighted variance of the dependent variable explained by the weighted independent variables, adjusted for degrees of freedom. The $\bar{R}^2$ obtained when regressing μ_1 on $\hat{\mu}_1$ from equation (1) was 0.62.

TABLE 2—TRANSITION PROBABILITY EQUATION FOR THE UNITED STATES
(Monthly Date 1969.4–1973.10 and 1965.2–1975.12)

	HWA	*Vm*	*w/w**	*TIME*	$\bar{R}^2$	*D.W.*	ρ
Adaptive Expectations							
1969.4–1973.10							
1	–	0.23	1.62	−0.0008	0.73	1.19	–
		(11.27)	(1.59)	(−1.61)			
2	–	0.21	0.91	−0.0002	*	2.02	0.29
		(8.57)	(1.11)	(−0.41)			
3	–	0.24	1.42	–	0.72	1.13	–
		(11.81)	(1.38)				
4	–	0.21	0.87	–	*	2.03	0.30
		(8.71)	(1.08)				
5	–	–	0.14	−0.0021	0.07	0.37	–
			(0.08)	(−2.38)			
6	0.50	–	1.36	−0.0031	0.72	1.18	–
	(11.20)		(1.33)	(−6.39)			
7	0.44	–	0.71	−0.0022	*	1.97	0.31
	(8.21)		(0.86)	(−3.84)			
8	0.45	–	0.21	–	0.51	0.67	–
	(7.64)		(0.15)				
1965.2–1975.12							
9	0.52	–	0.70	−0.0025	0.83	1.34	–
	(16.81)		(1.28)	(−19.74)			
10	0.53	–	0.47	−0.0025	*	2.03	0.34
	(11.45)		(0.81)	(−13.26)			
11	0.49	–	1.55	–	0.33	0.34	–
	(7.93)		(1.43)				
12	–	–	0.71	−0.0024	0.47	0.44	–
			(0.73)	(−10.62)			
ARMA Expectations							
1969.4–1973.10							
13	–	0.23	2.57	−0.0007	0.74	1.15	–
		(11.27)	(2.07)	(−1.54)			
14	–	0.20	1.96	−0.0002	*	2.03	0.30
		(8.63)	(1.98)	(−0.40)			
15	–	0.24	2.48	–	0.73	1.10	–
		(11.92)	(1.98)				
16	–	0.20	1.93	–	*	2.04	0.31
		(8.81)	(1.98)				
17	–	0.24	–	–	0.71	1.12	–
		(11.64)					
18	–	0.20	–	–	*	2.04	0.30
		(8.68)					
19	–	–	3.03	−0.0021	0.10	0.36	–
			(1.31)	(−2.49)			
20	0.49	–	2.48	−0.0030	0.73	1.17	–
	(11.23)		(2.00)	(−6.44)			
21	0.44	–	1.81	−0.0022	*	1.99	0.30
	(8.36)		(1.80)	(−3.96)			
22	0.44	–	2.23	–	0.53	0.65	–
	(7.71)		(1.34)				
1965.2–1975.12							
23	0.52	–	−0.37	−0.0026	0.83	1.33	–
	(16.7)		(−0.50)	(−19.19)			
24	0.53	–	−0.07	−0.0025	*	2.04	0.35
	(11.37)		(−0.10)	(−13.01)			
25	0.49	–	3.45	–	0.35	0.41	–
	(8.03)		(2.48)				
26	–	–	−0.09	−0.0025	0.46	0.44	–
			(−0.07)	(−10.31)			

Note: ρ is the first-order autocorrelation coefficient obtained by using the Cochrane-Orcutt approach.

*Not applicable.

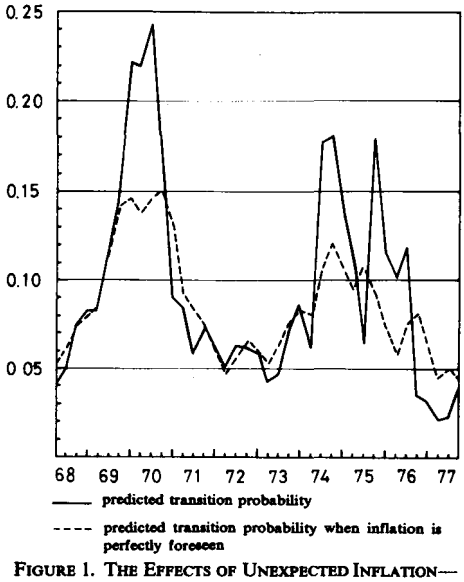

FIGURE 1. THE EFFECTS OF UNEXPECTED INFLATION—SHORT-TERM UNEMPLOYED IN SWEDEN

medium-term unemployed. Inflationary surprises produce, on the other hand, quite important unemployment effects for the short-term unemployed during the peak years 1969–70 and 1974–75. (See Figure 1.) The main part of the variation is, however, attributable to the vacancy variable.

Turning now to the *U.S.* regressions shown in Table 2, the dominant availability effect is even more pronounced than in the Swedish case. The vacancy variables used are highly significant in all regressions whereas the detection-lag coefficient is fairly sensitive with respect to the choice of expectations model and estimation period. A significant detection-lag effect is obtained only by applying an ARMA expectations-generating mechanism for the period 1969.4–1973.10. These results are independent of the choice of vacancy variable. Exclusion of the latter also gives rise to a strong decline in the *D.W.* statistic, indicating specification errors. When the estimation period is extended (1965.2–1975.12), the significance of unexpected inflation disappears.[11] It should

[11]The coefficient of w/w^* is significant in equation (25), but the *D.W.* value indicates that the *t*-ratio should not be taken seriously.

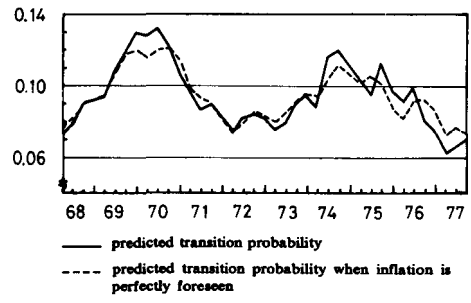

FIGURE 2. THE EFFECTS OF UNEXPECTED INFLATION—MEDIUM-TERM UNEMPLOYED IN SWEDEN

also be noted that a negative and significant trend coefficient is obtained when *HWA* is used as the vacancy variable.

The main conclusion from these exercises on *U.S.* data is that the job-availability variables are the dominant determinants of the cyclical fluctuations of unemployment duration. We cannot, however, rule out the possibility of some detection-lag effects in operation, at least during certain time periods, especially if the expectations are formed according to an ARMA process rather than adaptively.

V. Concluding Remarks

In job search literature there has been a tendency to overlook the importance of vacancy contacts as determinants of the duration of unemployment, the emphasis instead being placed on inflationary surprises. This (mis)use of the search story does not necessarily follow from the logic of the theory; most search models do recognize the significance of the stream of job offers. The popularity of the detection-lag view is probably its ability to provide a reasonable interpretation of the short-run Phillips curve. The transmission mechanism of aggregate demand policies is explicated in a fairly simple way: an increase in the money growth rate will increase inflation thereby fooling the acceptance decisions of job seekers.

In this paper we have demonstrated that this view has some empirical validity, at least for the short-term unemployed and for a labor market such as Sweden's. But we have also shown that unexpected inflation

can explain only a small part of the actual fluctuations in unemployment duration. Since the flow into unemployment is fairly stable over the cycle, our results imply, moreover, that cyclical changes in the unemployment rate are only slightly affected by inflationary surprises.

The elementary search model—where variations in the job offer probability are disregarded—is then clearly inadequate as an explanation of the short-run Phillips curve. Our results also rule out one of the mechanisms which imply a vertical long-run Phillips curve; the natural rate theory must of course be valid if the detection-lag hypothesis is a sufficient explanation of cyclical changes in unemployment. The results are thus more in accordance with the "mainline" view of inflation and unemployment stressing that aggregate demand influences employment and unemployment via the relaxation of job-rationing constraints rather than via misperceptions of relative wages. It is possible that unanticipated *price* inflation may be of some importance even within the latter framework—as a determinant of the flow of vacancies into the labor market. We are, however, unaware of solid theoretical work on that issue.

Let us, finally, offer some comments on the observed differences between the Swedish and *U.S.* labor markets. Sweden has a highly unionized labor market, and wage bargaining at the national level gives rise to relatively uniform and long-term wage contracts. One would be inclined to expect that this institutional setting would produce fast dissemination of information about the wages in general, thus reducing the importance of information-lag effects. The less-unionized *U.S.* labor market more closely resembles the familiar Phelpsian "island parable" (pp. 6–7), than does the Swedish. The scope for temporary wage misperception would therefore seem to be greater in the United States. In fact, we find the opposite. Why? Let us focus on one additional significant difference between labor market functioning in Sweden and the United States—the importance of temporary layoffs. Temporary layoffs constitute—as Martin Feldstein has pointed out—an important source of *U.S.* unemployment. The *U.S.* manufacturing layoff rate has varied between 10 and 20 percent (of the number of employed workers) per year whereas the corresponding Swedish figures are 2–4 percent. The major part (60–70 percent) of the *U.S.* layoffs are temporary, implying that most workers are ultimately rehired by the same employer. Temporary layoffs in Sweden are, on the other hand, very unusual. Unemployed workers on temporary layoff accounted for 2–3 percent of Swedish unemployment during the period 1975–78. The corresponding *U.S.* figures seem to have fluctuated between 10 and 20 percent.[12] Feldstein's view of those laid off as "waiting" rather than "searching" has been questioned on empirical grounds.[13] The Feldstein hypothesis might, however, be considered as modestly corroborated by our results; one interesting interpretation of our revealed *U.S.*-Sweden differences would be that the extent and intensity of job search among the unemployed is lower in the United States. If unemployed workers on layoff act as if they will be recalled—and therefore abstain from search—there is little scope for detection-lag effects of the traditional type.

A laid-off worker "has a job" in some sense; he is attached to a particular firm and expects to be recalled by his employer. He is probably also well-informed about wage changes in his firm. How then would a nonseeking unemployed worker on layoff respond to unexpected general wage inflation? He would, most likely, be *less* inclined to search, thereby reacting similarly to his employed fellows; a familiar implication of search theory is that quits will *decrease*—via lower propensity to search—as a response to unexpected wage increases. Clearly, temporary layoffs represent a middle state between employment and unemployment. Economic theories designed to explain indi-

[12]For Sweden, see the "Swedish Labor Force Surveys." Feldstein's figures imply that 18 percent of those unemployed in March 1974 were on temporary layoff. The corresponding figure for March 1978 is 11 percent (see *Employment and Earnings*).

[13]See the paper by Thomas Bradshaw and Janet Scholl and the discussion following.

ridual behavior in the polar cases would obviously be less suitable when applied to he middle state.

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CHAPTER 5 UNEMPLOYMENT AND LABOR MARKET PROSPECTS - A STUDY OF THE EFFECTS AND DETERMINANTS OF UNEMPLOYMENT

5.1 INTRODUCTION

The main goal in Swedish economic policy has for a long time been a low rate of unemployment. The reason for this emphasis on low unemployment is not only that high unemployment means loss of production and hence consumption for the whole society but that unemployment is regarded as a severe welfare problem for those individuals who are hit; the welfare losses of unemployment are concentrated on few individuals.

The individual welfare losses from unemployment are of different types. The most obvious one is the loss of income. This loss is to varying degrees mitigated by unemployment benefits. According to available data (Persson-Tanimura 1979), approximately 45 per cent of the unemployed receive about 90 per cent of their foregone income from the Swedish unemployment insurance system.[1] Around 20 per cent of the unemployed receive about 50-60 per cent of the foregone income from the state--financed benefit system (KAS). The remaining 35-40 per cent receive no compensation at all.[2] However, the long-term unemployed are overrepresented among those who receive compensation from the unemployment insurance system, which means that long spells of unemployment in general are better compensated than short ones (chapter 3).

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[1] This system is described in Persson-Tanimura (1979) and Edebalk/Wadensjö (1980).

[2] The main reason for this rather high figure is that entrants and reentrants are not eligible for any benefits during the first three months of unemployment.

Secondly, there might also be non-monetary welfare losses. A common view is that unemployment, especially long-term unemployment, means social isolation and distress.

A third, less obvious and not very well documented welfare loss, is that the unemployment experience may have a deleterious effect on subsequent labor market prospects. In particular the subsequent wage path might be affected by unemployment. For example, those who become unemployed because of structural changes in the economy might experience reductions in the market value of their skills with worse earnings prospects as a consequence. Similar mechanisms might also increase the future risks of becoming unemployed again. The seniority rules which often are used when firms have to lay off a fraction of their employees might treat those with past unemployment (and low seniority) unfavorably.

These individual welfare losses might be important enough to give high priority to low unemployment as a goal for economic policy. But it is also often argued that unemployment is a still more serious problem because the unemployment risks are very unevenly distributed within the population or the labor force. A general opinion is that unemployment hits those who have a weak position in the labor market also in other respects. Certain personal characteristics, low education and experience, social and physical handicaps etc. might create both low wages and extensive unemployment experience. This will reinforce the view of unemployment as a distributional problem.

It is probably this view of unemployment - high individual welfare losses concentrated on those who have a weak position in the labor force - which has motivated the active labor market policy in Sweden. The emphasis[1] has been on preventing unemployment by measures which increase the demand for labor. But several measures have also aimed at upgrading the unemployed. The most notable example is the retraining courses. Actually, unemployment has been a prerequisite for most of these (highly subsidized) courses.

[1] See e.g. Johannesson (1981).

Even though this view of unemployment as a welfare and distributional problem dominates in Sweden, it is also often argued that at least some amount of unemployment is more or less harmless from the welfare point of view. Some unemployment is considered as "frictional". Such unemployment is a natural consequence of voluntary investment in productive search for better jobs. In particular among entrants to the labor force such "search"-unemployment might be common. In addition, submarkets with high unemployment risks might offer compensating wage differentials to attract and maintain employees.

Consequently some amount of unemployment is consistent with equilibrium and does not imply a severe individual welfare problem; for some it might even be a welfare gain to become unemployed, in particular if some of the time can be used for "leisure"-consumption. Hence there is no need for policies to reduce and compensate for this type of unemployment (from the distributional point of view).

For the policy-makers it would, of course, be useful to draw a clear borderline between these two types of unemployment. In that case they would be able to consider the need for further labor market policies in different phases of the business cycle. For example, can all, or most, unemployment during prosperity years be neglected from the welfare point of view? They would also be able to direct measures toward certain types of unemployment; hiring subsidies for certain unemployed is an obvious example.

Now it is probably not realistic to believe that a clear borderline can be drawn empirically between these two types of unemployment - "serious" and "not serious" from the individual welfare point of view. However, a more realistic approach is to find indicators of the "seriousness" of unemployment. An obvious candidate is the *duration* of unemployment - either the duration of single spells of unemployment or the total duration of several spells during a certain period of time.[1] It could of course be argued that short-term unemploy-

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[1] Compare chapter 2.

ment could be neglected from the welfare point of view, whereas long-term unemployment could not. Especially the first two welfare losses from unemployment discussed above are likely to be small for short-term unemployed.

Another candidate is the *reason* for unemployment. Quit unemployment probably comes closest to the concept of frictional unemployment. But it is also a plausible hypothesis that permanent lay-offs have more serious consequences than unemployment among entrants and reentrants to the labor force.

Furthermore, it could be argued that the consequences of unemployment interact with *age*. Long-term unemployment and permanent lay-offs might be more serious for older than for younger people or vice versa.

The purpose of this study is to contribute to a better empirical picture of unemployment as a welfare problem.

First, we are interested in the third type of welfare loss of unemployment discussed above, namely, effects on the subsequent labor market prospects. We want to test whether there are any effects of unemployment on the subsequent wage path. But we will also study whether "unemployment creates unemployment", i.e. whether there are any effects on the future risks of becoming unemployed.

Second, we want to investigate whether unemployment hits those who in other respects have a weak position in the labor market. We do this by analysing the personal characteristics which determine the unemployment risk in the labor force.

Third, we are interested in indicators of the "seriousness" of unemployment. The data base used in this study permits an analysis of the duration of unemployment. In order to highlight this issue we will make a distinction between "occurrence-effects" and "duration-effects" of unemployment. By occurrence-effects we mean effects which arise as soon as an individual becomes unemployed. The presence of big effects of this type, e.g. on the subsequent wage, implies that even the short-term unemployed will make big losses.

If, on the other hand, there are only duration-effects which increase with the duration of unemployment, the reverse will hold.

Roughly speaking the analysis will focus on three kinds of relationships. First we estimate wage equations of the traditional human capital type, where two unemployment variables are included, namely: (i) a dummy variable for the occurrence of unemployment, and (ii) the duration of unemployment given that unemployment has occurred. Second we estimate the determinants of the *occurrence* of unemployment, i.e. the probability of becoming unemployed. Third we estimate the determinants of the *duration* of unemployment.

A natural fourth aim of a study like this would be to extend the analysis to the consequences of individual-oriented labor market policy measures like retraining and temporary jobs. The typical feature of the Swedish "model" for labor market policy has been to reduce open unemployment and instead rely on such measures. The crucial question will then be whether these ambitions have been successful. If there are long-run effects of unemployment, are these prevented by the measures? Unfortunately the data base has certain limitations for such an analysis, which will be discussed below.

The plan for the chapter is the following. Section 5.2 contains a brief survey of different economic theories which have relevance for the relationship between unemployment experience and subsequent wages. The data base used in the study is presented in Section 5.3. Methodological issues are discussed in Section 5.4. The empirical results from the estimates of the wage equations are presented in Section 5.5. Section 5.6 contains the results from the estimates of the determinants of unemployment. Finally in Section 5.7, some policy implications of the study are discussed.

5.2 UNEMPLOYMENT AND SUBSEQUENT WAGES IN ECONOMIC THEORY - A BRIEF SURVEY

There are several important theories which can establish a systematic relationship between unemployment and subsequent wages. Even though all these theories are partial, each one highlights mechanisms which may have relevance for different types of unemployment.

A *first* important approach is *human capital theory*. One part of this theory starts from the notion that the compensation of a job has two components, a pure wage component and a training component which increases the future earnings capacity. Different jobs in the labor market offer different combinations of these components. Hence, the individual can make a choice between the two components. By sacrificing current income he can enhance his future earnings capacity (human capital) via more training. The human capital theory tells us how an individual should choose between these two components over his working life. A simple but important result from this theory is that the fraction of time devoted to training will be larger the longer the individual plans to stay in the labor force. This so-called "horizon effect", also implies that the growth rate of wages will decrease over time.[1]

These results have also been used to derive explicit wage equations. The main points about unemployment can be made within the following context.

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[1] These results follow from models of optimal human capital accumulation which are formulated in the following way:

$$\max_{0 \leq k \leq 1} V = \int_0^T e^{-rt}\{1 - k(t)\}K(t)dt$$

$$\text{s.t. } \dot{K}(t) = f\big(k(t), K(t)\big)$$

where $K(t)$ = the total earnings capacity
$k(t)$ = the fraction of time devoted to training.

See e.g. Ben-Porath (1967), Haley (1973), Brown (1976) or Blinder/Weiss (1976). The latter is an extension since it also incorporates labor supply.

Suppose an individual enters the labor force at age μ. The wage level at this age will be determined by a host of variables like schooling and personal characteristics, denoted X_i:

$$(1) \quad \ln W_i(\mu) = \beta_o + \beta_1 X_i$$

From this initial level, wages will grow over time because of accumulation of experience:

$$(2) \quad \frac{\partial \ln W_i}{\partial t} = \alpha_o + \alpha_1 (t-\mu), \qquad t \geq \mu$$

The coefficient α_1 should be negative because of the horizon effect from the investment theory.

As long as there are no breaks in experience, the wage level at time t can be obtained by integrating (2) from μ to t and adding (1). This yields the familiar wage equation with experience and experience squared as determinants:[1]

$$(3) \quad \ln W_i(t,\mu) = \beta_o + \beta_1 X_i + \alpha_o (t-\mu) + \frac{\alpha_1}{2}(t-\mu)^2$$

In terms of this framework, unemployment can have two consequences. First, the unemployed will lose not only his current wage but also the possibility of accumulating human capital. Consequently the subsequent wage will be reduced. This effect will obviously be stronger the longer the *duration* of unemployment. Furthermore, this theory implies that an unemployment spell of a given length will reduce (the log of) the subsequent wage more, the earlier in life that unemployment occurs. The reason is that the loss of

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[1] An alternative approach to deriving a wage equation from the human capital theorems has been proposed by Mincer (1974). Actually his approach gives the same equation.

wage growth is higher for youth.[1]

A second, perhaps more speculative, hypothesis about human capital losses of unemployment can also be formulated.

Because of structural changes in the economy the demand for certain types of labor skills may fall suddenly. These may be rather broad skills which are specific to a certain industry or skills which are specific to a certain firm. Those who become unemployed because of such structural changes will make a once--and-for-all loss of earnings capacity. This can be called an *occurrence effect* of unemployment.

It is likely that such losses will be higher the longer the person has stayed with a firm or in an industry. Hence a proper specification of this effect is an interaction term with total experience, or with job tenure in the job held before unemployment if it is loss of firm specific human capital. Consequently, such occurrence effects are in general likely to be greater for older people.

Conceptually it can be argued that this is not an effect of unemployment per se but of the structural change. Actually this type of loss may appear even if a new job is obtained immediately after the old one is lost, i.e. without any intervening unemployment.

A very important issue is whether human capital losses like those discussed above are likely to be *permanent* or *temporary*. The difference can be demonstrated in the following figures.

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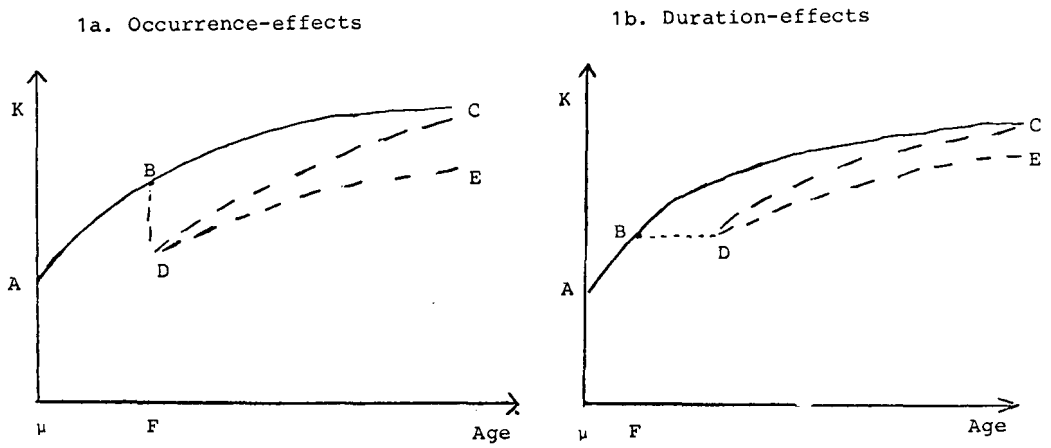
[1] (2) and (3) imply that the loss from an unemployment spell of a given length, d, will be:

$$L = \int_{t_o}^{t_o+d} \left(\alpha_o + \alpha_1(t-\mu)dt\right)$$

and

$$\frac{\partial L}{\partial t_o} = \alpha_1 d,$$ which is negative since α_1 should be negative.

Figure 1. Occurrence- and duration-effects of unemployment



In Figure 1 a, the line ABC illustrates the development of earnings capacity for an individual who is not hit by unemployment, whereas ABDC and ABDE represent two possible paths for individuals who became unemployed at age F and were hit by occurrence effects. (As the figure is drawn the duration effects are negligible.)

In Figure 1 b, the lines ABDC and ABDE instead represent duration effects.

In both cases the possibilities of temporary (ABDC) and permanent (ABDE) effects are illustrated. What can be expected? In terms of human capital theory the issue is whether the rate of accumulation depends on the stock of earnings capacity. If it is independent of the stock, the paths ABDE will follow and the effects will be permanent. On the other hand, if the growth rate increases after a loss, a path like ABDC will follow.

The theoretical literature gives no clear-cut answer to this issue. Actually both alternatives are consistent with different versions of human capital models.[1] Since there is no consensus on this from empirical studies we cannot have any strong a priori opinions on this issue.

Summarizing, human capital theory points at some important mechanisms through which unemployment can affect subsequent wages. Furthermore the theory predicts that the duration effects are likely to be negatively related to age whereas the occurrence effects can be positively related to experience or tenure in the job held before unemployment.

Still these results must be viewed with caution. Human capital theory, as it now stands, abstracts from unemployment and certainty is assumed about the future value of training. Consequently these kinds of human capital effects can only arise if unemployment is *unexpected*. Otherwise it would be optimal to adapt the planning to the unemployment risks and then the results from human capital theory used here need not hold any longer.

A *second* approach in economic theory which describes the unemployment and subsequent wage relationship is *search theory*. Originally, search theory attempted to explain both the decision to become unemployed (the quit decision) and behavior during unemployment, i.e. the duration of spells of unemployment. However, in most countries only a small fraction of unemployment can be attributed to quits (for the U.S. see Mattila (1974) and for Sweden see Chapter 2). Hence a pure search-theoretic approach is no longer regarded as a satisfactory explanation of the inflow to, or occurrence of, unemployment.

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[1] Lillard/Weiss (1977) present a model where the growth rate of wages is independent of the stock, whereas Haley (1973) presents a model (a simplified version of Ben-Porath (1967)) which can give higher growth rates for persons with lower stock. The models use different production functions for human capital (cf. the footnote on page 5:6). Because there are no theoretical or empirical arguments in favor of any of those production functions we cannot have any strong a priori opinions on the issue raised in the text.

That part of search theory which explains behavior during unemployment is important for our purposes. Basically this is a theory which explains the "aspirations" of the unemployed. Consequently, both the duration of spells of unemployment and the subsequent wage are explained.

To see this, consider the behavior of an unemployed according to the standard[1] search model. The assumptions in this model are:

(i) the unemployed faces a known distribution of wage offers with density- and distribution-functions $f(w)$ and $F(w)$ respectively

(ii) the probability of receiving an offer[2] per period is θ

(iii) the unemployed receives unemployment compensation which, after subtraction of direct search cost, is uc

(iv) the unemployed cannot retain the wage offers but has to accept or reject them during the period they are received

(v) the individual stays at the job he accepts until retirement

(vi) the unemployed is maximizing the discounted value of life-time income.

Given these assumptions the optimal search strategy is to choose a reservation wage which maximizes the present value of future income.[3] Wage offers equal to or above the reservation wage are accepted, others are rejected. The reservation wage in turn will determine both the duration of unemployment and the subsequent wage.

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[1] Lippman/McCall (1979) call this the standard search model since it is the most commonly used in the literature, which in turn probably is due to the richness of interesting hypotheses which follows from (different versions of) the model. However, Lippman/McCall also discuss several interesting extensions of the standard search model.

[2] Note that the probability of receiving an offer equals the probability of finding a vacancy times the probability of being accepted by the employer.

[3] The optimality of this strategy is proved in Lippman/McCall (1976).

Let us start by considering the case with infinite horizon. Consider an unemployed who is searching for a job a given period. Before starting he has to choose the reservation wage which maximizes his present value. Assuming that he has to search for a period before getting a job and that both unemployment compensation and wages are paid at the end of the periods the objective function becomes

$$(4) \quad V(w^*) = \frac{1}{1+r}\left[uc + \theta(1-F(w^*))E\,\frac{(w|w>w^*)}{r} + \{1-\theta(1-F(w^*))\}V^*(w^*)\right]$$

where w^* denotes the reservation wage, r denotes the interest rate and $V^*(w^*)$ denotes the maximum present value from further search according to the optimal reservation wage, w^*. The second term within brackets is the probability of getting an acceptable job times the expected present value of the wage income. The third term is the probability of not getting an acceptable job times the present value from further search. Maximizing (4) with respect to w^* gives the first-order condition

$$(5) \quad \frac{w^*}{r} = V^*(w^*)$$

i.e. all wage offers with a present value that exceeds the present value from further search are accepted.

Inserting (5) into (4) gives the reservation wage as the solution to the following equation

$$(6) \quad w^* - uc = \theta \int_{w^*}^{\infty} \frac{w-w^*}{r}\, f(w)\,dw$$

From this follows that, *ex ante*, the expected wage for an unemployed will be a function of the level of the unemployment compensation (uc), the interest rate, r, and the probability of receiving an offer, θ, with the following signs.[1]

$$(7) \quad E(w|w>w^*) = g(\underset{-}{r},\ \underset{+}{uc},\ \underset{+}{\theta})$$

The reservation wage will also determine the expected duration of unemployment; the probability of leaving unemployment, de-

[1] See e.g. Mortensen (1970).

noted α, will be $\alpha = \theta \cdot (1-F(w^*))$. Because the assumptions made above make the reservation wage constant over time the expected duration of unemployment spells will be

$$(8) \quad E(D) = \frac{1}{\alpha}$$

The determinants will have the following signs.[1]

$$(9) \quad E(D) = h(\underset{-}{r}, \underset{+}{uc}, \underset{?}{\theta})$$

It is also instructive to look at the *ex post* relationship between unemployment duration and subsequent wage which the standard search model predicts. First take the case with *identical* individuals.

As the probability of leaving unemployment is constant, α, the distribution of unemployment duration will be

$$(10) \quad P(D=i) = (1-\alpha)^{i-1} \cdot \alpha \qquad i = 1, 2, \ldots$$

However, the expected subsequent wage will be the same for all irrespective of the duration of unemployment, $(E(w|w \geq w^*))$. Hence there will be no correlation between the duration of spells of unemployment and the subsequent wage. In this world some will be lucky and receive an acceptable wage early, whereas others will have to wait longer.[2] Those who are unlucky will lose the discrepancy between the expected wage and the unemployment compensation during each additional period of unemployment.

When the individuals differ in some respects things will be different. Suppose that individuals have different unemployment compensation. From (6) follows the obvious result that high compensation raises the reservation wage. Consequently both the expected duration and the expected subsequent wage will be higher for those with high compensation. Now there will be a *positive* relationship between the duration of unem-

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1 See Mortensen (1970).

2 Of course the model also contains another lottery; within the range of acceptable wages some will receive high wages and some will receive wages close to the lower limit.

ployment and the subsequent wage in a cross-section of individuals. Those with long unemployment will be "compensated" by higher subsequent wages. In such a labor market the duration of unemployment will no longer be a good indicator of the "seriousness" of unemployment. Actually this is possible in the Swedish case since, as documented in the introduction, the dispersion in unemployment compensation is very high.

However, these rather trivial results are not the only possible outcomes of a search model. By changing the assumptions slightly other results can be obtained. In particular, several arguments can be put forward in favour of a declining reservation wage, i.e. the reservation wage declines during the spell of unemployment. Declining reservation wages in turn may generate a *negative* relationship between the duration of unemployment and the subsequent wage.

Several mechanisms can give rise to declining reservation wages. Already when the (simplifying) assumption infinite time horizon is removed and replaced by a finite time horizon, search theory predicts declining reservation wages.[1] The reason is that the shorter time the unemployed plans to stay in the labor force the less he can benefit from a high wage. This is a counterpart to the "horizon effect" in human capital theory discussed above. However, it can be questioned if this effect is strong in the search theoretic framework. Most unemployment spells are very short in relation to the time most persons plan to stay in the labor force. Consequently it can be questioned if the unemployed will reduce their reservation wages for this reason.

But declining reservation wages can also arise for other reasons. Lippman/McCall (1976) show for example that risk aversion is one such reason. A limited benefit period for the unemployment compensation is another one.

It might also be that there are negative "effects" of remaining unemployed. Employers might use the duration of un-

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[1] See e.g. Lippman/McCall (1976) or Gronau (1971).

employment as a signal for low productivity. Such behavior by employers might affect both the job offer probability and the wage offer distribution facing the unemployed. The job offer probability might decline during the spell of unemployment and the wage offer distribution might shift to the left as a consequence of such hiring behaviour by employers. This will also generate declining reservation wages from the standard search model.[1]

The *ex post* relationship between unemployment duration and subsequent wage can now be negative. The distribution of unemployment duration can be denoted

$$(11)\quad P(D=i) = \prod_{k=1}^{i-1} \{1 - \alpha(k)\}\alpha(i)$$

But the expected subsequent wage will depend on the duration of unemployment. The longer the duration, the lower the expected wage will be.

Within a group of identical individuals, those who are unlucky in their search and have to wait for a relatively long time before they receive an offer (which is acceptable) will make two kinds of losses in comparison with those who are lucky and receive a good offer early. First, they will lose the difference between the expected wage (obtained early during the spell of unemployment) and unemployment compensation. Second, they will obtain a lower subsequent wage.

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[1] To see this, consider the first-order conditions in a model with infinite horizon.

$$\frac{w^*_t}{r} = V^*_{t+1}(\theta) \qquad \frac{w^*_{t+1}}{r} = V^*_{t+2}(\theta \cdot k)$$

The job offer probability is declining by (1-k) per cent per period (k<1). $V^*_{t+2}(\theta \cdot k)$ must be lower than $V^*_{t+1}(\theta)$. From period t+1 onwards it is always possible to use the reservation wage which is optimal from period t+2 onwards. The higher job offer probability will generate a higher present value ($V^*_{t+1} > V^*_{t+2}$). This inequality will be aggravated when the optimal reservation wage is chosen.

In the simple search model presented here they will have this lower wage during the rest of their time spent in labor force. However, within the context of more elaborated search models this need not be the case. By allowing subsequent *search on the job* it should be possible to improve the wage. Such elaborated search models have been developed by Burdett (1978).

This short presentation has revealed that the standard search model has potentially important implications for the relationship between the duration of spells on unemployment and subsequent wages. The exact nature of this relationship depends on search costs, job offer probabilities, wage distributions and the planning horizon of the unemployed. Clearly it becomes an empirical task to find out the importance of these variables.

Unfortunately empirical tests of the search model are very hard to perform since the critical variables - the wage distribution is the most obvious example - are unobservable.

The first attempts to test the search model relied on a kind of "reduced form"-specifications.[1] One subsequent wage equation (like (7)) and one duration equation (like (9)) were estimated.

The main emphasis in these studies was on the importance of unemployment compensation as a determinant of unemployment duration and subsequent wages.

Recently Kiefer/Neumann (1979 a and b) have presented another test of the search model which comes much closer to a "structural" specification of the theory. Their approach is to specify explicit equations for reservation wages (w^r) and the wage offers (w^o) in the following way:

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[1] See e.g. Ehrenberg/Oaxaca (1976), Holen (1977) and Classen (1977) and (1979). Kahn (1978) represents a little different approach.

$$(12)\quad w_i^r = Z_i^1\gamma + \varepsilon_i^r$$

$$(13)\quad w_i^o = X_i^1\beta + \varepsilon_i^o$$

where both X_i^1 and Z_i^1 are vectors of individual and labor market characteristics. The random term ε_i^r in the reservation wage equation captures inter-individual variation in the reservation wages whereas the random term ε_i^o in the wage offer equation captures the dispersion of the wage offers.[1]

According to search theory, employment is accepted if

$$(14)\quad w_i^r - w_i^o = X_i^1\beta - Z_i^1\gamma + \varepsilon_i^o - \varepsilon_i^r > 0.$$

From this Kiefer/Neumann derive the joint density, $Pr(D_i, w_i)$, and apply a maximum likelihood procedure to estimate the structural parameters γ and β.

The data source available for this study has certain deficiencies as far as pure tests of the search model are concerned. The available measure of unemployment duration does not relate to single spells of unemployment but to the total number of weeks of unemployment during a calendar year. Consequently several spells of unemployment can be included. It is hard to say anything about the correlation between these two duration measures. However, in the empirical analysis below we only consider the simpler reduced form version of search theory.

A *third* approach is *discrimination or signalling theory*. The idea is that employers lack information about job applicants and that it is costly to obtain all relevant data. Thus it may be optimal to use some observable indicator or signal of the applicant's unobservable characteristics. In particular, it has been argued that *education* is such an indicator.[2] The reason is that, the more productive a person is, the lower the costs for education will be, as it becomes possible to pass a given exam quicker or to lower costs. In that case only the inherently more productive will find high education worthwhile.

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[1] Recently Kiefer/Neumann have extended the model to take account of heterogeneity in the wage offer equation, i.e. an individual-specific random term in (13) (Kiefer/Neumann (1981)).

[2] See e.g. Arrow (1973).

Whether the same argument applies to *unemployment* is hard to say. But it may of course be the case that employers believe that the inherently more productive are more clever at finding jobs. In that case applicants who already have a job will, everything else equal, be preferred rather than applicants who are unemployed. Consequently there will be *occurrence--effects* of becoming unemployed since the unemployed will receive poorer wage offers.

A more sophisticated version of this hypothesis is that employers use the *duration* of unemployment as an indicator. In that case the wage offers will be poorer, and perhaps less frequent, the longer the person has been unemployed. This possibility was incorporated into the search model above.

Summarizing, it can be argued that a reasonable hypothesis is that the hiring rules followed by employers might create both occurrence- and duration-effects of unemployment.

A *fourth* approach is the *theory of compensating wage differentials*. According to this theory the unemployment risks in different submarkets can be predicted by both employers and employees. If the expected *income* is to be equal in all submarkets, equilibrium *wages* must reflect unemployment risks. In the whole labor market the wage *levels* must be positively related to the expected periods of unemployment. If there exists a subsidized unemployment compensation system[1], the compensating wage differential will be reduced and be zero if the compensation level is 100 per cent.

Submarkets in this context can be sectors, industries and occupations. It is often argued that the low unemployment risks in the public sector are reflected in lower wages in comparison with the private sector. Another example is the construction industry, which is often said to have relatively high wages reflecting the high probabilities of unemployment when moving from one project to another.

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[1] In Sweden about 70 per cent of the costs for unemployment insurance are paid by the government.

However, the predictions from this theory become less clear if one moves from an expected income model to an *expected utility* model. Does unemployment mean consumption of leisure or social distress etc.? In the former case the wages may even be lower in the sectors with high unemployment risks if expected utility is equalized between the sectors.

In Sweden most people would probably argue that the latter holds, i.e. that unemployment represents a suffering *per se*. But there may be some exceptions. Temporary layoffs is one example; those who are temporarily laid off, but know that they will return to work soon, might find some "leisure--component" in unemployment.[1]

Another example can be those who have a weak labor force attachment like young people and perhaps some married women. Many young people may want to wait some years before settling down in order to try other activities like travelling, sports etc. For such young people a labor market with high unemployment risks may be as attractive as another one with the same wage but stable jobs because the unemployment periods can be used for other activities.

The same argument may hold for married women who can work in the household during unemployment.

Consequently the relationship between unemployment and wages may be different for different groups in the labor force.

Before turning to the empirical specification of the mechanisms discussed above, the data base to be used in this study will be presented.

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[1] In the standard contract model (see e.g. Sargent (1979)) it is the leisure consumption during layoffs that gives rise to temporary layoffs.

5.3 THE DATA BASE

A suitable data base for the purposes of this study is the one created by the Institute for Social Research in their "level of living project".[1] These data are based on a representative sample of the Swedish population between 15 and 75 years of age. The first sample was taken in 1968, when about 6500 individuals were questioned about different aspects of their level of living. This sample was drawn from the sample used in the regular Labor Force Surveys in February, 1967. The interviews were repeated in 1974 but only 5800 of the original individuals remained in the sample. Instead around 700 individuals were added to the sample. These were mainly young people and immigrants to make it a representative sample of the whole population.

Of primary interest for this study is the unemployment data. The criterion of unemployment in the level of living survey is that the individual *regards himself as being* (or having been) unemployed. This criterion is different from the one used in the Labor Force Surveys (Arbetskraftsundersökningarna, AKU). In the latter surveys *a search criterion* is used.[2]

These data contain different types of unemployment information. For our purposes the information about *unemployment experiences any time during the preceding year*, that is 1967 and 1973, is useful. Respondents were asked whether they had been unemployed or not any time during the year and the total number of weeks of unemployment during the year for those who had been unemployed.

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[1] For a presentation see Norlén (1979) and Vuksanović (1979).

[2] See Björklund (1979).

Because the sample was drawn from the AKU survey in February, 1967, the data base also contains information about unemployment experience any time during 1966.[1] This information consequently refers to the search criterion of unemployment.

By combining the information about unemployment experience during 1966 and 1967 it is possible to calculate a measure of the duration of unemployment during the two years. Even though it is questionable to combine unemployment data according to two different criteria, it will still be done.

A comparison between this unemployment information and the one from the retrospective survey in AKU is presented in Table 1.

Table 1. Comparison of unemployment data from the Level of Living Survey and AKU

	Unemployed any time during the year(s)	Average weeks of unemployment
Level of Living Survey		
1967	222,000	15.6
1973	320,000	16.1
1966 and 1967	541,000	14.8
AKU		
1967	325,000	≈ 13
1973	398,000	15.0

The comparison reveals that both years less persons are hit by unemployment according to the Level of Living Survey than according to AKU. On the other hand, the duration is longer in the former survey.

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[1] The yearly retrospective survey, discussed in Chapter 2.

Consequently the results from this study cannot uncritically be applied to the regular data.

Two more unemployment variables are available, namely (i) "unemployment experience any time during the last five years", and (ii) "unemployed any time more than two months". Unfortunately this information is available only for those who were employed during the week of the interview. As will be shown below, this drastically reduces the usefulness of these variables.

It is a main drawback that no information is available about the reason for unemployment, like permanent lay-offs, temporary lay-offs, entrance to the labor force, quits, etc. However, there is information about job tenure for those who were employed at the time of the survey. Consequently it is possible to distinguish between those who have changed employer after the unemployment experiences (1973 and 1966/67, respectively) and those who have not.

The data base also includes some information about labor market policy measures. First we know whether the individuals have had any relief jobs (temporary jobs) during 1963-67 and 1969-73, respectively. Second there is information about retraining courses and sheltered employment for the same periods. During the first period the number of observations is very low. However, during the second period the number of observations is much higher.

Unfortunately, this information is available only for those who were employed during the week of the interview. This drastically restricts the use of the data for evaluations of labor market policies.

In addition to the data on unemployment and labor market policies, the level of living survey also contains a lot of traditional "human capital" variables such as schooling and experience, as well as information on personal characteristics. The wage data refer to the employment during the week of the interview.

5.4 EMPIRICAL METHODOLOGY

The wage equations

A very straightforward specification of the unemployment effects discussed above is to insert unemployment variables into a traditional wage equation in the following way:

$$\ln(W_i) = f(HC_i, PC_i, U_i, UW_i) \tag{15}$$

where $\ln(W_i)$ = log of the wage level for individual i

HC_i = human capital variables like experience and schooling

PC_i = variables representing personal characteristics

U_i = dummy variable denoting unemployment experience (1, otherwise 0)

UW_i = weeks of unemployment given that unemployment occurred (otherwise 0).

Obviously U captures the occurrence effect of unemployment whereas UW captures the duration effect.

According to the theoretical discussion above quite different mechanisms might generate such effects. Consequently, the unemployment coefficients in (15) will capture the *net* effect of these different mechanisms.

Human capital theory predicts that an occurrence effect can arise because of loss of specific human capital. Such effects can only arise for a certain type of unemployment, namely permanent lay-offs. The data do not contain any information about the reason for unemployment. However, the information about job tenure can be used to distinguish between those who have the same employer and those who have not. These occurrence effects can be expected among the latter. Consequently separate unemployment variables in (15) will be used for these groups.

The hypothesis raised above that the losses might depend on the original stock of human capital will be tested by means of an interaction term between unemployment occurence and experience.[1]

The duration coefficient will, according to this theory, represent loss of accumulation of human capital.[2] In agreement with the discussion above an interaction term with age will be tested.

In terms of *search theory* a specification like (15) can neither be regarded as a reduced form nor a structural form. However, it can be seen as a description of an *ex post* outcome or realisation from a search model. If the dispersion in unemployment benefits is high (as it is in Sweden) and the effects of the benefits on subsequent wages and unemployment duration is high a positive coefficient for UW_i can be expected. On the other hand, declining reservation wages will tend to generate a negative coefficient for UW_i.

In order to highlight the importance of unemployment benefits, the reduced form version of search theory presented in section 5.2 will be tested too:

$$\ln(W_i) = g(HC_i, PC_i, UC_i) \tag{16}$$

$$UW_i = h(HC_i, PC_i, UC_i) \tag{17}$$

where UC_i = receipt of unemployment compensation (1, otherwise 0).

The variables representing human capital and personal characteristics capture the level of the wage distribution and the determinants of the job offer probability. No variables representing the interest rate or the planning horizon are available.

1 This means that we beside unemployment occurrence, U_i, insert U_i x Experience in (15); the total effect of unemployment will then depend on work experience.

2 If unemployment duration is used beside work experience (defined as time in work) in (15) the interpretation of the coefficient for the former becomes difficult; if one controls for experience additional unemployment weeks mean less time for activities outside the labor force. However, the measure of work experience is quite crude; the explicit question in the surveys was: How many years approximately have you been a wage earner. Hence, longer unemployment duration, given *measured* work experience, is likely to capture less real work experience.

In terms of the theory of *compensating wage differentials* the duration variable in (15) is an indicator of an occupation or an industry or sector with high unemployment risks. The wage-*level*[1] is likely to be higher in those submarkets. By controlling for such submarkets the unemployment variable can no longer capture such mechanisms. Therefore we also try wage equations with dummy-variables for the construction industry and the public sector. The former is regarded as a sector with high, and the latter a sector with low, unemployment risks.

Furthermore, it was argued that unemployment might to a greater extent be regarded as "leisure" for those with a weak attachment to the labor market. Consequently, we will run separate regressions for prime-aged men (20-60 years).

Finally, the unemployment coefficients in (15) can also capture effects of discrimination or more "psychological" effects of unemployment.

Choice of human capital variables

Because we are interested in the partial effect of unemployment it is crucial to choose the appropriate variables representing human capital and personal characteristics to be included in the equations. As unemployment is likely to be correlated with these variables, omission of such variables can create omitted-variable bias of the unemployment coefficients which are of main interest in this study.

The following variables have been included in the wage-equations:

(i) Work experience (years)
(ii) Work experience squared
(iii) Years of schooling
(iv) Educational level (seven levels)

[1] Consequently, the wage will be higher both before and after unemployment in those submarkets.

(v) Age
(vi) Age squared
(vii) Sex
(viii) Marital status (married/not married)
(ix) Physical ability.

The first three variables are completely in agreement with the human-capital theory presented above. The others require some arguments.

The inclusion of *educational levels* beside years of schooling has contributed to the explanatory power in other studies on Swedish data (Blomquist 1979). A plausible argument is that, given a certain number of years of schooling, a higher educational level probably captures greater ability or motivation.

As far as *age* (and *age squared*) is concerned it could be argued that aging has a separate effect on productivity irrespective of years of experience.

Sex is likely to have a separate effect on the wage. The reason for this could be discrimination or lower career ambitions among women because of more household work.

Also *marital status* could have a separate effect. Those who are married are likely to have more dependents than those who are unmarried and this could influence the wage rate.

Finally, *physical ability* evidently is likely to affect the productivity of the individual.[1]

Heterogeneity

In practice it is hard or even impossible to include all relevant variables in a wage equation. Variables like ambition and intelligence are in general unobservable. The presence of such unobservables is often called *heterogeneity*. If these individual variables are correlated with the included variables, heterogeneity obviously creates omitted-variable bias.

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[1] Our measure of physical ability is a dummy-variable equal to one for those who have normal physical ability and zero for those who have reduced physical ability. (See Vuksanović (1979), page 342.)

A great advantage of a longitudinal data base is that it offers some possibilities to control for heterogeneity. To see how this can be done with our data base, consider the following model, where we (for simplicity) only consider occurrence effects:

$$(18) \qquad \ln(w74_i) = \alpha_o + \alpha_1 X74_i + \alpha_2 X_i + \alpha_3 U73_i + \varepsilon_i^{74}$$

$$(19) \qquad \ln(w68_i) = \beta_o + \beta_1 X68_i + \beta_2 X_i + \varepsilon_i^{68}$$

Here $X74_i$ and $X68_i$ represent variables which change over time and X_i variables which are constant (like sex). If there is an effect of unemployment during 1973, it will affect the wage level 1974 but not 1968. Consequently, the unemployment variable for 1973 shall only appear in the wage equation for 1974 (equation 18). Next, suppose the error terms can be decomposed into one individual effect which is constant over time and one pure error term which is uncorrelated over time:

$$(20) \qquad \varepsilon_i^{74} = \gamma_i + e_i^{74}$$

$$(21) \qquad \varepsilon_i^{68} = \gamma_i + e_i^{68}$$

The individual effect γ_i could represent innate personal characteristics like ambition and intelligence. If this is correlated with the unemployment variable there will be an omitted-variable bias.

This kind of heterogeneity can be handled in two ways.[1] The first relies on removing the individual effect by taking differences:

$$\Delta \ln w = (\alpha_o - \beta_o) + \alpha_1 X74_i - \beta_1 X68_i + (\alpha_2 - \beta_2) X_i + \alpha_3 U73_i + e_i^{74} - e_i^{68}$$

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[1] See Kiefer (1979) and Goodfellow (1979) who apply these methods on other but related problems.

This will yield unbiased estimates of α_3, i.e. the effect of unemployment.

The second approach relies on estimating one pre-unemployment and one post-unemployment equation in the following way:

$$(22) \quad \ln(w74_i) = \hat{\alpha}_o + \hat{\alpha}_1 X74_i + \hat{\alpha}_2 X_i + \hat{\alpha}_3 U73$$

$$(23) \quad \ln(w68_i) = \hat{\beta}_o + \hat{\beta}_1 X68_i + \hat{\beta}_2 X_i + \hat{\beta}_3 U73$$

The reason for inserting U73 into the pre-unemployment equation is that its coefficient will capture the influence from the omitted variable γ_i. Suppose the relation between the omitted variable γ_i and the unemployment variable U73 is

$$(24) \quad U73 = \delta_o + \delta_1 \gamma_i$$

In that case the coefficient for unemployment in the pre--unemployment equation, $\hat{\beta}_3$, will only capture the effect of the omitted variable since in fact β_3 equals zero, i.e.[1]

$$(25) \quad E(\hat{\beta}_3) = \delta_1$$

However, the coefficient in the post-unemployment equation will capture *both* the effect of unemployment *and* the influence of the omitted variable:

$$(26) \quad E(\hat{\alpha}_3) = \alpha_3 + \delta_1$$

By taking differences between the estimated coefficients an unbiased estimate of α_3 will be obtained.

Obviously, it is possible to control for a certain type of heterogeneity by either of these methods. The idea is to exploit the before-after comparison which is possible with longitudinal data.

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[1] This follows from the ordinary expression for omitted variable bias (see e.g. Johnston (1972)).

In the empirical analysis the second method will be used since it has the perceptive advantage of displaying both the influence of the omitted variable(s) (the pre-unemployment equation) and the "real" effect of unemployment. For our purposes both effects are of interest. The first shows whether unemployment is correlated with unobservable variables which affect the wage *levels*. The second shows whether there is also an *effect* of unemployment on subsequent wages.

Due to the limitations of the data base this method can only be applied to the effects of unemployment experience during 1973 on the subsequent wage (in May) 1974, i.e. a kind of *short run* effect. The basic specification will be like (22) and (23) plus a variable for unemployment duration during 1973.[1]

Of course, the ideal approach would be to estimate the pre-unemployment equation on wage data immediately before the occurrence of unemployment. However, our data base does not permit this. The problem is that we don't have unemployment information during 1968-1972. It is hard to say if and how this will bias the results. A plausible argument is that the effects of unemployment will be underestimated (absolutely). The reason is that the unemployment coefficients in the post--unemployment equation capture the partial wage differential between those who were unemployed in 1973 and all others. However, among the latter those who were unemployed 1968-72 are included and their wage level has been affected by unemployment, too.[2] Consequently the estimated partial wage differential can underestimate the effect of unemployment.

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[1] The equations (22) and (23) will be estimated by Zellner's method for seemingly unrelated equations. By ordering the individuals in the same way in both equations this method allows for an error structure like (20) and (21). Only individuals with a positive wage both in 1968 and in 1974 are included. The sample selection problem which arises is discussed below.

[2] The exception is when the effect of unemployment only lasts for a very short time; in this case less than one and a half year.

To some extent this bias can be reduced by using the variable representing unemployment experience any time during the last five years, i.e. approximately 1969-1973. This possibility will be discussed below.

It is also possible to use the longitudinal data base to test whether there are *long run effects* on subsequent wages. Consider the following equations:

$$(27) \qquad \ln (w74)_i = \alpha_o + \alpha_1 X74_i + \alpha_2 X_i + \alpha_3 U6667$$

$$(28) \qquad \ln (w68)_i = \beta_o + \beta_1 X68_i + \beta_2 X_i + \beta_3 U6667$$

where U6667 = unemployed 1966 or 1967 (1, otherwise 0).

In (28) the coefficient β_3 will capture the influence of unobserved variables correlated with unemployment plus the effect of unemployment during 1966-67 on the wage level of 1968, i.e. the *short-run* effect. In (27) the coefficient α_3 will capture the influence of time-invariant unobserved variables plus the effect of unemployment during 1966-67 on the wage level 1974; i.e. the *long-run* effect. By estimating (27) and (28) and testing for differences between α_3 and β_3[1] we can test whether the effects of unemployment remain, increase or decrease over time.

Sample selection bias

A problem with the wage models specified above is that only those individuals who were employed at the time of the survey can be included, since we do not have wage data on the others. This means that we can study the effects of unemployment on the subsequent wage only for those who happen to have a positive wage at the time of the survey.[2] This might create

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[1] The Zellner-technique will be used for this purpose too.

[2] In order to use Zellner's technique for seemingly unrelated equations we can only include individuals who have a positive wage both in 1968 and in 1974.

so-called sample selection bias. To understand the sources of such a bias, consider the following model:[1]

(29a) $$Y_{1i} = X_{1i}\beta_1 + u_{1i}$$

(29b) $$Y_{2i} = X_{2i}\beta_2 + u_{2i}$$

Suppose that data are available on Y_{1i} if $Y_{2i} \geq 0$ while data on Y_{1i} are missing if $Y_{2i} < 0$. The regression function for the subsample of available data will then be

(30) $$E(Y_{1i}|X_{1i}) = X_{1i}\beta_1 + E(u_{1i}|\text{sample selection rule})$$

According to the sample selection rule above, this becomes

(31) $$E(Y_{1i}|X_{1i}) = X_{1i}\beta_1 + E(u_{1i}|u_{2i} \geq -X_{2i}\beta_2)$$

Now, if $h(u_{1i}, u_{2i})$ is a bivariate normal density, it can be shown[2] that the last term equals

(32) $$E(u_{1i}|u_{2i} \geq -X_{2i}\beta_2) = \frac{\sigma_{12}}{(\sigma_{22})^{1/2}} \lambda_i$$

where σ_{12} and σ_{22} are the covariance of the disturbances in (29a) and (29b) and the variance in (29b) respectively, and where

$$\lambda_i = \frac{\phi(Z_i)}{\Phi(-Z_i)}$$

where ϕ and Φ are the density and distribution function for the standard normal variable, and

$$Z_i = \frac{-X_{2i}\beta_2}{(\sigma_{22})^{1/2}}$$

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1 The exposition here (including the notation) follows Heckman (1979) closely.

2 See Griliches, Hall, Hausman (1978).

The equation for the available sample will consequently be

$$(33) \qquad E(Y_{1i}|X_{1i}) = X_{1i}\beta_1 + \left(\frac{\sigma_{12}}{(\sigma_{22})^{1/2}}\right)\lambda_i$$

The sample selection obviously works as an ordinary omitted variable if the equation is estimated from the available data. Thus the coefficient vector β_1 will be biased if (i) λ_i and X_{1i} are correlated *and* (ii) $(\sigma_{12}/(\sigma_{22})^{1/2}) \neq 0$ i.e. $\sigma_{12} \neq 0$. Sample selection will evidently not *necessarily* create bias. Even in the case when the probability of being included in the sample is systematically related to some variables, X_2, whereof some might be included in X_1, there will be biased estimates only if the disturbances are correlated.[1]

Heckman (1979) has developed methods which tackle this problem. The idea is to obtain estimates of λ_i in (33) and estimate the equation using this information. Estimates of λ_i can be obtained in the following way:

1) If the X_{2i} are known for the whole population, the probability that $Y_{2i} \geq 0$ (i.e. Y_{1i} is observed) can be estimated using probit analysis[2] for the whole population. This yields estimates of $\beta_2/(\sigma_{22})^{1/2}$.

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[1] However, there is an exception to this rule. If Y_{1i} enters among the variables explaining Y_{2i} there will be selection bias even if the disturbances are uncorrelated. To see this, note that if the model looks like

$$Y_{1i} = X_{1i}\beta_1 + u_{1i}$$

$$Y_{2i} = X_{2i}\beta_2 + Y_{1i}\beta_3 + u_{2i}$$

the counterpart to (31) will be

$$E(Y_{1i}|X_{1i}) = X_{1i}\beta_1 + E(u_{1i}|u_{1i}) \geq \frac{X_{2i}\beta_2 - X_{1i}\beta_1\beta_3 - u_{2i}}{\beta_3}$$

where the last term will be different from zero also when the disturbances are uncorrelated.

[2] The probit model is designed for dependent variables which only can take on values between zero and one for any combination of independent variables; i.e. it is a model explaining e.g. probabilities. See Goldfeld and Quandt (1972)

2) From these probit estimates both Z_i and λ_i can be estimated.

3) The estimated λ_i can be used as a regressor in (18) for the selected subsample.

This procedure yields unbiased estimates of β_1. Unfortunately the estimator is inefficient because of heteroscedasticity and consequently the standard errors will be uncertain.

An application of this methodology on our models requires that two problems must be solved. First, the "whole population" from which the sample is selected must be defined. Second, the model for sample selection (29b) must be specified.

For the wage equations used for tests of short-run effects we have defined the population as the labor force during 1973, i.e. those who belonged to the labor force any time during the year. The counterpart to the tests of long-run effects is the labor force during 1966 according to the retrospective Labor Force Survey in February 1967.

For the wage equations referring to the search theory obviously all those who were unemployed any time during the year constitute the "population".

The second problem is to specify the sample selection model, i.e. a model explaining the probability of being employed during the week of the interview. The method described above also requires that this model only includes variables which are available for the whole population.[1]

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[1] Note that this requirement makes it impossible to use the information about labor market policies in the model for sample selection since this information is available only for those who were employed during the week of the survey. Consequently, it is tricky to use these variables in the wage equations, too, since we do not know whether the estimated coefficients will capture the true effect or the effect of the omitted variable. The same argument applies to the information about job tenure and unemployment experiences during the last five years.

After some experimentation the following variables were included in the sample selection model for the first class of wage equations.

(i) Marital status
(ii) Years of schooling
(iii) Age
(iv) Wealth
(v) Total income of wife/husband
(vi) Unemployment experience during the year (1, otherwise 0)
(vii) Weeks of unemployment during the year.

For the wage equations referring to the search models the following variables were included:

(i) Marital status
(ii) Age
(iii) Sex
(iv) Number of children
(v) Receipt of unemployment compensation (1, otherwise 0).

5.5 EMPIRICAL RESULTS

We start by discussing the short-run effects of unemployment on subsequent wages. The main results are presented in Table 1 in the Appendix. The coefficients for the human capital and personal characteristics variables are presented in Table 7. Column 1 a, the post-unemployment equation, displays negative coefficients for both the occurrence and the duration variables, with (absolute) t-values around two. However, the occurrence coefficient is negative and significant (at least at the 10 per cent level) in the pre-unemployment equation (1 b) too. Furthermore, the t-value for the test of equality of the coefficients in the two equations is close to zero (shown at the bottom of the table), indicating that there is *no occurrence effect* of unemployment. Rather it seems as though unemployment occurrence is an indicator of unmeasured variables which influence the wage level.

On the other hand the results indicate that there are *duration effects* of unemployment. The duration coefficient is close to zero in the pre-unemployment equation and the t-value for test of equality between the coefficients in the two equations is -2.05. The point estimate of the effect is, according to equation 1 a and 1 b, -0.007 (-0.0057 - 0.0013), i.e. the wage level is reduced by 0.7 per cent for each additional week of unemployment. This yields quite drastic effects for long-term unemployment. However, the precision of this estimate is low.

In equations 2 a and 2 b the variable which corrects for sample selection bias (λ) has been deleted. This affects the duration coefficient which becomes closer to zero; the t-value for the test of equality between the coefficients is reduced to -1.52. This result clearly demonstrates the importance of the sample selection problem.[1]

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[1] The coefficient for λ in 1 a is 0.1137 (with t-value 1.86) which indicates a positive correlation between the error terms in the sample selection model and the wage equation.

The specification in 1 a and 1 b captures the net effect of unemployment on subsequent wages which, as discussed above, can appear for several reasons. In the other columns we present the alternative specifications of the unemployment effects which can shed some light on the mechanisms behind the effects.

In columns 3 and 4, interaction terms with age (duration) and work experience (occurrence) are allowed for. The explanatory power does not increase and consequently these specifications, which are in agreement with human capital theory, cannot be regarded as superior to the simple specification in column 1.

In column 5 we use the information about job tenure; the variables "same employer" (SE) and "change of employer" (CE)[1] have been constructed. According to the discussion above, occurrence effects can arise for those unemployed who have changed employer. However, the tests in column 5 do not display occurrence effects for any category of the unemployed. The duration effects are stronger (and more significant) for those unemployed who have stayed with the same employer. This is a rather confusing result, which is hard to explain within the framework of the theories above. One explanation is that these individuals have had to stay with the same employer in a stagnating industry or occupation with low wage increases.[2]

In column 6 we have inserted variables for the construction industry and the public sector. The rationale for this is that the unemployment variables would otherwise be indicators of industries with high unemployment risks and compensating wage differentials. By inserting those variables this influence of unemployment can be removed. However, the unemployment coefficients in column 6 are not very different from those

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[1] Change of employer has been defined as those who have worked for the same employer during the last six years, in order to capture all changes which have taken place between the time for the pre-unemployment and post-unemployment equations.

[2] This possibility points at the importance of also taking change of occupation and industry into account.

in column 1. This means *either* that the compensating wage differentials for unemployment risks are low *or* that this is a bad method to take these wage differentials into account.[1]

In column 7 we present the results for prime-aged men. As mentioned above it can be argued that unemployment is experienced in a different way by those who have a strong attachment to the labor force. However, the estimates in column 7 do not differ much from those in column 1.

Finally, in column 8 we present the results obtained when unemployment experiences during the last five years, i.e. approximately 1969-73, are used. Still there is no occurrence effect and the duration effect has the same size (-0.7 per cent for each additional week of unemployment) with a little bit higher t-value absolutely (-2.59) than in column 1 (-2.05).[2]

Summarizing, the results indicate that unemployment occurrence is an indicator of unmeasured variables which influence the wage level negatively. On the other hand, the estimations have displayed duration effects of unemployment even though these effects only are "borderline" significant. Such effects are compatible with quite different theories and consequently it is not possible to determine the mechanisms which have generated the effects. More detailed data are needed to find out which the mechanisms are.

According to the theoretical discussion above a high dispersion in unemployment compensation among individuals can establish a positive relationship between unemployment duration and subsequent wages. Obviously the negative coefficient for unemployment duration in the wage equations indicates that this "search-mechanism" is either very weak or dominated by other mechanisms which work in the opposite direction.

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[1] The positive coefficient for the public sector is perhaps an indication of a specification error.

[2] This is a weak indication that the results are not very sensitive to the fact that we do not have complete unemployment information between 1968 and 1974.

The absence of a strong effect of the unemployment compensation is also supported by the results from the reduced-form version of search theory. Receipt of unemployment compensation does not significantly affect the subsequent wage (Table 3), nor does unemployment compensation significantly affect the duration of unemployment (Table 4). In most cases the coefficient in the duration equations is negative although insignificant. Even though this result is quite robust in the sense that it holds for duration during 1966-67, 1968 and 1973, it would be careless to conclude that the existence of an unemployment compensation system does not increase unemployment. A plausible interpretation of the results is that other variables which tend to reduce unemployment duration are correlated with receipt of unemployment compensation. Such a variable could be the contact with the employment offices which is a prerequisite for the receipt of unemployment compensation. Furthermore, it must be kept in mind that the duration measure used differs from the one which search theory (in its standard formulation) is based on.

Still these results taken together support a view that unemployment compensation has a minor importance for unemployment in relation to other factors. This interpretation is well in line with the results obtained in chapter 3.

If there are negative effects of unemployment on subsequent wages, the present value of the implied income losses depends on whether the effects are permanent or not. The wage equations in Table 2 are used to test for this; the population of interest is the labor force during 1966 and we test whether the effects of unemployment experiences 1966-67 on the wage level 1968 *remain* in 1974. The results in all specifications show that the unemployment coefficients have not changed (significantly)

from 1968 to 1974. Consequently it is tempting to draw the conclusion that the effects of unemployment duration which were found above are permanent. This in turn implies that the present value of the income losses implied by these effects can be very high.

However, a closer glance at the results in Table 2 casts some doubts on the results obtained above, i.e. that there are duration effects of unemployment. In the wage equations for 1968 *neither* unemployment occurrence (1960, 1966-67) *nor* unemployment duration is significantly different from zero. In the wage equations for 1974 in Table 1, the short-run cases, both unemployment occurrence (1973) and unemployment duration are significantly lower than zero and the before-after comparison shows an effect of the latter. Of course, the different results 1968 and 1974 are not inconsistent per se. It might be that one would find effects of unemployment during the sixties, too, if the before-after comparison could be made; the effects might be "hidden" by the influence of unobserved variables. In that case a structural shift has occurred from the 1960's to the 1970's in the sense that the correlation between unemployment and unobserved variables affecting the wage level has changed.

However, another interpretation of the difference between the two time periods is that we have specified the effects of unemployment in a bad way and/or that the estimated coefficients are very sensitive to specific observations.

5.6 THE DETERMINANTS OF UNEMPLOYMENT

Does unemployment hit those who have a weak position in the labor market also in other respects? Unemployment would be a much more severe problem from the welfare and distributional point of view if the relatively low-paid in the labor market had the highest unemployment probabilities. This is the case if low education, low experience, social and physical handicaps are important determinants of unemployment risks. This in turn is very plausible; a straightforward interpretation of the human capital theory presented above is that the benefits from investment in schooling and on-the-job-training partly appear in lower unemployment risks.[1] The same argument applies to the importance of different personal characteristics.

Before studying the determinants of the unemployment risks it is constructive to take a look at the *simple* correlation between wages and past unemployment experience. If wages are regressed only on unemployment occurrence and unemployment duration, the coefficients will capture (i) the effect of unemployment on subsequent wages, (ii) the influence of unobservable variables which are correlated with unemployment and wages and (iii) the influence of observable but omitted variables (like schooling and experience) which are correlated with wages and unemployment. In this way the human capital variables and personal characteristics are removed from the wage equations above and the third influence will be added to the unemployment coefficients we obtained above; the resulting wage equations will in a simple way show if the relatively low-paid in the labor market have the highest unemployment probabilities. However, it could be argued that the interesting comparison is the one between two persons with the same age (and perhaps also sex) but different unemployment experiences. Therefore wage equations with age, age squared, (sex), unemployment occurrence

[1] This interpretation has been suggested by Nickell (1979).

and unemployment duration as explanatory variables[1] have been estimated and these are presented in Table 5.

Perhaps the most striking feature of the results is the difference between the three time periods 1973, 1966 and 1966-67.

We start by the results for 1973 (columns 1-4, 11). Here the occurrence coefficient is marginally lower (i.e. more negative) than in the wage equations in Table 1 where also personal characteristics and human capital variables were included. Consequently unemployment occurrence seems to capture not only the influence of unobserved variables which reduce the wage level but also to some extent the influence of the observed variables (schooling experience etc.) which also reduce wages.

The duration variable displays a different pattern. In Table 1 above, unemployment duration was negative (-0.0057) with t-value (-2.05). The before-after comparison indicated that this was an effect of unemployment duration. When the human capital variables and personal characteristics are removed, both the coefficient and the t-value are closer to zero. The lowest coefficient and t-value are obtained in column 11 where "unemployment during the last five years" is used. Consequently, unemployment duration seems to be an indicator of variables which raise wages.

Summarizing, these results have shown that, given a certain age and sex, a person with unemployment experience during 1973 has lower wage 1974. On the other hand we have not found that a person with long unemployment duration has lower wage than a person with short duration. However, behind this seems to lie two different countervailing mechanisms. First, unemployment duration seems to be positively correlated with variables that increase wages, i.e. an indicator of high earnings capacity. Second, our results in Table 1 indicate that there is a negative effect of long-term unemployment, i.e.

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[1] We also include the sample-selectivity variable "λ", since we are interested in the potential wage given the explanatory variables.

the unemployment experiences seem to reduce the subsequent wage and the longer the duration of unemployment the bigger the reduction will be.

The relationship between unemployment experiences 1966-67 and wages 1968 is different. By only taking the unemployment experiences during 1966 into account (columns 5-7) we find that unemployment duration is an indicator of a low wage. When we also take 1967 into account the opposite patterna emerges (columns 8-10); only unemployment occurrence is now an indicator of a low wage. Consequently the structure and character of unemployment during 1966 and 1967 must have been different.

Another rather puzzling result is that both duration and occurrence of unemployment 1966-67 are indicators of low wages 1974 (column 4).

So far we have found that, given age and sex, persons with past unemployment experiences have lower wages than those without such experiences. We have also found that the role played by unemployment occurrence and unemployment duration is different during different periods.

Next we turn to the determinants of unemployment, i.e. equations which explain the occurrence and duration of unemployment respectively. Such equations can tell us *which* variables (schooling, experience, etc.) that are important determinants of unemployment risks in the labor force.

Unfortunately, the experience variables in the data base are not available for all individuals in the labor force; hence we cannot use these variables.[1] Instead we construct an experience variable like (age minus school years minus six). This probably comes close to true experience for men but not for most women.

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[1] An alternative would be to estimate the unemployment equations on the subsample with available experience variables and rely on the technique to handle sample selection bias. Some experiments were made with this but then inconsistent results emerged.

In Table 6 we present the results from the estimations of the occurrence of unemployment.[1] Since we cannot control adequately for experience the results must be regarded as very tentative.

For 1973 it appears that, when age/experience are controlled for, the risk to become unemployed decreases with years of schooling and is lower for married persons and persons with good physical strength.[2] The coefficients for schooling and physical strength indicate (according to the lowest row) that approximately four additional years of schooling have the same effect on the unemployment risk as good physical strength.

The third row displays that both occurrence and duration of unemployment during 1966-67 increases the unemployment risk 1973. This result can be explained in two ways; either there is an effect ("unemployment causes unemployment") or there are some unobserved variables which have influenced the unemployment risks both 1973 and 1966-67. It is not possible to apply the technique with before-after-comparison in this case and discriminate between these hypotheses.

Above we concluded that unemployment occurrence 1966-67 (but not only 1966) was an indicator of a low wage. From the second row we can see that this can be attributed to high unemployment risks for persons with low schooling, for persons with physical handicaps and (these years) for women.

Next we turn to the equations for unemployment duration[3] (Table 4). A main impression from the figure is the low explanatory power of the equations. This indicates that unmeasured individual characteristics might be very important. Only the variable for age/experience is significant in all equations

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[1] The probit model has been used.

[2] In the wage equations above, all those variables have *positive* coefficients.

[3] Ordinary least squares have been used although it can be argued that we have a limited dependent variable (lowest value 1 and highest 52 (104 for 1966-67). However, the observations are not strongly concentrated on the limits.

(except 1966 when the t-value is 1.32). Above we concluded that unemployment duration 1973 was an indicator of variables which increase wages. The results in column 1 show that this can possibly be explained by the positive effect of age/experience on unemployment duration.

On the other hand we found above that unemployment duration 1966 was an indicator of a low wage level. Actually this is the only year when schooling affects unemployment duration; hence this can explain the result above.

Summarizing, the lack of experience variables has prevented a careful analysis of the determinants of unemployment occurrence and unemployment duration. However, two tentative results are worth nothing. First, schooling decreases the risks to become unemployed (but not the duration) significantly. This indicates that complete estimates of the returns to schooling also must take the unemployment risks into account. It also gives tentative support to the common view in Sweden that upgrading policies like retraining can reduce unemployment risks.

Second, physical inability increases the risk to become unemployed as well as unemployment duration given that unemployment has occurred. This indicates that the policies to improve the labor market prospects for handicapped people are insufficient.

5.7 SUMMARY AND SOME POLICY IMPLICATIONS

Three main issues have been analysed in this chapter. *First* we have attempted to test whether there are any negative *effects* of unemployment on subsequent labor market prospects. Methodologically a reliable test of effects of different events in the labor market requires that a before-after-comparison can be made. For our purposes this could only be done for the effects of unemployment experiences during 1973 on the wage level 1974.

We did not find any "occurrence-effects" of unemployment on subsequent wages, i.e. simply becoming unemployed does not change subsequent wages although there are some plausible theoretical arguments that they may change. On the other hand, we found "duration-effects" of unemployment on subsequent wages; each additional week of unemployment reduces wages by 0.7 per cent according to the point estimate. This implies quite high wage reductions for long-term unemployment. According to another test the effects on subsequent wages seemed to persist for at least six years.

However, the results must be taken with care. The test--statistics only showed "borderline" significance and the estimates were sensitive to the variable which corrects for sample selection bias. The method used to correct for this bias is rather new and not tested adequately yet; the method also introduces heteroscedasticity which makes the standard errors unreliable.

Another reason to be careful when interpreting the results is that the coefficients for unemployment duration in the wage equations differ between 1968 and 1974. However, this *need* not be an inconsistency, since structural changes might have taken place between the years; the description of unemployment in Chapter 2 revealed marked changes of unemployment structure from the sixties to the seventies. Consequently, the impact of unemployment on subsequent wages might have changed too.

Second, we have tried to investigate whether unemployment tends to hit those who, also in other respects, have a *weak position in the labor market*. We found that, given age and sex, a person with past unemployment experiences had lower wages both 1968 and 1974. However, different patterns between unemployment experiences and wages were found for different years. For 1973 it was found that unemployment occurrence was an indicator of a low wage level. On the other hand unemployment duration was no such indicator. Consequently, the effects of unemployment duration which were discussed above have not hit the most low--paid among the unemployed.

During the sixties the pattern was different between unemployment experiences 1966 and 1967. The first year unemployment duration was an indicator of a low wage whereas unemployment occurrence played the same role 1967.

Of course these results raise the hypothesis that no *stable* relationships exist between unemployment experiences and subsequent wages, i.e. there are no real mechanisms between unemployment and subsequent wages in the Swedish labor market like those discussed above. However, a more interesting hypothesis which can be put forward is that unemployment has different characters during recessions and business peaks. 1966 was a year with quite high economic activity whereas 1967 and 1973 were recessions.

Third, we wanted to shed light on whether *unemployment duration* is a good *indicator of the "seriousness" of unemployment*. Should unemployment duration, rather than the *stock* of unemployment, be the guideline for economic policy in general and labor market policy in particular?

The reason that this is an appealing indicator is, in my view, that it is *operational*. It can easily be used by the labor market authorities; long-term unemployed can be offered retraining courses and hiring subsidies can be given to employers who hire long-term unemployed.

Of course there is no simple answer to the question, since there are many goals both for economic policy and labor market policy. However, in particular for labor market policy, it is constructive to make a distinction between two different goals. The first is that the measures should prevent the welfare losses of unemployment, like loss of income and (possibly) a deleterious labor market development. The second is that the measures should improve the overall situation for those who have a weak position in the labor market, like low pay and high unemployment risks.

These two goals need not require the same type of measures. If one wants to emphasize the first goal it seems plausible to prevent the welfare losses from coming into being by means of measures to create employment. In Sweden temporary jobs (earlier called relief work) have been a flexible tool to create employment during recessions. In that way the individual welfare losses of unemployment can be avoided.[1]

If, on the other hand, one wants to improve the overall situation for the relatively low-paid in the labor force some kind of "upgrading" measures, like retraining, seem to be called for. Such measures can, hopefully, improve the individual's permanent position in the labor force.

If this "division of labor" between different types of measures is accepted, what conclusions can be drawn about unemployment duration as a guideline?

Let us start by the welfare losses of unemployment; if the welfare losses of short-term unemployment are small, or even negligible, but the welfare losses instead increase with the duration of unemployment it seems plausible to use the measures for creating employment in such a way that priority is given to the long-term unemployed.

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[1] It must be emphasized that this is an open and controversial question. Suppose that there are deleterious effects of unemployment due to discrimination of unemployed by employers; unemployment is taken as an indicator of low productivity. As unemployment is a prerequisite for temporary jobs, employers might treat those who have had temporary jobs in the same way.

No doubt, our results concerning the effects on subsequent wages support this view. We have not found any negative occurrence-effects of unemployment and the "search-mechanism" which could give rise to *positive* duration-effects has not been supported by the tests; rather the duration-effects might be negative.

On the other hand, our results are ambiguous as far as unemployment duration as an indicator of a weak position in the labor market is concerned. Consequently, unemployment occurrence, or risk to become unemployed, might be a better indicator or guideline for upgrading policies like retraining courses.

The issues raised in this chapter are crucial for a proper evaluation of the unemployment problem as well as the design of labor market policy. More reliable answers on the issues are needed. It is also important to extend the analysis to other welfare components than the wage level, for instance mental health.

However, more reliable answers require more detailed data than are available today in Sweden. As mentioned above, longitudinal data are needed for studies like this. However, the longitudinal data base used for this study can be improved in several ways. A major improvement would be to collect data on the complete labor market histories for individuals. Many drawbacks with the existing data base would then be eliminated. The most important improvement for our purposes would be to have complete data on unemployment experiences. Now we only have unemployment data from the preceding year. Furthermore, it would be an improvement to get data about types of jobs and wages over the whole life-cycle.

For reasons stated earlier it is also important to get such data for the whole population and not only for those who are employed at the time of the survey.

Of course it may be very costly to collect data on the complete labor market histories of individuals. A less ambitious and less costly approach within the framework of surveys like

the Level of Living Survey, would be to describe the labor market history between the surveys more completely.

Even with the ambitions in the present surveys several improvements can easily be made. First, it would be useful to decompose the total unemployment weeks during a year into the number of spells during the year. It might be that the welfare consequences of two spells of five weeks duration differ from those of one spell of ten weeks duration.

Second, it would be a major improvement to get data on the *reason* for unemployment. Evidently the effect of lay-off unemployment is likely to be different from entrance and reentrance unemployment.

Finally, data on participation of individuals in different labor market policies (temporary jobs, retraining, etc.) are needed for at least two reasons. Such data could make the estimates of effects of unemployment more reliable since the labor market prospects for the unemployed might have been affected by such policies, e.g. retraining. But still more important, it would then be possible to evaluate these policies by means of the methodology used in this study. The typical feature of Swedish labor market policy has been to reduce unemployment by means of measures like temporary jobs and retraining; in spite of the high expenditures on such measures we know very little about the effects of them.

Appendix 1. Tables

Notations

U73(U66,U67):	unemployed any time during 1973 (1966, 1967)
UW73(UW66,UW67):	weeks of unemployment 1973 (1966, 1967)
U6667:	unemployed any time 1966 or 1967
UW6667:	weeks of unemployment during 1966 and 1967
U6973:	unemployed any time between (approximately) 1969 and 1973
U6367:	unemployed any time between (approximately) 1963 and 1967
UC73(UC67,UC66,UC6667):	receipt of unemployment compensation 1973 (1967, 1966, 1966-67)
ln(w68):	log hourly wage in May 1968
ln(w74):	log hourly wage in May 1974
ED2:	vocational education for at least one year in addition to compulsory school
ED3:	roughly junior high school
ED4:	junior high school plus at least one year vocational education
ED5:	roughly high school diploma
ED6:	high school diploma plus at least one year vocational education
ED7:	degree from a university or a corresponding school
λ:	coefficient for correction for sample selection bias
$\bar{R}^2$:	adjusted R^2
n:	number of observations

t-values are presented in parenthesis under the estimated coefficients.

Table 1. Wage equations. Short-run unemployment effects.[1]

	1a	1b	2a	2b	3a	3b	4a	4b
Dep.var.	ln(w74)	ln(w68)	ln(w74)	ln(w68)	ln(w74)	ln(w68)	ln(w74)	ln(w68)
Indep.var.								
U73	-0.078 (-1.95)	-0.088 (-1.74)	-0.071 (-1.78)	-0.090 (-1.78)	-0.093 (-1.42)	-0.039 (-0.47)	-	-
UW73	-0.0057 (-2.17)	0.0013 (0.41)	-0.0038 (-1.56)	0.0011 (0.36)	0.0025 (0.36)	-0.0011 (-0.12)	-	-
U73 x Exp	-	-	-	-	0.00060 (0.19)	-0.00303 (-0.76)	-0.0027 (-1.44)	-0.0043 (-1.78)
UW73 x Age	-	-	-	-	-0.00021 (-1.20)	0.00007 (0.33)	-0.00016 (-2.47)	0.00004 (0.52)
Construct. industry	-	-	-	-	-	-	-	-
Public sector	-	-	-	-	-	-	-	-
U6973	-	-	-	-	-	-	-	-
Change of employer (CE)	-	-	-	-	-	-	-	-
U73 x CE	-	-	-	-	-	-	-	-
UW73 x CE	-	-	-	-	-	-	-	-
U73 x SE[3]	-	-	-	-	-	-	-	-
UW73 x SE	-	-	-	-	-	-	-	-
λ	0.1137 (1.86)	-0.135 (-0.25)	-	-	0.110 (1.80)	-0.0157 (-0.27)	0.093 (1.59)	-0.023 (-0.44)
$\bar{R}^2$	0.4194	0.5401	0.4182	0.5403	0.4194	0.5397	0.4192	0.5400
n	1810	1810	1810	1810	1810	1810	1810	1810
t-values[2]	+ 0.20 - 2.05		+ 0.36 - 1.52		- 0.62 + 0.39 + 0.88 - 1.22		+ 0.63 - 2.38	

[1] The coefficients for human capital variables and personal characteristics for equations 1a, 1b, 7a, 7b are presented in Table 7; the results for 2-6 and 8 are very close to 1.

[2] Test for equality of the unemployment-coefficients between equations; i.e. the null hypothesis is $U73_{74} - U73_{68} = 0$ etc. Inclusion of unemployment variables for 1966-67 did not change the results.

[3] SE = same employer

5a ln(w74)	5b ln(w68)	6a ln(w74)	6b ln(w68)	7a Men only ln(w74)	7b Men only ln(w68)	8a ln(w74)	8b ln(w68)
-	-	-0.085 (-2.12)	-0.093 (-1.84)	-0.070 (-1.39)	-0.085 (-1.43)	-	-
-	-	-0.0057 (-2.19)	0.0001 (0.31)	-0.0051 (-1.86)	0.0011 (0.33)	-0.0072 (-3.36)	-0.0001 (0.04)
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	0.049 (2.54)	0.069 (2.81)	-	-	-	-
-	-	0.005 (0.37)	0.033 (2.04)	-	-	-	-
-	-	-	-	-	-	-0.053 (-2.82)	-0.073 (-3.05)
-0.026 (-2.21)	-0.043 (-2.81)	-	-	-0.011 (-0.77)	-0.041 (-2.31)	-	-
-0.078 (-1.85)	-0.103 (-1.94)	-	-	-	-	-	-
-0.0046 (-1.70)	0.00093 (0.28)	-	-	-	-	-	-
0.106 (0.76)	0.043 (0.24)	-	-	-	-	-	-
-0.021 (-2.26)	0.00525 (0.45)	-	-	-	-	-	-
0.116 (1.91)	-0.015 (-0.27)	0.119 (1.96)	-0.002 (-0.04)	0.121 (2.26)	0.034 (0.65)	0.103 (1.70)	-0.022 (-0.42)
0.4221	0.5413	0.4209	0.5419	0.3715	0.5178	0.4205	0.5414
1810	1810	1810	1810	1176	1176	1810	1810

+ 0.45
- 1.57
+ 0.34
- 2.13

+ 0.16
- 1.97

+ 0.23
- 1.84

- 2.59
+ 0.79

Table 2. Wage equations. Test of long-run unemployment effects.[1]

	1a	1b	2a	2b	3a	3b
Dep.var.	ln(w74)	ln(w68)	ln(w74)	ln(w68)	ln(w74)	ln(w68)
Indep.var.						
U66	-0.022 (-0.75)	-0.027 (-0.73)	-	-	-	-
UW66	-0.0013 (-0.56)	0.0002 (0.085)	-	-	-	-
U6667	-	-	-0.024 (-0.99)	-0.027 (-0.87)	-	-
UW6667	-	-	-0.0020 (-1.28)	-0.0007 (-0.33)	-0.0028 (-2.23)	-0.0012 (-0.69)
U6367	-	-	-	-	-0.0082 (-0.42)	-0.030 (-1.21)
λ	-0.19 (-3.71)	0.04 (0.35)	-0.16 (-3.03)	0.06 (0.51)	-0.16 (-2.96)	0.07 (0.63)
$\bar{R}^2$	0.4033	0.5389	0.4049	0.5392	0.4047	0.5394
n	1810	1810	1810	1810	1810	1810
t-values[2]	+0.12 -0.51		+0.08 -0.61		-0.95 -0.83	

[1] The coefficients for human capital variables and personal characteristics are not presented; the results are very close to those presented in columns 1a and 1b in Table 7. Inclusion of U73 and UW73 in the equations for 1974 did not change the results.

[2] Test of equality of coefficients between equations; i.e. the null hypothesis is $U66_{74}-U66_{68} = 0$ etc.

Table 3. Wage-equations. Search-model.[1]

	(1)	(2)	(3)	(4)	(5a)	(5b)
De.var.	ln(w68)	ln(w68)	ln(w68)	ln(w68)	ln(w74)	ln(w68)
Indep.var.						
UC66	0.093 (1.15)	0.028 (0.48)	-	-	-	-
UC67	-	-	0.019 (0.79)	-	-	-
UC6667	-	-	-	0.02 (0.44)	-	-
UC73	-	-	-	-	0.048 (0.76)	0.027 (0.29)
λ	0.804 (1.17)	-	-	-	-0.149 (-1.22)	0.029 (0.16)
$\bar{R}^2$	0.4062	0.4053	0.4628	0.4308	0.2201	0.6115
n	238	238	116	329	74	74
t-value[2]						+ 0.21

[1] The coefficients for the human capital variables and the personal characteristics for equation 1 and 5 are presented in Table 7.

[2] Test of equality of the unemployment-coefficients between equations.

Table 4. Unemployment equations. Determinants of unemployment duration.

	(1)	(2)	(3)	(4)
Dep.var.	UW73	UW73	UW66	UW6667
Indep.var.				
Sch.years	0.284 (0.83)	-0.176 (-0.40)	-0.470 (-1.95)	-0.37 (-1.28)
Work.exp.[1]	0.330 (4.10)	0.258 (2.51)	0.057 (1.32)	0.137 (2.66)
Married	-1.24 (-0.69)	-2.62 (-1.22)	-0.83 (-0.69)	-2.25 (-1.63)
Women	2.14 (1.29	0.088 (0.04)	4.15 (3.56)	2.17 (1.62)
Physical strength	-3.23 (-1.16)	-5.08 (-1.59)	-2.70 (-1.80)	-3.16 (-1.85)
UC73	-2.44 (-1.14)	-2.13 (-0.88)	-	-
UC66	-	-	0.81 (0.60)	-
UC6667	-	-	-	-0.004 (0.01)
U6667	-	-6.58 (-2.19)	-	-
UW6667	-	0.124 (1.19)	-	-
$\bar{R}^2$	0.1011	0.0933	0.0609	0.0438
n	294	216	399	553

[1] Age-school years - 6.

Table 5. Wage equations. Unemployment as an indicator.

Dep.var.:	1 ln(w74)	2 ln(w74)	3 ln(w74)	4 ln(w74)	5 ln(w68)	6 ln(w68)	7 ln(w68)	8 ln(w68)	9 ln(w68)	10 ln(w68)	11 ln(w74)	12 ln(w68)
Indep.var.												
Age	0.033 (7.54)	0.030 (6.54)	0.032 (7.50)	0.032 (7.63)	0.086 (15.54)	0.088 (14.73)	0.077 (16.19)	0.086 (15.46)	0.0888 (14.69)	0.077 (16.19)	0.031 (7.12)	0.085 (15.26)
Age^2	-0.0004 (7.54)	0.0003 (-6.68)	-0.0004 (-7.52)	-0.0004 (-7.64)	-0.0008 (-11.29)	-0.0008 (-11.01)	-0.0008 (-11.28)	-0.0008 (-11.19)	-0.0008 (-10.96)	-0.0008 (-11.31)	-0.0004 (-7.17)	-0.0007 (-11.06)
U73	-0.088 (-1.81)	-0.080 (-1.54)	-0.124 (-3.38)	-0.059 (-1.21)	-	-	-	-	-	-	-	-
UW73	-0.0035 (-1.16)	0.0015 (0.47)	-	-0.0033 (-1.12)	-	-	-	-	-	-	-0.0042 (-1.78)	-
U6973	-	-	-	-	-	-	-	-	-	-	-0.094 (-4.13)	-
U66	-	-	-	-	-0.021 (-0.49)	0.011 (0.24)	-	-	-	-	-	-
UW66	-	-	-	-	-0.0045 (-1.34)	-0.0082 (-2.26)	-0.0056 (-2.26)	-	-	-	-	-
U6667	-	-	-	-0.046 (-1.58)	-	-	-	-0.0079 (-2.10)	-0.052 (-1.30)	-0.053 (-1.86)	-	-
UW6667	-	-	-	-0.0031 (-1.74)	-	-	-	0.0025 (1.05)	0.0001 (0.03)	-	-	0.0008 (0.41)
U6267	-	-	-	-	-	-	-	-	-	-	-	-0.065 (-2.18)
Women	-0.219 (-15.54)	-	-0.218 (-15.51)	-0.219 (-15.57)	-0.296 (-16.85)	-	-0.296 (-16.84)	-0.299 (-17.00)	-	-0.298 (16.97)	-0.223 (-15.8)	-0.299 (-17.02)
λ	-0.011 (-0.23)	-0.193 (-3.87)	-0.026 (-0.57)	-0.014 (-0.30)	-0.77 (-11.46)	-0.62 (8.74)	-0.77 (-11.47)	-0.77 (-11.18)	-0.61 (-8.34)	-0.76 (-11.21)	-0.021 (0.43)	-0.76 (-11.02)
$\bar{R}^2$	0.1534	0.0405	0.1533	0.1597	0.3263	0.2207	0.3266	0.3260	0.2185	0.3260	0.1598	0.3262
n	1810	1810	1810	1810	1810	1810	1810	1810	1810	1810	1810	1810

Table 6. Unemployment equations. Determinants of unemployment occurrence. Probit estimates.

Indep.var.	Sch.years	Exp.[1]	Physical strenght	Women	Married	U6667	UW6667	n
Dep.var.								
U66	-0.0619	-0.0084	-0.0934	-0.0051	-0.0008	-	-	4806
	(-5.12)	(-4.09)	(-1.23)	(-0.01)	(-0.01)			
U6667	-0.0727	-0.0127	-0.1897	-0.0906	0.0018	-	-	4806
	(-6.47)	(-6.54)	(-2.71)	(-1.81)	(0.03)			
U73	-0.0596	-0.0221	-0.2719	-0.0016	-0.3725	0.4761	0.0149	3576
	(-4.09)	(-6.73)	(-2.50)	(-0.02)	(-4.87)	(3.88)	(2.74)	
U73	-0.0714	-0.0220	-0.2744	-0.0484	-0.3622	-	-	3576
	(-4.92)	(-6.88)	(-2.59)	(-0.69)	(-4.83)			

[1] Age-sch.years - 6.

Table 7. The coefficients for human capital variables and personal characteristics in selected equations.

	Men only						
Dep.var.	1a (Table 1) ln (w74)	1b (Table 1) ln (w68)	7a (Table 1) ln (w74)	7b (Table 1) ln (w68)	1 (Table 3) ln (w68)	5a (Table 3) ln (w74)	5b (Table 3) ln (w68)
Indep.var.							
Sch.years	0.019	0.041	0.015	0.027	0.027	0.028	0.016
	(4.95)	(7.26)	(3.06)	(3.97)	(1.16)	(1.23)	(0.31)
ED2	0.036	0.054	0.028	0.077	0.093	-0.020	0.338
	(2.08)	(2.39)	(1.30)	(2.96)	(1.06)	(-0.23)	(2.56)
ED3	0.057	0.053	0.055	0.019	0.077	0.009	0.296
	(2.57)	(2.00)	(1.82)	(0.57)	(0.69)	(0.10)	(1.76)
ED4	0.114	0.168	0.127	0.157	0.244	-0.145	0.486
	(4.74)	(4.82)	(4.20)	(3.63)	(1.73)	(-1.19)	(1.90)
ED5	0.224	0,234	0,223	0,204	0.024	0.183	-0.17
	(5.98)	(3.61)	(5.10)	(2.84)	(0.083)	(1.09)	(-0.47)
ED6	0.250	0,387	0.296	0.399	0.337	-0.008	0.333
	(6.36)	(6.93)	(5.78)	(5.74)	(1.37)	(-0.044	(0.78)
ED7	0.395	0.475	0.424	0.502	0.605	0.1133	1.22
	(8.50)	(7.01)	(7.27)	(6.32)	(1.93)	(0.43)	(2.13)
AGE	0.012	0.037	0.006	0.029	0.044	0.022	0.110
	(2.12)	(4.52)	(0.64)	(2.38)	(1.99)	(0.81)	(2.09)
$(AGE)^2$	-0.00013	-0.00038	-0.00001	-0.00018	-0.0004	-0.00034	-0.0011
	(-1.93	(-4.22)	(-0.43)	(-1.39)	(-1.65)	(-1.01)	(-1.67)
Work.exp.	0.015	0.028	0,019	0.021	0.012	0.023	0.020
	(4.97)	(7.59)	(3.69)	(3.33)	(1.20)	(1.42)	(0.88)
$(Work.exp)^2$	-0.00023	-0.00048	-0.0003	-0.00059	-0.0002	-0.0004	-0.0008
	(4.29)	(4.61)	(-4.02)	(-5.26)	(-0.92)	(-1.32)	(-1.34)
Married	0.056	0.081	0.091	0,117	0.315	-0.013	0.115
	(2.78)	(4.61)	(4.06)	(5.38)	(2.63)	(-0.24)	(1.11)
Women	-0.200	-0,237	-	-	-0.349	-0.118	-0.267
	(-14.65)	(-13.9)			(-5.07)	(-2.19)	(3.09)
Physical strength	0.051	0.030	0.047	0.064	0.200	-0.127	0.0014
	(3.08)	(1.29)	(2.20)	(2.08)	(3.03)	(-1.20)	(0.009)

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CHAPTER 6 WHAT HAVE WE LEARNT AND WHAT SHOULD BE DONE NEXT?

The dynamic view of unemployment which became popular around 1970 stands in sharp contrast to the view which was dominate before. Earlier, the notion of a "hard-core" group of unemployed, with great difficulties of finding a job without aggressive aggregate demand policies, was common. The new view emphasized the turnover among the unemployed which was seen as a natural consequence of search for new jobs. In addition, search theory was one of the new theoretical approaches emphasizing the voluntary decisions by the unemployed. In inflation theory the concept "natural unemployment" became established and often this was considered as equivalent to "turnover unemployment", which was regarded as more or less harmless from the welfare point of view.

No doubt the new view was, and has been ever since it was introduced, very controversial. What have we learnt from the theoretical and empirical research during the last decade and what conclusions about the need for further research can be drawn?

In a very influential article Clark/Summers (1979) have given a very detailed description of unemployment in the U.S. labor market. They conclude that only a small fraction of unemployment in the U.S. is attributable to normal turnover among the unemployed; instead most can be ascribed to a few persons

being unemployed for quite long periods. As search theory, in the first place, can explain the former type of unemployment, this approach has a limited value according to Clark/ /Summers. What is needed is a theory which can explain why certain individuals suffer from repeated long spells of unemployment.

In a sense it can be argued that this conclusion implies that in the U.S. one is back to the view of unemployment which was dominating during the sixties. Furthermore, it might seem tempting to draw the same conclusion for the Swedish case from the studies presented in this volume.

According to the empirical picture presented in Chapter 2, only a small fraction of total unemployment is attributable to persons who are unemployed less than or equal to three months during a year.

The results in Chapter 3 indicate that it is hard to explain the longer unemployment duration during the seventies with reduced search costs, i.e. extended unemployment benefits.

The results in Chapter 4 do not support the modern view, adopted by the rational expectations school, that misperceptions of wages cause cyclical fluctuations of real magnitude like unemployment. Rather, the results are in line with a Keynesian view that fluctuations of aggregate demand, via more vacancies, generate unemployment fluctuations.

Finally, the results in Chapter 5 support the traditional view of unemployment as a severe problem from a welfare and distributional point of view. The "search-mechanism" which could give rise to a positive relationship between unemployment duration and subsequent wages was not found; rather there were some indications (although not robust) of deleterious effects of unemployment on subsequent labor market prospects.

However, I think it would be a severe mistake to draw the conclusion that the approach described above which has been taken during the seventies has

not been useful and will not be fruitful for further research. Of course it is easy to agree with Clark/Summers that too little work has been devoted to explaining long-term unemployment and in particular the causes of repeated long spells of unemployment for certain individuals. Still, I think that theories which emphasize the behavior of the unemployed, like search theory, have an important role to play. Furthermore, but this is probably not controversial, it is important to realize that the welfare losses of different types of unemployment can differ a lot and that, probably, the duration of unemployment is a good indicator in this case; hence, it is likely that labor market policies should give priority to certain groups among the unemployed.

On the following final pages I am going to discuss some important topics for future research. First, I will focus on *causal* analysis of unemployment and then I turn to more *welfare-oriented* analysis of unemployment issues.

As search theory has been used in the studies presented in this volume it is important to discuss the importance of this approach to unemployment analysis. Basically, search theory explains how the aspirations of the unemployed are determined, given that he faces certain restrictions like the wage offer distribution and job offer probabilities; the aspirations in turn are decisive for the job offers that will be accepted and rejected. Those who critize this approach generally argue that what matters for the unemployed, and perhaps in particular the long-term unemployed, is the job offer probabilities rather than their aspirations. As the former are not *explained* by search theory, they do not provide a satisfactory explanation of unemployment.

It is,of course,likely that too little attention has been paid to analysis of the job offer probabilities for the unemployed. Both the behavior of employers and the role played by the employment offices are important in this respect. But it is,

in my view very unlikely that *all* unemployed accept *all* offers which would make search theory obsolete. Furthermore, it is important to realize that it is possible for the unemployed to influence his job offer probability by varying the *search intensity*; this is possible to analyze by means of a slight extension of the standard search model (Burdett (1979a)).

Consequently, the aspirations of the unemployed can have an important role to play when explaining unemployment. Several hypotheses which follow from different versions of search theory can explain many important unemployment phenomena like changes of the unemployment structure and unemployment differentials between different groups and sub-markets.

One very simple but still potentially important result from search theory is the "horizon-effect", i.e. the longer a person plans to stay on a job the higher the optimal reservation wage will be. Actually, there are some indications at the macro-level that people have stayed in the labor force longer time during the seventies than during the sixties (see SOU 1978:60). This can explain *both* the longer duration of unemployment spells *and* the lower inflow of unemployed persons during the seventies; the lower mobility between the labor force and outside the labor force will reduce "reentrance-inflow" to unemployment; the longer planning horizon will increase the duration of unemployment spells.

Another interesting and potentially important result from search theory is the influence of the dispersion of the wage offer distribution on the reservation wage; the result is that the reservation wage will be higher the higher the dispersion is. This can explain different unemployment patterns on different local labor markets.

Another structural change in the Swedish labor market is the higher participation rate for married women which means that both man and wife are active on the labor market in more families. How has this affected job search and unemployment

patterns? This seems to be an interesting issue both from the empirical and theoretical point of view; theoretically a slight modification of the search model to the household is called for.

A very controversial but important issue is the effects of unemployment benefits. It is important to get better estimates of the effects of the unemployment benefits on unemployment and the outcome of the search process (the subsequent wage). As both the benefit level and the rules for eligibility are policy parameters, it is important to know how these affect job search. Actually, we know very little about this; the results obtained in Chapters 3 and 5 can possibly support a view that unemployment benefits have a minor effect in comparison with other determinants of unemployment but no conclusions about the effects of the benefit level and the other rules can be drawn.

Search theory can be used to generate hypotheses about these effects. Burdett (1979b) has worked through the effects of extended unemployment on the survival-rates in a more careful way than was done in Chapter 3. His results show that quite different effects can be expected for short-term and long-term unemployed and for those who are eligible for benefits and those who are not.[1]

But better data are also needed for empirical analysis of these issues. Some further insight into the problem can perhaps be obtained by using the information available at the unemployment-benefit societies. But a reliable analysis probably requires that we compare the outcome of job search for those who have and those who do not have unemployment benefits. Consequently, additional information seems to be called for.

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[1] An interesting result is that higher benefits for those who are eligible for benefits can reduce unemployment duration for those who are *not* eligible; by accepting a job offer, those not eligible can become eligible and gain from higher benefits if they are laid off. This can possibly explain the "unexpected" effects for youths and uninsured obtained in Chapter 3.

Perhaps some would argue that this rather optimistic view of the usefulness of search theory is not justified since the theoretical foundations for search theory are rather weak in certain respects. First of all, the reservation wage property of the optimal search strategy does not hold when the wage offer distribution is unknown (Rothschild 1974); thus the results discussed above need not hold. The standard search model is also very partial since the wage offer distribution and the job offer probabilities and search costs are exogenous. It would be an improvement if they could be explained endogenously in a general approach where the behavior of the unemployed plays an important part. Without such a theoretical foundation all empirical work must be viewed with some caution; it is a major challenge for theoretical research in this field to arrive at such a foundation of search theory.

One of the purposes of the new approach to unemployment theory was to arrive at a satisfactory micro-foundation of the Phillips-curve-relationship. One common approach has been to postulate that the causal mechanism goes *from* inflationary surprises *to* real magnitudes like unemployment and output. In Chapter 4 we found that aggregate demand, via more vacancies, seems to be the main determinant of cyclical fluctuations of unemployment duration. It is important to realize that this can be regarded as a satisfactory micro-foundation of the cyclical fluctuations of unemployment since the specification is compatible with search theory (i.e. maximizing behavior by the unemployed).

However, it is equally important to realize that there are other versions of search theory which can generate the mechanisms that transmit the inflationary surprises into unemployment. We only considered the case where the unemployed speculate on the distribution of *nominal* wages.

According to the taxonomy used by Santomero/Seater (1978) this is only one of three versions of search theory; the second

implies that the unemployed misperceive the real wage; the third implies that the unemployed speculate over time on normal level of nominal wages. There are no reliable tests of the latter yet. However, the approach taken in Chapter 4 can be used for tests of these versions, too.

As mentioned above it is an important task for future labor market research to explain the existence of long-term unemployment. What theoretical approach should be taken to explain this phenomenon? Of course it cannot be ruled out that some modified and extended version of search theory will prove useful. But in what way should it be modified and extended? In my view this is very hard to say.

Therefore it seems reasonable to recommend an inductive approach for future research in this field. By detailed descriptive surveys of the unemployed it would be possible to find certain characteristics which long-term unemployed have in common. The analysis in Chapter 5 showed that it was very difficult to explain the duration of unemployment with variables like years of schooling, age/experience, sex, physical strength, marital status and unemployment compensation. A more detailed descriptive analysis could concentrate on finding other characteristics which the long-term unemployed have in common. Are they concentrated to certain industries, regions, types of cities? Do they have attractive home opportunities? Do they have individual characteristics which make it hard to get a job? If more of this information becomes available, it would be easier to find a relevant theoretical approach to explaining long-term unemployment. Actually, the data base used in the study in Chapter 5 can be used for more detailed descriptive analysis than was made in that study.

The work needed to arrive at a plausible explanation of long-term unemployment is closely related to our final issue, namely the welfare-consequences of unemployment.

No doubt, the unemployment rate is one of the most important economic variable in Sweden; it is followed very closely by politicians and the development of measured unemployment has probably affected the outcome of several elections. The reason for this emphasis on unemployment is of course that unemployment is regarded as a welfare problem for those who are hit.

But is unemployment, as measured by the search criterion used in the Labor Force Surveys, a good measure in this respect?

I would say that this is something we know very little about. The problem is to compare the "welfare-level" between, on the one hand, the unemployed and, on the other hand, the employed and those outside the labor force. Inter-personal welfare or utility comparisons are very tricky to perform in a satisfactory way, which is well-known from welfare theory. Still the problem is potentially so important that some kind of measure of unemployment is needed. Consequently, it seems to be a very important task to evaluate different unemployment measures according to their ability to capture persons with low "welfare-levels". A plausible approach to such an evaluation is to define certain indicators which most people would agree upon as being important. Such indicators could be "the wage level in subsequent jobs", "possibility to do meaningful (defined in some way) non-market activities", "mental health", etc.

Such evaluations could be performed on some groups which are candidates to be included in a more extended measure of unemployment. One such group is the "hiddenly unemployed", i.e. those who say that they want a job but do not search actively. An evaluation like the one proposed above could e.g. display that those who belong to this group have much more attractive possibilities to perform non-market activities than those who are openly unemployed. In that case it might be plausible to exclude this group from a welfare-oriented measure of unemployment.

Another group which many argue should be included in a welfare-oriented measure of unemployment are those who are employed by means of labor market policies, like retraining and temporary jobs. Are those courses and jobs from the individual point of view close substitutes to "ordinary" jobs or a kind of disguised unemployment? Or to put it in another way, is it *because of* or *thanks to* those policies that the Swedish unemployment rate is low in comparison with other countries?

Of crucial importance for this issue is whether the policies contribute to better labor market prospects (higher subsequent wages and lower unemployment risks). In my view there is an urgent need for evaluations of these policies; in spite of the high expenditures on labor market policies we know very little about the effects. The methodological development reached by American economists and statisticians during the last years[1] is probably useful for these purposes. But most of all, more complete longitudinal data sets than those available today are needed (see Section 5.7).

It is not only important to consider whether certain groups should be included in a welfare-oriented measure of unemployment or not; it is also important to get a good picture of the dispersion of welfare consequences among the unemployed as discussed in Chapter 5. Potentially the welfare problems for the long-term unemployed are very severe. In addition to deleterious effects on labor market prospects there might be negative psychological or mental effects of different types. But still it cannot be ruled out that some,

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[1] Some references and applications can be found in Chapter 5. Another class of methods have been developed to analyze the labor market histories, i.e. the transition between labor market states (employment, unemployment, etc.) for individuals. (See Heckman/Borjas (1981), Tume/Robins (1980).

or even many, of the long-term unemployed have rather attractive alternatives outside the labor market (including the "black" market).

Summarizing, I think that there is an urgent need for more data on the characteristics, the time-use, mental health, etc., about the unemployed, and in particular the long-term unemployed. This is crucial both for a satisfactory explanation and a proper evaluation of the Swedish unemployment problem. Without such knowledge the correct policy conclusions cannot be drawn.

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