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Abstract

The purpose of this paper is also to analyze the importance of unemployment and other social factors as risk factors for impaired mental health. It departs from previous studies in that we make use of information about first admissions to a psychiatric hospital or ward as our measure of mental illness. The data base for our analyses has been constructed by merging two large Danish longitudinal data sets. The first is a panel of approximately 240.000 individuals which corresponds to 5 per cent of the Danish population aged 16-74, and contains detailed year-by-year information about the individuals' labour market behaviour, incomes, individual characteristics and so on from a fifteen-year period, 1976-91. The other panel is the Central Psychiatric Case register which contains all cases of psychic illness and their diagnoses (a little over 300.000 individuals and a little over one million cases) as registered in all Danish psychiatric hospitals and wards since 1969. The numebr of people found in both panels is a little over 15.000. We carry out analyses at two levels of the data. Firstly, we examine the determinants of first admission rates using aggregate time series data constructed from the Psychiatric case register. Secondly, we estimate conditional logistic regression models for case-control data on first admissions to a psychiatric hospital. The explanatory variables in the empirical analysis include age, gender, education, marital status, income, wealth, and unemployment (and length thereof) and other labour market statuses during the years preceding the first admission. This allows us to study whether unemployment as a risk factor differs between age groups, men and women, and single and married persons, and whether education and earnings have a moderating effect on theunemployment - mental illness relationship.

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1. Introduction

In this paper we use a completely new data source to address the question of a possible relationship between unemployment and mental disorders. The data are representative for the whole (Danish) population and allow us to link information on individual hospital records with data on individuals' labour market status, education, income and cohabitation variables. We perform analyses at two levels. First, we use aggregate time series data to estimate the correlation between unemployment and the number of first admissions to psychiatric hospitals. Second, we use the panel data on individuals in a nested case-control study to investigate whether similar relationships can be detected also at the micro level.

In assessing the social costs of unemployment economists have traditionally focussed on the value of output lost due to operating the economy below its potential and used Okun's Law or some related device to arrive at measures of the costs. It has increasingly been recognised, however, that there may be an additional burden to the individuals, a burden which is often referred to as the psychological costs of unemployment. Whether these effects exists, and if so, what are their quantitative importance, is of course mainly an empirical matter. A growing literature in the fields of social medicine, psychology, sociology, and recently also economics have attempted to provide answers to these questions.[1]

There are several measures of individual psychological well-being available. They differ mainly with respect to the kind of psychological problems, symptoms or illnesses they are constructed to evaluate. The most frequently utilized measure in connection with studies of the relationship between unemployment and mental health is the General Health Questionnaire, which includes items such as anxiety, depression, self-esteem and day-to-day difficulties, and which originally was developed to measure *minor* psychiatric disorders. A relatively common finding in studies using panel data is that unemployment does cause a decline in mental well-being but that the degree of persistence in the negative effects of unemployment on psychological well-being is rather low. After re-employment, the individual's well-being returns to its pre-unemployment level.

It should be noted, however, that these findings may to some extent reflect the fact that the population studied in most of the earlier investigations were either youth or workers laid off from a major plant/firm closure. Young people are likely to be less affected as they usually have no dependants, are less committed to employment and have more alternatives than adults. Major plant or firm closures may be unrepresentative of "normal" unemployment because they are often accompanied by some policies (by local or national authorities) to help the redundant workers.

This study differ from previous in that the focus is on mental illness, or more precisely, *first admission with mental illness.* Of course, one can argue that this is merely "the tip of the iceberg".

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[1] For three recent reviews, see Feather (1990), Björklund and Eriksson (1995) and Darity and Goldsmith (1996).

However, this "tip" is well-defined (whereas the rest of the iceberg is not), but is not likely to be captured in conventional surveys. It is obvious that only a small portion of all persons who have psychiatric symptoms (as those measured by the GHQ) or poor mental health are actually admitted to a psychiatric hospital or ward. On the other hand, these admissions are considerably closer to internationally prevalent concepts of psychic illness than the self-reported symptoms or rather unspecified psychological problems as proxied by a few questions in a questionnaire that have been studied in earlier research. The first admissions measure differs from the GHQ in that it is not a subjective measure and that it captures severe and non-temporary mental health problems. As a consequence, the measurement errors are likely to be smaller, and we know their direction. It should also be noted that as there is a limited number of sickbeds available and that in order to be admitted the person has to be seriously ill, there is a very little element of individual choice in the admission decision (in fact, in many cases the individuals are so ill, they are not able to make a choice).

There is very little research-based knowledge regarding the role of unemployment in conjunction with other social factors as a determinant of mental illness.[2] And yet, mental illness implies a great hardship for the person taken ill as well as for her family, friends and others. It has been estimated that of all sicknesses in Denmark, mental illness leads to the highest economic costs to society (NASTRA, 1995). It should be noted, however, that this is likely to be an underestimate of the true costs as the earnings losses of the sick are not included in this assessment of the costs.[3]

Our point of departure is that unemployment *per se*, and especially long spells of unemployment and the break-up of social contacts people usually have had on their former workplace, may be an important causal factor of mental illness. An alternative mechanism, stressed in the earlier literature (see *e.g.* Eisenberg and Lazardsfeld (1938)) which was much influenced by the high unemployment in the 1930s, is that the stress and anxiety associated with income losses and decreases in material living standards may trigger mental health problems. More recent research in the fields of social medicine and psychology indicate that the unemployment experience and the stress associated with it may change an individual's self-consciousness with ensuing identity crises and loss of time perspective. These strains may in turn weaken a person's power of resistance to somatic as well as psychic illnesses. There is, furthermore, the possibility that unemployment has a greater negative effect on psychological well-being if it is conceived of as particularly stigmatising, as might be the case if unemployment is low in the region, period, age group or industry to which the unemployed individual belongs.

In the study of the health consequences of unemployment, access to longitudinal data is crucial. A

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[2] Four exceptions which use individual level data are Bland *et al.* (1988), Kessler *et al.* (1989) and Viinamäki *et al.* (1994) and Fregusson *et al.* (1997), and one which makes use of aggregate data on local unemployment rates and psychiatric admissions is Kammerling and O'Connor (1993).

[3] As has been demonstrated by Bartel and Taubman (1986), and Ettner *et al.* (1997), these costs may be considerable.

reasonable conjecture is that some of the unemployed have more symptoms of weakened mental health (feel depressed, anxiety, are nervous, have difficulties sleeping and have a low self-esteem). However, it is also obvious these symptoms may also to some extent select these individuals into unemployment. Although we know very little about and to what extent unemployment is related to mental problems leading to illness (and hospitalisation), it is very likely that a corresponding selectivity problem has to be accounted for in the analysis. However, this problem is less likely to be present when *first admissions* are examined as in this paper. Most of the earlier studies attempting to test for causation have produced indirect evidence from longitudinal data sets by looking at the change in mental health upon re-employment. There are very few studies in which the level of mental health *prior* to becoming unemployed is known. When the outcome variable is first admissions, we know at least that the person has not been mentally ill (to extent that he needs hospitalisation) before.

The data set is constructed by merging two longitudinal data sets. The first is a panel consisting of approximately 240,000 individuals which corresponds to 5 per cent random sample of the Danish population aged 16-74, and contains detailed year-by-year information about the individuals' unemployment and employment experience, incomes, individual characteristics, other family members and so on from a seventeen-year period (1976-93).[4] This information has been taken from a number of Danish administrative registers which have been linked by a common individual registration number, like the social security number as the identifying key. The high quality and accuracy of the data set is guaranteed by the fact that the underlying administrative data are updated about every time a person approaches public authorities.

The other panel is the central psychiatric case register which contains all cases of psychic illness and their diagnoses as registered in all Danish psychiatric hospitals and wards since 1969.[5] This data set has a little over 300,000 individuals and a little over one million cases of hospitalisation and treatment.[6] A little less than 15,000 individuals number in the labour market panel can also be found in the central psychiatric register. One great advantage of the data set is that its design allows us to study a large unselected population and, therefore, the possibilities of generalising the findings are very good. The data were merged by Statistics Denmark and made available at the Research Facility of Statistics Denmark in Aarhus.[7] A permission from the Scientific Ethics Council was also required.

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[4] Due to data problems for the first four years, the current analysis is for the period 1980-83.

[5] This is the only register in the world which covers all hospitals and wards in a whole country. For detailed descriptions of the register and its use in earlier research, see Munk-Jørgensen, Kastrup and Mortensen (1993), Mortensen, Allebeck and Munk-Jørgensen (1996) and Munk-Jørgensen and Mortensen (1997).

[6] There are no private inpatients in psychiatric facilities in Denmark and no fee for service.

[7] The merge was made possible by the newly created research facilities of Statistics Denmark, which makes it possible to use hitherto confident data in safe environments inside Statistics Denmark.

In addition to this longitudinal data set we also make use aggregate time series information on annual admission rates from the central psychiatric case register and carry out an aggregate level analysis of the determinants of first admission rates. Both micro- and macro studies have their limitations: a central problem in micro-level studies is the possibility of selection effects, whereas the macro-level studies are more often open to the objection of omitted variable bias. By using both methods on the same data we can avoid some of the problems and this should increase the credibility of the relationships found.

2. Earlier Research

Numerous studies based on cross-sections or longitudinal data sets from large-scale surveys have shown that unemployed people have much poorer mental health than their employed fellow-men (see Warr (1987), Feather (1990), Darity and Goldsmith (1996), and Björklund and Eriksson (1995) for some recent surveys). This conclusion is general unaltered after controlling for a host of individual characteristics. Except for Christoffersen (1996), previous Danish studies of the relationship between unemployment and mental health have mostly been based on data sets in which persons who became unemployed due to plant closures are followed over a number of years; see e.g. Iversen and Klausen (1981), Iversen and Sabroe (1988) and Andersen (1991). The data set used by Christoffersen (1996) contains information about a little over 15.000 children born in 1966 and 1973, and their parents whose unemployment experience is recorded for the 1981-93 period. The study is concerned with the relation between unemployment and mortality and suicide rates of the parents, and with the social and health (including psychiatric) problems of the children. However, as Christoffersen does not control for any other factors, like education of the individuals and their parents, it is not clear how strong causal conclusions can be drawn from his study.

There is also some evidence (Clark and Oswald, 1994) that, despite a more generous unemployment compensation system and a more developed social safety net, the extent to which the unemployed experience their joblessness as an unpleasant one has not changed during the seventies and the eighties in a number of European countries. Using the same data set, the *Eurobarometer Survey Series*, Oswald (1997) furthermore shows that rises in real national income are associated with small increases in self-reported happiness, whereas unemployment is a large source of unhappiness. In a recent study of life-satisfaction data from the *German socioeconomic panel* by Winkelmann and Winkelmann (1995) it is made plausible that as much as 70 per cent of the total costs of male unemployment in their sample were non-pecuniary. (This follows from the compensating income variation being estimated to be at least 100 per cent and a replacement ratio of 60 per cent).

The social psychology literature (see the survey by Feather (1990)) distinguishes between three, interrelated mechanisms by which unemployment may have negative emotional consequences. The

first is the loss of self-esteem. Although self-esteem is generally considered to be fairly stable over an individual's life cycle (and mainly shaped during childhood), major life changes or traumatic events may alter it. Job loss is such an event which is remembered by many persons as a very nasty experience even long afterwards; see Goldsmith *et al.* (1996) and Akerlof and Yellen (1985) for evidence.

The second mechanism is the feeling that as a consequence of joblessness life is not under one's control. The feeling of helplessness caused by the fact that one's employment prospects seem to be independent of one's efforts to obtain a job is experienced as depressive by many of the unemployed.

A third mechanism, emphasized by Jahoda (1982), is the loss of a number of latent functions of working life, such as the time structure of the working day or working week, the contacts with people outside home, and the status and identity associated with having a job. Deprivation of these functions can be psychologically destructive for many persons.

Given individuals have lost their jobs, there are three phases when unemployment are seen to have an impact on mental health (Jackson and Warr (1984), Warr (1987)). The first is immediately in the beginning of an unemployment spell. During this phase, symptoms as those measured by the GHQ tend to increase. This is not universal, however; for a minority the job loss is associated with improved mental health. In cases where unemployment continues, mental health remains poor but after a certain period of time it does not in general deteriorate further. Some studies have found this to occur after about six months of unemployment (Warr (1987)). However, for a minority mental health as well as other problems continue to worsen. The third instance is re-employment. Several studies show a rapid and considerable improvement in mental health as people move back into employment (see *e.g.* Korpi (1997)).

A related periodisation is provided by the stages hypothesis (Hill (1977)). This divides the response to stressful events such as unemployment into three stages. The first stage, the *shock*, is characterised by that the individual is still optimistic about her possibilities of landing a new job. The second stage, *active distress*, is when she has failed to find new work and is becoming increasingly pessimistic about the prospects of obtaining a new job. As the individual becomes more fatalistic and believes she will never be employed again, she enters the *adaptation stage* trying to adjust to what she considers as the new normal state. The evidence on the stages hypothesis is mixed; Kelvin and Jarrett (1985) present evidence in support of the hypothesis, whereas Stokes and Cochrane's (1984) longitudinal study does not.

The relationship between employment/unemployment and mental health is complex as individuals differ in how they cope with their joblessness. A wealth of studies have shown that factors such as age, gender, income, social support, the reason for job termination, commitment to employment and length of unemployment may moderate or reinforce the negative consequences of joblessness on mental health (Warr and Jackson (1985)). Thus, it has, for example, frequently been observed that middle-aged persons' mental health is impaired more by unemployment than that of other age groups

(Hepworth (1980), Warr and Jackson (1985)).[8] Mental health is also found to be more likely to deteriorate among unemployed men. Also the decline in life-satisfaction is larger for middle-aged persons, and men in particular (Clark and Oswald (1994), Winkelmann and Winkelmann (1995)). Highly educated people and professionals also seem to have less mental deterioration as a consequence of their unemployment. A number of studies have also pointed to a number of mechanisms which can worsen the harmful impact on mental health of unemployment. Among these the most important are financial worries, commitment to employment and lack of inadequate social support (Bolton and Oatley (1987), Gore (1978), Iversen and Sabroe (1988), Warr and Jackson (1985)). It seems plausible to assume that these factors may be of importance for how unemployment affects mental illness, too.

Negative health-related lifestyles, such as high drinking levels, are often attributed to the unemployed. Available research does not, however, as a rule show that drinking increases as a consequence of unemployment (at least not among adults[9]). Rather, the unemployed drink less than their employed brothers and sisters, because they have less money to spend on alcohol; see for example Iversen (1990). Although unemployment does not seem to lead to increased drinking, among the unemployed, a group (mainly men) are problem drinkers. For this group, their drinking is not likely to be caused by their unemployment. Their alcohol problems have stigmatized them to the extent that it has contributed to their joblessness.

3. New evidence

Mental illness and unemployment can both be measured in several alternative ways and another common feature is that both are in many cases repeat events. In the following we will focus on the first spell of mental illness of individuals, that is, the *first admissions* to a psychiatric hospital or ward. By restricting our attention to first admissions we obtain a clean case for the study of a causal relationship between unemployment and mental illness. (Of course, persons with repeated spells of mental illness may also be affected by unemployment. However, in their case we would among other things have to control for the duration of the period since last mental illness spell (and the length of the latter)).

In the sequel we will report two types of evidence. The first is derived from time series data and the second is based on an analysis of data on individuals. These two different approaches lead to two

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[8] Given that youth have less financial responsibilities and other uses of time than adults, the findings of a negative impact of unemployment on their mental well-being as reported by Goldsmith *et al.* (1996) and Korpi (1997) are quite striking.

[9] As for teenagers, there are some evidence from Sweden - see Hammarström *et al*. (1988), Hammarström and Janlert (1994) and Janlert and Hammarström (1992) - that drinking, smoking and drug abuse increases with increasing length of unemployment.

different measures of association. However, as shown by Norström (1988), the measures are related and can be a valuable supplement to each other. In particular, it is important to note that the micro level estimate of the relationship between unemployment and mental illness captures the direct effect of unemployment on illness whereas the aggregate level macro estimate may in addition also capture indirect effects. One example of a negative indirect effect could be the impact on the mental health of the other members of the family of the unemployed or other persons who fear for their jobs.

3.1. Time series evidence

The purpose of our time series study is to establish whether there is an association between unemployment and mental illness as measured by first admissions at the *macro* level. It should be clear from the outset that in case we do detect such an association, this does not automatically imply that this also holds true at the individual level. On the other hand the direction of causality is less a problem in this context as cyclical or secular changes in unemployment are obviously not caused by changes in mental health. The analysis of individual level data is presented in the next section of this paper.

Figure 1 and *Table 1* give some descriptive information about the development of admissions over time and admissions by diagnosis groups, respectively. One potentially important factor underlying the evolution of admissions during the period is an attempt to reduce hospitalisation through a reduction in the number of sickbeds in the psychiatric hospitals. This started in 1975 and is calculated to have led to a decrease in sickbeds by about fifty per cent twenty years later. Of course, this may not necessarily have led to a proportionate decline in the number of admissions as one alternative adjustment is shorter spells of hospitalisation.[10]

Comparing *Figure 1a* and *1b* we can see that the negative trend starting in 1975 is much more pronounced for first admissions than for all admissions. First admissions also vary more from year to year (the coefficient of variation is in fact twice as high for first admissions). Over time the first admissions´ share of all admissions have declined. Thus, it seems as if the reduction in hospital treatment has above all reduced the number of first time admitters. On the other hand, the number of re-admissions has increased. This may be due to individuals with a higher readmission probability being selected as the number of sickbeds available have been decreasing. It could also be due to shorter but more frequent stays at the hospitals.[11]

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[10] This is indeed what has occurred for people suffering from schizophrenia (Munk-Jørgensen and Mortensen (1992) and affective disorders (Wulff Svendsen (1997)).

[11] This has indeed been shown to have taken place for patients suffering from schizophrenia; see Mortensen and Eaton (1994).

Table 1 shows the average shares of all and first admissions by twelve diagnosis groups for both genders and for men and women separately.[12] We may note that schizophrenia and manic-depressive illness account for a substantially higher share of all admissions than of first admissions. This is because persons suffering from these illnesses are repeatedly admitted to treatment. Diagnoses with a relatively low rate of repeat admissions are reactive psychoses, neuroses and the category other non-psychotic disorders. These diagnoses account for about 30 per cent of all first admissions but only one fifth of all admissions.

For one out of five admitted males the diagnosis is alcoholism. Typical female diagnoses are manic-depressive illness and neuroses whereas alcoholism and schizophrenia are only half as common as among males. Clearly, some of the diagnoses (for example, dementia and other organic psychoses) do not seem to be particularly relevant with respect to investigating the negative effects of unemployment on mental health. As for the majority of diagnoses, there are no strong reasons to exclude them on the basis that they could not be related to stressful events like unemployment.

Let us now turn to the statistical analyses of the time series on admissions. The equation we estimate is:

(1) $\text{Log FA}_t = \alpha_0 + \alpha_1 \text{ Log FA}_{t-1} + \beta_i \Sigma u_{t-i} + \gamma \text{Trend} + \varepsilon_t,$

where FA is the number of first admissions in year t, u is the overall annual unemployment rate according the Labour Force Survey and trend is a trend variable equal to 0 in the years 1970-74, 1 in 1975, 2 in 1976 and so on. The trend variable is included to capture the secular decline in the number of admissions due to the policy of reducing the number of sickbeds. The time trend may also pick up other secular changes (which may partly have been induced by the policy of reducing the number of sickbeds) like changes in people's attitudes towards seeking professional help for psychiatric problems, and shifts towards other treatments than those requiring hospitalisation. We have included dynamics in the form of a lagged dependent variable and on the unemployment rates to assist absence of serial correlation. In addition we have estimated a sequence of equations to examine the robustness of the key results with regard to both changes in dynamic specification and differences in the definition of the dependent variable. Thus, our results are immune to the objections raised against lag structures found by data mining which have unknown confidence levels.

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[12] It should be noted that the diagnosis made at the first admission does not need to be, and in many cases is not, the same at the next admission(s).

TABLE 1. DISTRIBUTION OF ADMISSIONS BY DIAGNOSIS, 1970-93 (PER CENT)

Diagnosis	All admissions			First admissions		
	BS	M	F	BS	M	F
Schizophrenia	14.0	18.5	9.7	2.0	2.8	1.3
Manic-depressive illness	14.1	9.3	18.6	9.5	7.2	11.6
Dementia	5.4	4.9	5.8	9.7	9.8	9.6
Other organic psychoses	4.5	5.1	3.9	5.9	6.6	5.2
Reactive psychoses	7.3	5.5	9.0	10.9	9.4	12.2
Neuroses	7.5	3.9	10.7	12.6	7.6	17.2
Personality disorders	15.3	14.2	16.4	14.9	14.5	15.3
Mental retardation	1.0	1.0	0.9	0.9	1.0	0.7
Alcoholism	13.3	20.6	6.3	10.9	17.8	4.8
Drug abuse	2.7	3.0	2.5	2.6	2.9	2.2
Other psychoses	4.4	4.0	4.8	3.7	3.6	3.9
Other non-psychotic disorders	7.6	7.0	8.2	16.4	16.8	16.0
Unknown	3.1	3.1	3.1			

Equation (1) has been estimated on the total number of first admissions irrespective of diagnosis. *Table 2* reports the estimation results for all first admissions. As can be seen our parsimonious specification explains a substantial proportion of the annual variation in first admissions. The trend and the unemployment rates carry statistically significant coefficients with the expected signs. The coefficient to the unemployment rate is robust to the inclusion of a lagged dependent variable. Initially we included the unemployment rate with three lags of which the one year lag never was close to significant. We also first estimated equation (1) with the unemployment rates in logarithmic form. The results were quite similar to those found in Tables 2 and 3, below. The overall fit of the linear specification was marginally better, however, and we therefore report and base our discussion on it. We had expected the logarithmic form to give a better fit as we anticipated a non-linear relationship (if any) due to the fact that unemployment becomes less selective at higher levels.

Both the trend and the unemployment rate have a quantitatively important impact on the development of admissions. With unemployment unchanged, the estimates imply that first admissions would have declined from 1970 to 1993 by 50-55 per cent, whilst the increase in unemployment, everything else equal, would have contributed to an increase in first admissions of

about 20 per cent in the same period. As the dependent variable has displayed a negative trend in the period studied and the unemployment rate also contains a trend, albeit in the other direction, one might suspect that the unemployment rate together with the time trend could be picking up the secular change in admissions. A closer look at the residuals of the estimated equations show, however, that the unemployment variables also help in explaining the variation around the trend. In fact, estimations with the deviations of log admissions from a trend as the dependent variable and unemployment rates as explanatory variables lead to similar results as those presented in Table 2.

TABLE 2. ESTIMATION RESULTS FOR ALL FIRST ADMISSIONS

Dependent variable: Log of number of first admissions; period: 1970-93; t-statistics in parentheses

	(1)	(2)	(3)	(4)
Constant	7.442	7.416	9.283	9.323
	(4.75)	(5.40)	(549.9)	(266.3)
Log (first admissions)$_{t-1}$	0.200	0.203		
	(1.19)	(1.27)		
Trend	-0.034	-0.034	-0.041	-0.034
	(6.36)	(5.22)	(17.1)	(9.16)
Unemployment rate$_t$	0.003			0.016
	(0.30)			(2.16)
Unemployment rate$_{t-1}$	-0.005			
	(0.40)			
Unemployment rate$_{t-2}$	0.028	0.025	0.030	
	(2.78)	(4.01)	(6.70)	
R^2 (adj.)	0.972	0.972	0.969	0.917
DW			1.76	0.93
Durbin's h	0.24	0.3		

The key result of this exercise is that an association between unemployment and mental illness does indeed seem to exist. The relationship found is not between contemporaneous variables; in most cases it is unemployment lagged one or two years which helps in explaining variations in first admissions.

Finally, we have also examined whether there is a similar relationship between *all* admissions and unemployment at the macro level. That is, we estimate an equation similar to (1) , but now with the total number of admissions (including first as well re-admissions) or re-admissions as the dependent variable. A set of estimation results are collected in *Table 3*. The results for all admissions in the first

two columns and especially those for re-admissions only displayed in the third column indicate that the impact of unemployment on readmission occurs with a shorter time-lag. (However, the contemporaneous unemployment was totally insignificant in these estimations and is, therefore, omitted in Table 3.) This is consistent with a notion of those people who already have been mentally ill before being more vulnerable to stressful events like unemployment or that people who have previously been mentally ill are in a weaker position in the competition for vacant jobs in short supply.

TABLE 3. ESTIMATION RESULTS FOR ALL ADMISSIONS AND RE-ADMISSIONS

Dependent variable:	Log all admissions	Log all admissions	Log re-admissions
Constant	5.249	4.870	3.697
	(3.85)	(3.38)	(3.90)
Lagged dep.var.	0.509	0.545	0.644
	(3.96)	(4.02)	(7.01)
Trend	-0.010	-0.009	-0.006
	(3.88)	(3.29)	(3.73)
Unemployment rate$_{t-1}$	0.011		0.014
	(1.89)		(3.18)
Unemployment rate$_{t-2}$	0.008	0.015	
	(1.13)	(2.56)	
R^2 (adj.)	0.887	0.863	0.932
Durbin's h	0.06	1.20	0.40

To conclude this part of the estimations based on aggregate data, we would like to stress that these results do not necessarily imply causation, although we do feel fairly confident that there is a causal relationship behind the findings. The unemployment rates in general precede the admissions with one or two years and even in the case of a contemporaneous relationship is it hard to think of causality going in the reverse direction. Clearly, what is needed is corroborating evidence from analyses at the individual level.

3.2. Micro-level evidence

3.2.1. The statistical model and the data

Our intention in this section is to provide some evidence on the relationship between unemployment

and mental illness using the micro data. The basic sample used in the analysis of unemployment and mental illness at the individual level was as explained earlier obtained by merging the Psychiatric Register files with the longitudinal labour market data set, henceforth called the LDB, which covers 5 per cent of the Danish population in the age 15 to 74.

The study design is a nested case-control study (Breslow and Day (1980), Rothman (1986)), where every person admitted for the first time is matched to all available controls using time matched incidence density sampling. In short, the controls come from all individuals who are at the risk at the time of the individual's first admission, that is, they are alive and have not (yet) been hospitalised to a psychiatric institution. This design and its applications in psychiatric research have been discussed in more detail in Mortensen (1988). So far the case-control approach has not, however, been applied much by economists although Lancaster (1990; 190-193) recognises its potential; see also Scott and Wild (1986) and McFadden (1997) for further discussions.

Out of all the individuals included in the LDB, 14,835 individuals had been admitted at least at least once to a psychiatric hospital (or ward). Of these, 10,849 persons were first time admitters which is the group we will focus on. However, one third of these first admissions occurred prior to being observed in the LDB and another third in the period 1976-81. This reduces the population of first time admissions studied here further to 4,906.

We restrict our analysis to persons who were between 18 and 59 years of age in the year they had their first admission.[13] As a consequence, 1,349 persons were excluded from the sample of first admissions. In addition there were 174 persons for which we have either no data during the two years before the admission or missing covariates. After excluding them, the final sample of first admitters consists of 3,383 individuals. After applying the same restrictions as described above, each of these cases have a reference group consisting of between 184,124 and 199,782 previously never admitted individuals. From each of these groups, a random sample of 28 to 49 individuals is selected as controls so that the data set analysed consists of 3,383 cases and 127,584 controls.

The explanatory variables used were age, gender, education, marital status, children, wealth, annual labour income, sickness leave and labour force status. The two latter variables refer to each of the the two years *prior* to the admission,[14] whereas the other explanatory variables refer to the year prior to the first admission year. The income and wealth variables come from the tax register and are measured pre-tax and with a high degree of accuracy as they have been cross-checked with the employers. The age variable is a set of dummy variables, one for each five-year interval: 18-24, 25-29, 30-34,....,55-59. The upper limit of 59 years is employed in order to make sure that transitions

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[13] The main reason for this age restriction is that we do not want to have to account for that one potential cause of mental illness is the transition from work to early or normal retirement. This is left for further analyses.

[14] It is important to note that the labour market variables do *not* refer to the same year as the admission. This is because we wanted to avoid having admissions occurring prior to for example an unemployment spell.

from unemployment/employment to the post-employment wage scheme ("*efterlønsordningen*") are not included in the sample. Education is measured in years: 7-10 years corresponding to secondary school, 11-13 to medium-level higher education, and 13 or more years to a university degree or equivalent.

The marital status variable distinguishes between married or cohabiting couples and singles. The single persons are further divided into subgroups according to gender and whether they have children or not. (If the child was born in the previous year, this is indicated by an additional dummy variable.) There are two dummies for whether the individual has been on sickness leave in the preceding year or the year before. To account for the individual's accumulated wealth and labour earnings, we use dummy variables for the individual's position, as measured by quartiles, in the in the wealth and annual income distributions.

The individual´s main labour force status in the two preceding years is one of the following: wage earner in employment or self-employed, student, on disability pension, out of labour force for other reasons and unemployed.

Unemployment is measured unconventionally as a degree of unemployment in the following way: The administrative unemployment register contains for each individual on a weekly basis information on the fraction of the week for which unemployment benefits have been claimed. By summing over all weeks in a year, a corresponding annual figure is constructed as a degree between 0 and 1[15]. In order to simplify our estimations we transformed the degree of unemployment measure into six categories, the first for the case when the degree is zero, the second for a degree greater than zero but less than 0.2, and so on. In the first estimations all unemployment degree dummies were included and we tested for a reduction of their number. It turned out that for the analyses presented here, it suffices to have three dummies (for each year): one for the unemployment degree equal to zero, another for greater than zero but less than 0.2, and finally, one for degrees between 0.2 and 1.

The statistical model used in this paper is a conditional logistic regression model for case-control data (see Clayton and Hills (1993), Prentice and Breslow (1978)).[16] "Cases" stand for individuals who encounter an event (here: first admission) at time *t*, and the "controls" are individuals with a non-event status (that is, are not admitted and have never been) at time *t*. Assume that the dichotomous process, $D_i \in \{0,1\}$, indicates whether individual i is admitted at time *t*, and let $x_i(t)$ denote the attached covariate vector and let $\lambda(t)$ be an unspecified and positive baseline parameter.

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[15] This measure is well suited to indicate the total burden of unemployment during the year. However, it also has two drawbacks. Firstly, it does not distinguish between a situation with several short spells and one with one (or few) long spell(s). Secondly, as the degree of unemployment refers to the *calendar* year, it does not account for the possibility that unemployment spells may last longer than one year.

[16] The statistical analyses were performed using the conditional logistic regression under the GenMod and PhReg in SAS version 6.11.

We model the admission probability, $P(D_i|x_i)$, as

(2)

$$P(D_i(t) = 1/x_i) = \frac{\lambda(t)\exp(x_i(t)\beta)}{1 + \lambda(t)\exp(x_i(t)\beta)},$$

which is also referred to as the choice probability by Manski and McFadden (1981). Suppose, that individual "1" is admitted at time t, and that m-1 individuals (indexed 2 to m) are randomly selected as controls for this particular case. The conditional probability that the first individual is a case and that the remaining individuals are controls, as observed, can be written as

(3)

$$P(D_1(t) = 1/\sum_{i=1}^{m} D_i(t) = 1, \ x_1, \ldots, \ x_m) = \frac{\exp(x_1(t)\ \beta)}{\sum_{i=1}^{m} \exp(x_i(t)\ \beta)},$$

where the baseline parameter, $\lambda(t)$, cancels out.

A conditional likelihood for β based on n cases with distinct admission times t_j, $j = 1, \ldots, n$ and with m_j, $j = 1, \ldots, n$ controls, respectively, is simply the product of the terms in (3):

(4)

$$L(\beta) = \prod_{j=1}^{n} \frac{\exp(x_j(t_j)\ \beta)}{\sum_{i=1}^{m_j} \exp(x_i(t_j)\ \beta)},$$

This likelihood can also be obtained as a partial likelihood, as emphasised by Oakes (1981), who also stresses that β is estimated efficiently by even very few controls per case. Note that (4) is equal to the likelihood for the conditional logistic regression model (see Green (1993), 668-670), which many economists are more familiar with.

3.2.2. Socio-economic risk factors

A sample of estimation results are set out in *Table 4.* As the β-coefficients, due to the non-linearity of the model, are not very informative we present the relative risk ratios instead. For the interpretation of the relative risk estimates it is important to notice that they refer to a comparison

to a reference individual, assigned a relative risk equal to unity. Thus, for example, for the labour force status variables, the reference category is an individual who has been fully employed in both years t-2 and t-1. As can be seen from the first column in Table 4, a person who has been unemployed for more than 20 per cent in both years, has a 1.41 relative risk of first admission compared to a fully employed person (with otherwise similar characteristics.)

As can be seen from the confidence intervals most of the estimates differ significantly from 1. Beginning with the first column, we may notice some difference between the genders as well as between age groups. There is a significant difference between men and women, men having a higher ceteris paribus first admission probability.[17] The risk of admission increases as individuals move through their thirties up through their forties to return to its former level as they move into their fifties. As can be sen from columns 2 and 3, the age pattern differs somewhat between the genders: the first admission probability peaks later for men and the probabilities vary less between the age groups for women.

Perhaps somewhat surprisingly, the differences between educational levels turned out insignificant. However, as we have included labour income and labour force status as explanatory variables, the effects of education (if any) may already be captured by these variables.

TABLE 4. RISK FACTORS FOR FIRST PSYCHIATRIC ADMISSION

	Both genders	Males	Females
Age:			
18-24 (reference)	1	1	1
25-29	1.042	0.953	1.179
	0.909 - 1.195	0.788 - 1.152	0.954 - 1.458
30-34	**1.502**	**1.338**	**1.743**
	1.309 - 1.724	1.102 - 1.625	1.411 - 2.155
35-39	**1.819**	**1.766**	**1.885**
	1.587 - 2.085	1.458 - 2.138	1.524 - 2.332
40-44	**1.779**	**1.652**	**2.002**
	1.543 - 2.052	1.343 - 2.033	1.634 - 2.508
45-49	**1.797**	**1.999**	**1.754**
	1.551 - 2.082	1.623 - 2.464	1.391 - 2.189
50-54	**1.467**	**1.349**	**1.606**
	1.251 - 1.721	1.063 - 1.711	1.271 - 2.028
55-59	**1.195**	1.257	1.201
	1.009 - 1.416	0.976 - 1.620	0.940 - 1.535

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[17] This is line with earlier studies on the relationship between unemployment and mental health. It should be noted, however, that as a consequence of excluding the labour income and wealth variables, the gender differential becomes insignificant.

Gender: male	**1.375**		
	1.241-1.523		
Education:	1.023	1.072	1.090
7-10 years	0.907 - 1.154	0.890 - 1.292	0.909 - 1.308
11-13 years	0.887	0.961	0.934
	0.786 - 1.002	0.803 - 1.151	0.780 - 1.119
13 years or more (ref.)	1	1	1
Marital status and children:			
Married or cohabiting with or without children (reference)	1	1	1
Single men with children	**1.681**	**1.543**	
	1.295 - 2.182	1.175 - 2.026	
Single men without children	**2.036**	**1.979**	
	1.833 - 2.261	1.767 - 2.215	
Single women with children	**2.500**		**2.470**
	2.172 - 2.877		2.133 - 2.860
Single women without children	**2.299**		**2.140**
	2.025 - 2.611		1.869 - 2.450
Child(ren) born preceding year	**0.658**	0.849	**0.528**
	0.547 - 0.792	0.652 - 1.106	0.402 - 0.692
Sickness leave:			
No leave (reference)	1	1	1
In year t-2, not in t-1	**1.579**	**1.510**	**1.604**
	1.370 - 1.819	1.228 - 1.857	1.300 - 1.978
In year t-1, not in t-2	**2.310**	**2.428**	**2.484**
	2.029 - 2.630	2.017 - 2.923	2.034 - 3.035
In years t-1 and t-2	**2.975**	**2.892**	**3.374**
	2.595 - 3.410	2.360 - 3.544	2.738 - 4.157
Wealth:			
Highest quartile (ref.)	1	1	1
Third quartile	**1.183**	**1.205**	1.020
	1.034 - 1.353	1.004 - 1.445	0.826 - 1.261
Lower half	**1.572**	**1.805**	**1.240**
	1.397 - 1.768	1.548 - 2.104	1.021 - 1.506
Labour income in t-1:			
Highest quartile (ref.)	1	1	1
Third quartile	**1.364**	**1.304**	**1.365**
	1.214 - 1.533	1.121 - 1.516	1.102 - 1.690
Second quartile	**1.619**	**1.890**	**1.395**
	1.422 - 1.844	1.581 - 2.259	1.114 - 1.748
First quartile	**1.955**	**2.164**	**1.688**
	1.634 - 2.340	1.676 - 2.793	1.258 - 2.264
Unemployment degree in t-2/t-1:			

0/0 (reference)	1	1	1
0/0.01-0.2	1.231	**1.368**	1.104
	0.999 - 1.517	1.037 - 1.806	0.788 - 1.546
0/0.21-1.0	**1.798**	**1.906**	**1.745**
	1.466 - 2.204	1.429 - 2.541	1.274 - 2.391
0.01-0.2/0	**1.259**	1.255	1.310
	1.029 - 1.539	0.947 - 1.664	0.968 - 1.774
0.01-0.2/0.01-0.2	0.804	0.906	**0.645**
	0.632 - 1.022	0.661 - 1.242	0.435 - 0.957
0.01-0.2/0.21-1.0	**1.508**	**1.710**	1.231
	1.222 - 1.862	1.293 - 2.262	0.864 - 1.755
0.21-1.0/0	**1.679**	**1.535**	**1.576**
	1.309 - 2.153	1.094 - 2.154	1.057 - 2.349
0.21-1.0/0.01-0.2	1.200	1.103	1.359
	0.950 - 1.516	0.776 - 1.569	0.978 - 1.888
0.21-1.0/0.21-1.0	**1.406**	**1.683**	1.198
	1.241 - 1.594	1.402 - 2.021	0.989 - 1.451
Other labour force status, t-2/t-1:			
Employed/Employed	1	1	1
Other/Other	**2.180**	**2.446**	**1.975**
	1.818 - 2.613	1.804 - 3.318	1.508 - 2.587
Other/Employed	**1.578**	**2.187**	1.142
	1.233 - 2.021	1.527 - 3.132	0.783 - 1.664
Other or Student/	**3.579**	**3.641**	**2.445**
Disability pension	2.311 - 5.544	1.958 - 6.772	1.162 - 5.143
Student/Other	**1.620**	1.703	1.663
	1.109 - 2.365	0.947 - 3.065	0.973 - 2.840
Student/Student	**0.701**	**0.593**	0.766
	0.538 - 0.913	0.400 - 0.878	0.518 - 1.134
Student/Employed	0.882	**0.583**	1.350
	0.669 - 1.162	0.373 - 0.912	0.934 - 1.950
Disabil./Disabil.	**1.878**	**1.448**	**2.161**
	1.548 - 2.279	1.053 - 1.990	1.624 - 2.875
Employed or Other/	1.335	0.997	**1.746**
Student	0.964 - 1.849	0.586 - 1.628	1.107 - 2.753
Employed/Disabil.	1.459	1.160	1.635
	0.961 - 2.216	0.613 - 2.197	0.885 - 3.021
Employed/Other	**2.295**	**2.081**	**2.383**
	1.803 - 2.923	1.432 - 3.026	1.656 - 3.428
Employees in t-1:			
Blue-collar worker		**0.884**	1.046
		0.733 - 0.972	0.906 - 1.208
Self-employed		0.820	1.079

	0.669 - 1.007	0.845 - 1.377
White-collar w. (ref.)	1	1

*.The figures shown are risk ratios, and beneath them the lower and upper bounds of the 95% significance level, risk ratios significantly different from unity are marked in bold.

Marital status turns out to be important. Marital status can measure a number of things. Obviously, some of the factors that lead to some people being single may also explain their higher probability of having a mental illness. Indeed one such factor may be the illness itself. But marital status is also a proxy measure of the amount of social support the individual receives in case of negative experiences. In interpreting the results with respect to marital status, it should be noticed that "married" includes cohabiting couples. From the table we can see that being single is associated with a higher relative risk of first admission and single women appear to have a higher risk than single men. Single men without children do not differ from single women with and without children. However their relative risk is higher than for single men with children. This is in all likelihood due to the latter being a highly selective group. Persons who have had a baby during the previous year have a significantly lower first admission risk. This is most probably an outcome of a selection process due to people having children during the psychologically healthier periods of their lives.

The likelihood of a first admission for individuals who have been receiving sickness benefits (for other reasons than mental illnesses leading to hospitalisation) for spells lasting at least two weeks during the preceding year is twice as high as for those who have no received sickness benefits. The risk for those who have been on sickness benefits during both of the two preceding years is three times as high. However, the effect of a sickness leave is halved when the first period with sickness benefits is followed by a year without a sickness leave. These results are consistent with earlier studies (see *e.g.* Warr (1987)) showing that poor physical health is associated with poor mental health. This could be due either to physical ill health leading to mental problems or the sickness leave in the years before the first admission having been due to mental health problems but treated (or recorded) as a physical health problem. Accounting for earlier sickness spells is important as it eliminates one factor which may contaminate our estimates of the effects of unemployment, namely a gradual process during which illness may lead to unemployment and next to a psychiatric admission. Including earlier sickness spells should reduce this selection effect and hence give cleaner estimates of the effects of unemployment.

Next we consider the *labour force status* variables. We have included two sets of dummies - one for individuals who were unemployed in either one or both years, one for those in other labour force states - to capture the individuals' labour force states and changes therein during the *two* years preceding the year of first admission (if any).[18]

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[18] We have tested for whether it would be sufficient to include only the labour force statuses during the preceding year (as not having to account for change of statuses would simplify a lot). This was decisively rejected by the data.

Beginning with the unemployment degrees one and two years prior to the admission, we can see that except for one case (to be discussed below) is the first admission probability significantly higher for individuals who have experienced unemployment than for those who have not. Consistent with the stages hypothesis discussed above, unemployment degrees exceeding 20 per cent in either or both years increase the relative risk of a first admission compared to shorter unemployment durations.[19] There is one notable exception to this pattern, namely the category with less than 20 per cent unemployment degrees in *both* years. This group has a relative risk which is actually lower than for those in continuous employment. One explanation is that this category is likely to include most of the people who are temporarily laid off. As documented by Jensen and Westergård-Nielsen (1990), temporary layoffs are rather common in Denmark due to the unemployment compensation system and the relatively unrestrictive job security legislation. As people on temporary lay-off return to their employer after what is a typically a short unemployment spell, they do not consider their joblessness as equally unpleasant as permanently laid of workers might do. Rather, if temporary layoffs recur year after year in an expected way, they are more likely to be considered as a form of leisure.[20]

The differences between the estimates for those who have been unemployed only in the preceding year, only 2 years ago and in both years are not large. In fact only for those who have been unemployed in the preceding year is the relative risk slightly higher. This indicates that there is some adaption to unemployment. The pattern of the estimates is, however, also consistent with the view that becoming unemployed and becoming re-employed are psychologically stressful events.

Looking at the unemployment effects for men and women separately, we can observe an interesting difference between the genders. In general unemployment experience matters less for the women's mental health. In particular long-term unemployment increases the relative risk of a first admission more for males than for females. This seems to suggest that joblessness is a larger stress factor for men, for example as a consequence of a larger reduction in self-esteem which is consistent with notions that having a job is more important for well-being for men than for women. Earlier evidence on a possible gender differential is scant as well as conflicting. Feather (1990) found depression to be more common among unemployed men than among unemployed women, whereas Stokes and Cochrane (1984) and Viinamäki *et al.* (1993) could not find differences in mental symptoms between the genders.

As for the other labour force states, and changes therein, we may note that being a student as well as moving from student to employment are associated with a lower first admission probability.

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[19] Too much weight should not, however, be put on differences in the estimates as the degree of unemployment refers to the calendar year. Thus, little unemployment in t-2 and much unemployment in t-1 may be due to one long spell (starting late in t-2) or two (or more) spells, one of which is short.

[20] As stressed by Björklund and Eriksson (1995), when examining health consequences of unemployment it is important to distinguish between different types of unemployment. Unfortunately this is, however, not possible with the current data set (nor with most other data sets).

Notice, however, that whilst being a student seems to be equally beneficial for both genders, moving from study to employment is much more beneficial for men. In fact, the risk ratio exceeds one for women. One explanation could be that for women, the entrance into working life coincides with other stress factors like raising family and having small children. The same circumstances may explain why there is also a difference between the genders with respect to those who go from employment to study. Not unexpectedly, individuals who have been out of work but do not qualify for receiving unemployment benefits or persons who have moved into the disability pension status, face a higher first admission risk. Their increased risk is almost two times as high as the risk for a person who has experienced a significant increase in her unemployment.

Moving now to the other economic variables, we may first note that coming from the lower halves of the wealth and the work income distributions is associated with a higher first admission probability. Moreover, the impact of wealth and income is more pronounced for men than for women. This is consistent with results from job satisfaction studies showing that wage aspect of jobs matter less for women; see for example Sloane and Williams (1994). The income and wealth variables can be seen as proxy measures for two types of factors which may worsen the deterioration of mental health among the unemployed. The first is financial worries which follow from a period of joblessness. The higher a person's accumulated wealth or income from work, the smaller the financial consequences of unemployment.[21] The second factor captured by previous labour income is (given age, education and industry) commitment to employment. In the first case a positive effect on mental health is expected whereas in the second case, the effect is the opposite. Our results indicate that the former dominates the latter.

However, the wealth and labour income variables are likely to be correlated with unemployment and other labour force states and may, therefore, be picking up some of the effects of the latter variables. In order to check for how this may affect our results, we have also estimated three alternative versions of the model in the first column of *Table 4:* without wealth, without labour income and without both wealth and labour income variables, respectively. As can be seen from the results which are set out in *Table A-1* in the Appendix, the risk ratios are indeed higher when the wealth and labour income variables are excluded. The magnitude of the changes are larger for the other labour force states than unemployment. But also the risk ratios for the unemployment degrees increase, and especially (and not surprisingly) for those persons who have a high degree of unemployment in year t-1. The same holds true also for the other labour force states when there is a change involving a lower income state in t-1 (like from work to disability pension or to the "other" category). Thus, most of the increases in the risk ratios are due to the exclusion of the labour income variables (cf. columns 2 and 3 in Table A-1). Wealth, which mainly is made up of owner-occupied housing, is more related to age than labour force state and excluding it as an explanatory variable does indeed lead to some

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[21] Naturally, family income and the individual's contribution to this would be better measures of the financial consequences of unemployment.

changes in the risk ratios for the age groups (not shown here).

To summarize, in this section we have found that a number of socio-economic factors, notably including previous labour force status and changes therein, are important predictors of first psychiatric hospitalisation. Naturally we cannot completely rule out the possibility that the relationships detected to some extent also reflect a selection due to the mentally ill persons going through processes leading to unemployment, disability pension, withdrawals from the labour force, etc. before the first admission. Irrespective of whether the results are interpreted as being due to selection or a causal relationship, we think the strength and the consistency of the relationship is noteworthy.

3.2.3. The stigmatisation hypothesis

One reason for why long-term unemployment may have a negative impact on a person's psychiatric health is that the person experiences it as a kind of stigma (which, of course, is reinforced if long-term unemployment is considered as a signal of low productivity by employers). It seems plausible to assume that whether or not joblessness is conceived of as a stigma depends on your peers or reference group; whether unemployment is a rare event in the region you are living in or in the industry or occupation of your employment. Thus, one hypothesis would be that being unemployed in a low-unemployment area or industry/occupation is more stigmatising and hence, may have more deleterious consequences for your mental health. We have tried to test this hypothesis by interacting the individual's annual degree of unemployment in year t-1 with dummies for whether the person is living in a low-, average or high-unemployment region or industry. Classifying regions and industries is helped by the fact inter-regional and inter-industry unemployment differentials are very stable over time (and so, there are no regions moving from being low- to becoming high-unemployment regions, or *vice versa*, during the period of study). Therefore, we can use the same set of dummies to characterise regions and industries in each year.

The data set allows us to use counties as regional units and for industries or occupational groups, these have to be approximated by the unemployment insurance funds (which are organised by industry) to which the individuals belong. There are two disadvantages of this procedure. First, we are not able to distinguish between Copenhagen (which is a high-unemployment area) and the rest of the Greater Copenhagen area (which is a low-unemployment area). Instead we have included them as a separate region. Second, proxying industries with unemployment insurance funds leaves those who are not insured without any industry affiliation.[22] Again, we have included them as a separate category in the statistical analysis. It should also be noted that in order to facilitate interpretation of our results, we have only included labour force status variables for year t-1 (and not t-2 as before)

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[22] "Non-insured" means that the person in case of unemployment would only get means tested benefits. Unemployment insurance is not compulsory in Denmark, but more than 80 per cent of the work force are insured.

in the estimation model. The other explanatory variables are the same as in Table 4. To save space only the interaction terms are presented here.

The results, displayed in *Table 5*, clearly contradict the stigmatisation hypothesis. The risk ratios for individuals with unemployment experience in the previous year are very similar in low- and high unemployment regions and industries/occupations. The only groups which stand out by having higher risk ratios are people living in the Greater Copenhagen area and unemployed people who are not members of an unemployment insurance fund.[23]

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[23] The higher risk ratio for the non-insured could be due to negative effect of unemployment being larger for people for whom the financial consequences are more severe as they are likely to be for those without unemployment insurance.

*TABLE 5. SOME EVIDENCE ON THE STIGMATIZATION HYPOTHESIS**

Unemployment degree in t-1:	Regions	Industries
Low unemployment - regions/industries:		
0	**0.839**	1
	0.731-0.963	
0.01-0.2	0.862	0.733
	0.655-1.133	0.450-1.193
0.21-1.0	**1.253**	**1.611**
	1.012-1.551	1.148-2.261
High unemployment - regions/industries:		
0	0.886	1.069
	0.780-1.006	0.831-1.375
0.01-0.2	1.042	1.187
	0.841-1.292	0.900-1.566
0.21-1.0	**1.259**	**1.567**
	1.066-1.486	1.225-2.004
Average unemployment - regions/industries:		
0	**0.734**	1.159
	0.641-0.840	0.930-1.443
0.01-0.2	**0.679**	1.229
	0.525-0.879	0.937-1.613
0.21-1.0	1.026	**1.593**
	0.851-1.238	1.249-2.032
Greater Copenhagen area:		
0	1	
0.01-0.2	**1.397**	
	1.093-1.786	
0.21-1.0	**1.738**	
	1.458-2.072	
Non-insured:		
0		1.068
		0.856-1.333
0.01-0.2		**2.013**
		1.364-2.972
0.21-1.0		**2.430**
		1.741-3.392

*. Low-unemployment regions are the following counties: Frederiksborg County, West Zealand, South West Jutland and North West Jutland; Average unemployment counties are: South Jutland, South East Jutland, West Jutland, and East Jutland; High-unemployment counties are: West Zealand, Southern Islands, Bornholm County, Fyn County, and North Jutland. The low-unemployment industries/occupations are: academics and metal industry; high unemployment industries are: construction and unskilled workers, and average unemployment industries are: services and other industries.

TABLE 6. THE IMPACT OF BUSINESS CYCLE CONDITIONS

Period	Unemployment degree/labour force state (t-1)	Risk ratio
1980-83:		
	0 (employed)	1
	0.01-0.2	1.123
		0.916-1.376
	0.21-1.0	**1.311**
		1.114-1.542
	Disability	1.751
		1.358-2.257
	Other	**1.450**
		1.191-1.765
1984-87:		
	0	1.310
		0.864-1.988
	0.01-0.2	**1.669**
		1.067-2.611
	0.21-1.0	**2.138**
		1.389-3.290
	Disability	**2.494**
		1.544-4.029
	Other	**2.926**
		1.870-4.577
1988-93:		
	0	1.126
		0.762-1.664
	0.01-0.2	1.085
		0.694-1.696
	0.21-1.0	**1.841**
		1.228-2.759
	Disability	**2.360**
		1.512-3.683
	Other	**2.673**
		1.754-4.075

It is a well-known fact that unemployment tends to be less selective during periods of increasing and

high unemployment than in years of low unemployment. Also, during periods of low and/or falling unemployment, remaining unemployed, and in particular for long periods, could be associated with more psychological stress and be more stigmatizing for the individuals than in periods of increasing unemployment. Both the sorting and the stigmatization mechanisms indicate that the association between unemployment and mental illness might be stronger in periods of low and/or declining unemployment.[24] Although it is extremely difficult to distinguish between the two mechanisms, it is still worthwhile looking into whether *any* of them are present in the data. For that purpose we distinguish between three sub-periods, two of which - 1980-83 and 1988-93 - are characterised by increasing unemployment rates (from 7.0 to 10.5 and 8.7 to 12.4 per cent, respectively), and one - 1984-87 - by decreasing unemployment (from 10.1 to 7.9 per cent). We use dummies for these time periods and interact them with unemployment degrees and the labour force states disability pension and "other". For the same reasons as above, we only use information about labour force states in year t-1. (Otherwise, the other explanatory variables are the same as in Table 5). The estimation results may be found in *Table 6.*

What do we find? Firstly, there has been no notable change in the risk ratio for the employed. Secondly, the relative risk of the unemployed is higher in the 1984-87 period, when unemployment was falling, than in 1980-83, when it was rising. The risk ratio is lower again in 1988-93 when unemployment was rising. The differences to the 1984-87 period are relatively small, however. Finally, a similar pattern as for unemployment can be observed for disability pensioners and persons in the "other" category, too. These results can be interpreted as lending some support to the stigmatisation hypothesis. On the other hand, an alternative and equally plausible interpretation is that the estimates reflect changes over time in the selection of the unemployed and disability pensioners.

4. Conclusions

This paper has provided some new evidence on the mental health consequences of unemployment by examining a more severe as well as more well defined outcome variable than is usually used in the literature, namely mental illness leading to a first psychiatric hospitalisation.

We have performed analyses at two levels of the data. The first is an aggregate time series analysis of the determinants of the annual number of first admissions. The second analysis is concerned with the risk factors for first admissions at the individual level. The time series analysis indicates that a higher rate of unemployment is followed by a higher inflow of first admissions into psychiatric hospitals. According to the results of individual level analysis unemployment in either or both of the preceding years leads to a higher probability of an individual being admitted for the first time to a

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[24] The selection argument can also be applied to disability pensions and the group of people who do not qualify for unemployment benefits.

psychiatric hospital. The impact of unemployment on the individuals' admission probabilities does not differ between high- and low-unemployment regions or industries which suggests that the stigmatisation effect is insignificant. There is, however, a difference in the unemployment impact between different phases of the business cycle. While this is consistent with stigmatisation, it could also be due different persons being selected into unemployment in booms than in throughs.

In addition to unemployment, our analysis also caters for a wide range of other socioeconomic factors which we find to be important predictors of first psychiatric hospitalisation. These include previous income from work, wealth and cohabitation status. Higher income and wealth lowers the first admission probability, whereas being single increases the risk. Individuals moving to disability pension or to other social benefits have a significantly higher risk of first hospitalisation.

Although several of our findings are consistent with the bulk of the literature in this field, good comparisons simply do not exist. The only other studies which do not use self-reported mental health indicators are based on small nationally non-representative samples.

Our main finding is that socio-economic conditions including unemployment and labour force status before the first psychiatric admission are strong predictors of the risk for hospitalised mental illness. This is in our mind quite striking in a country like Denmark where socio-economic differences are comparatively small and where there is an extensive social security safety net.

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TABLE A-1.   Estimates from specifications excluding income and wealth variables

	Explanatory variables excluded:		
	Wealth and income	Income	Wealth
Unemployment degree in t-2/t-1:			
0/0 (reference)	1	1	1
0/0.01-0.2	**1.308**	**1.283**	**1.242**
	1.046-1.610	1.042-1.580	1.008-1.529
0/0.21-1.0	**2.119**	**2.018**	**1.840**
	1.732-2.552	1.649-2.469	1.501-2.255
0.01-0.2/0	**1.290**	**1.263**	**1.278**
	1.055-1.576	1.033-1.545	1.045-1.562
0.01-0.2/0.01-0.2	0.808	0.807	0.802
	0.636-1.026	0.635-1.025	0.631-1.020
0.01-0.2/0.21-1.0	**1.689**	**1.649**	**1.515**
	1.371-2.082	1.338-2.033	
0.21-1.0/0	**1.922**	**1.819**	**1.733**
	1.501-2.462	1.420-2.330	1.351-2.222
0.21-1.0/0.01-0.2	1.253	1.223	1.218
	0.992-1.581	0.969-1.544	0.965-1.538
0.21-1.0/0.21-1.0	**1.617**	**1.553**	**1.431**
	1.431-1.827	1.371-1.756	1.263-1.621
Other labour force statuses, t-2/t-1:			
Employed/Employed	1	1	1
Other/Other	**3.422**	**3.094**	**2.223**
	3.025-3.873	2.731-3.505	1.856-2.661
Other/Employed	**2.081**	**1.941**	**1.614**
	1.637-2.645	1.526-2.468	
Other or Student/	**5.460**	**5.047**	**3.585**
Disability pension	3.567-8.520	3.310-7.696	2.316-5.548
Student/Other	**2.349**	**2.223**	**1.598**
	1.646-3.351	1.558-3.172	1.095-2.332
Student/Student	1.011	0.981	**0.674**
	0.803-1.274	0.775-1.236	0.517-0.877
Student/Employed	1.139	1.106	0.865
	0.870-1.491	0.845-1.447	0.656-1.140
Disabil./Disabil.	**2.671**	**2.538**	**1.850**
	2.250-3.170	2.136-3.014	1.527-2.242
Employed or Other/	**1.967**	**1.891**	1.292
Student	1.459-2.652	1.403-2.550	
Employed/Disabil.	**1.863**	**1.829**	1.423
	1.233-2.815	1.209-2.766	
Employed/Other	**3.487**	**3.230**	**2.302**
	2.840-4.281	2.629-3.969	1.810-2.928

Figure 1. (A) All admissions, 1970-93.

All admissions

Figure 1. (B) First admissions, 1970-93.
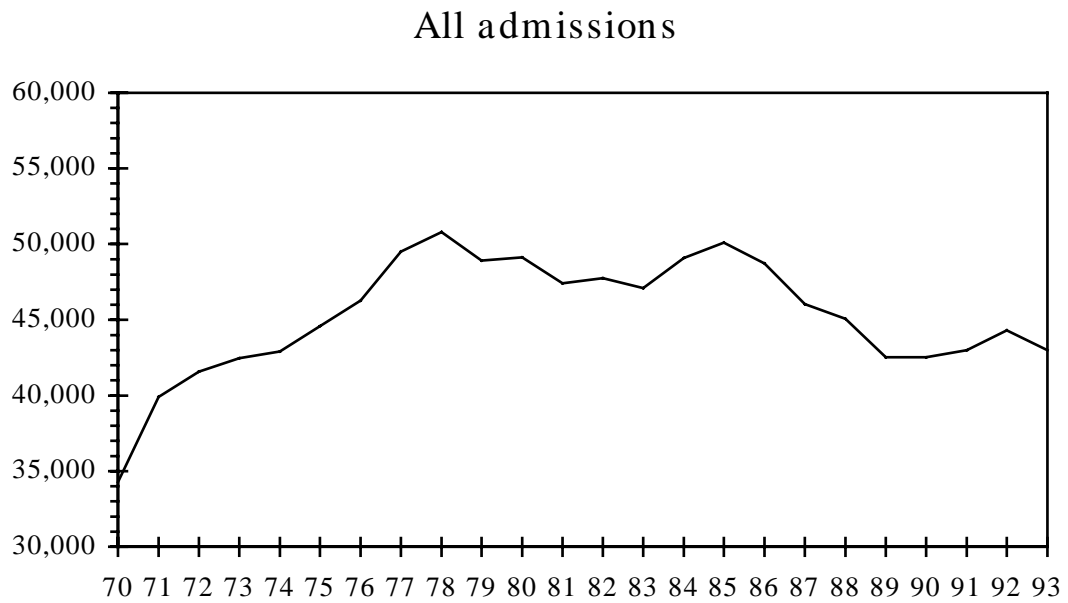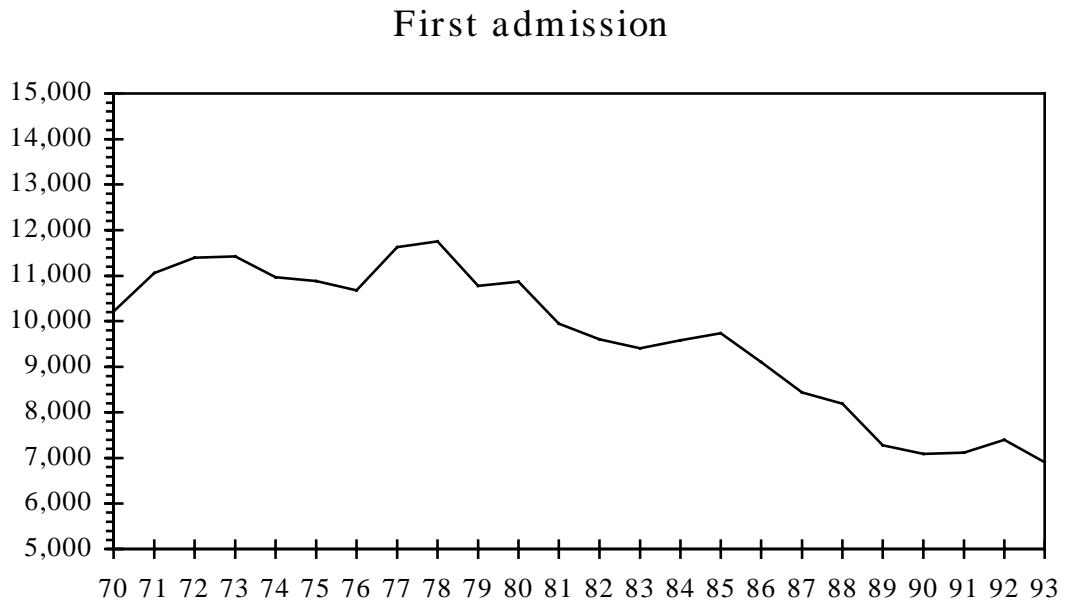
First admission

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