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Cyclicalities of Mobility Rates on Human Capital - Evidence from Danish register data, 1988-1997

By

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1. Introduction

Several studies of employee mobility between work places have been done in recent years.¹ The studies use matched employer-employee data to find worker mobility as well as job mobility. Worker mobility is defined as a move of a person into or out of a job while job mobility is defined as a new established job or a closure of a job without rehiring at the work place. Especially, the job mobility is difficult to measure correctly.²

The main purpose of the studies have been to determine the size of the adjustments in the labour markets, i.e. flows of workers and jobs, to external as well as internal shocks. The micro-based figures are then aggregated to macro figures and related to the conditions and shocks to the economy. These studies have mainly focused on the adjustment of the work force at the work places through empirical research. The outcome has been a stock of stylised facts on worker flows, which in some cases have challenged the present theoretical models. For example, the fact that firms may fire and hire simultaneously can be difficult to model theoretically consistent since both hiring and firing can be voluntary as well as forced.

The present paper gives Danish job mobility rates based on matched employer-employee data for the period 1988-97. The decade is characterised by a negative business cycle starting in 1987 and ending in 1993 and a positive business cycle from 1994 and onwards, c.f. Figure 1. This full business cycle allows a comparison with the mobility rates of employees on the labour market. According to earlier Danish and Norwegian findings, a procyclical pattern is to be expected in the worker flows, cf. Bingley et al (1999) and Ekeland (2000).

The present analysis gives a comprehensive picture of the mobility flows on the Danish labour market over a decade. Bingley et al document that 40 percent of the overall worker flows is associated with a job flow, which means that the work place either create a new job or does not replace the existing job. However, the remaining 60 percent is reallocation of jobs although the exact replacement cannot be identified. A firm can upgrade the work force by firing a low educated and hire a higher educated or it can change the firm by closing a position requiring low skills and open a new requiring higher skills. This is not possible to distinguish in the

¹ See, for instance, the survey by Dale-Olsen and Rønningen (2000) for a comprehensive empirical and methodological comparison of Norwegian results with results from a long list of other studies performed in the 1990s.

² For example, Bingley et al (1999) has access to register data on the entire population for the period 1980 to 1995. However, they cannot identify shifts in work positions or whether a hired employee replace another or take a new position so they define job mobility as a change in the total number of employees at the workplace no matter which internal shifts there has been, i.e. upgrading of the work force.

register data. Hence, the cause for a job shift may be forced or voluntary without differences in the observable register data.

The distribution of mobility rates on branch, age, educational level, size of workplace etc. gives a more fully picture of the Danish case. Section 2 schedules the theoretical arguments for an analyse of cyclicity in mobility rates while Section 3 presents the business cycle for the period of interest together with the overall aggregated mobility rates. In Section 4, mobility rates for various subgroups are presented. The trends in the data are compared with the business cycle in Section 5 while Section 6 concludes.

2. Mobility and cyclicity

Mobility rates of employees are closely linked to knowledge exchange and circulation in the economy. The mobility of individuals is a well-defined and comparable measure although it only measures one dimension of knowledge exchange between firms. Firms can also change or increase their knowledge stock by for example internal or external upgrading of the existing work force. Such a knowledge upgrading can afterwards be spread throughout the firm. Other knowledge links, which the firms may use in the knowledge upgrading, are external experts and consultants, cooperation with other firms, and own R&D departments. However, information on this kind of knowledge exchange and tacit is hard to collect in a comparable measure. The similar is the case for the tacit knowledge obtained through internal knowledge exchange. Hence, mobility of individuals is uniquely measurable, comparable and the best indicator for the overall knowledge exchange.

Theoretically, the firms adjust their work force in response to the multiple shocks they face. The simultaneous hiring and firing process on the micro level averages to the macro level measures of total job creation or job destruction, i.e. the change in the total number of employees. However, the micro level figures may show job creation as well as job destruction at the same time depending on the branch, firm size etc. This heterogeneity on the firm level is in stark contrast to the representative firm theory. The present paper looks at explanatory factors explaining parts of this heterogeneity through measures on flow magnitudes and flow cyclicity.

The business cycle is the most often used indicator for the overall well being of the economy. The magnitude, persistence and distribution of the mobility rate are expected to correlate with the business cycle. Hence, the present paper analyse whether this empirically is the case.

A common stylised fact is that job destruction is countercyclical and that job creation is procyclical, c.f. Boeri (1996), and that the sum of the two is countercyclical. The explanation is that jobs are easy to destroy and hard to create, so the destruction rate is more volatile than the creation rate giving a countercyclical job reallocation. Section 5 gives relevant Danish evidence for and against this stylised fact.

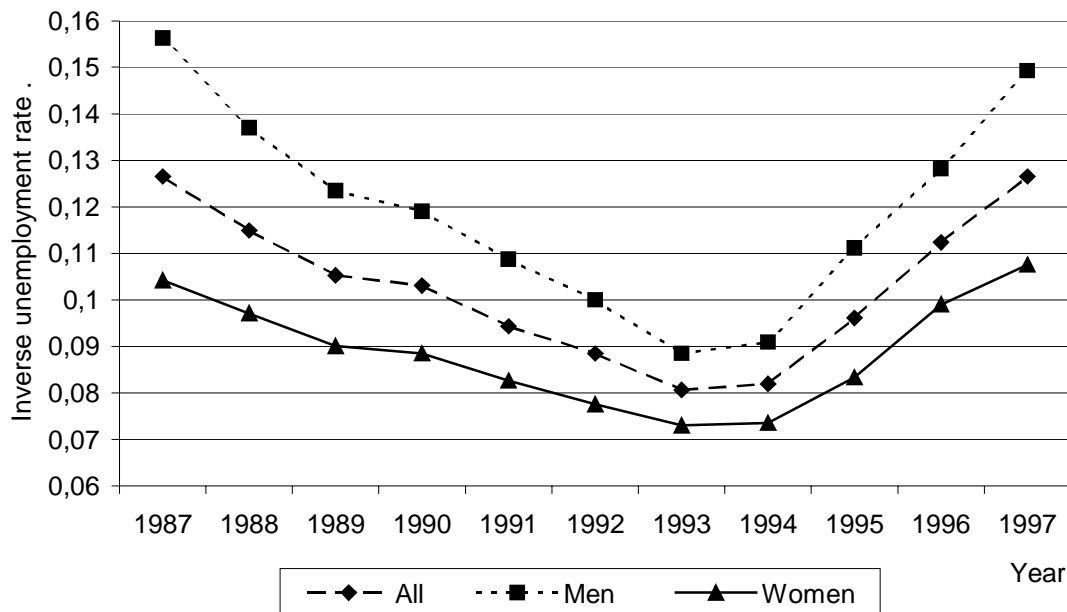
The mobility rates are found from register data in the Integrated Database for Labour Market Research (IDA in Danish). The database is Longitudinal and includes matched employee and employer data in the first week of November each year. Mobility of an employee is measured as a move from one state (an employer or no job) to another state (another employer or no job) between two years.³

3. The business cycle in the period 1988-1997

The business cycle in the period 1988-1997 is measured by the inverse unemployment rate in the labour market. The unemployment rate is found as the number of full-time equivalent unemployed workers over the total work force. Other similar measures may be used as long as the correlation between the indicator and the business cycle is high and stable. For example, Bingley et al (1999) uses the number of employed workers as the indicator of the business cycle. Figure 1 shows the unemployment rate as the registered unemployed in percent of the labour force aged 16-66 years. The inverse unemployment rate is an effective indicator on the national business cycle.

³ For example, the inflow mobility rate is the number of new workers in the establishments from year t-1 to year t divided with the total number of employees in year t. The outflow mobility rate is the number of workers employed in the establishments in year t but not in year t+1 divided with the total number of employees in year t. The rates can be calculated on various subgroups as well.

Figure 1: The inverse unemployment rate by gender. Pct.

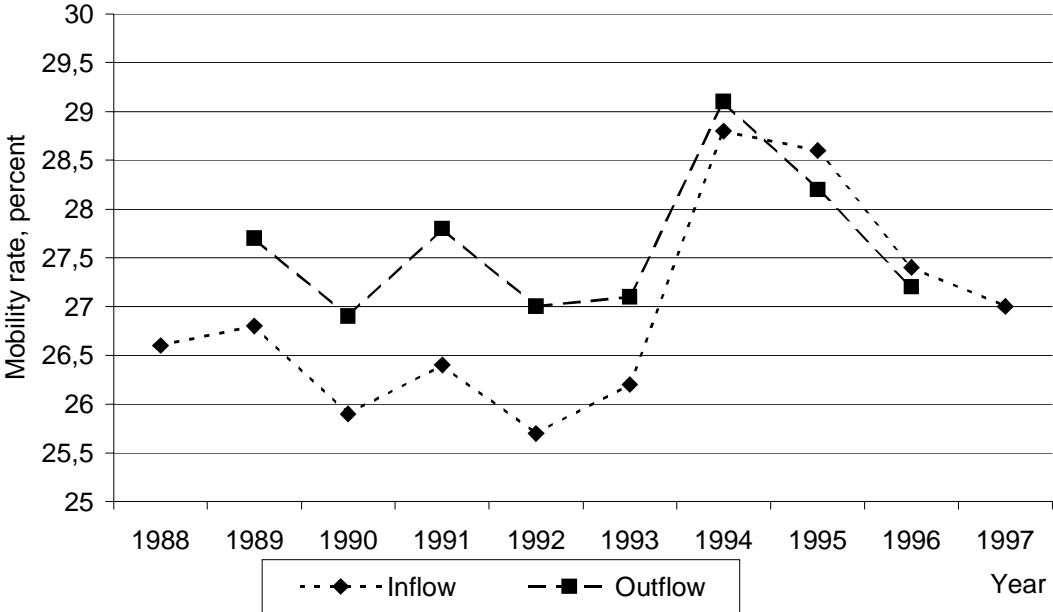


Source: STO (1990, 1998)

Figure 1 indicates the same trend in the male and female unemployment rates. Although the levels differ, the changes are parallel. The overall mobility rates of workers into and out of jobs at the work places are shown in Figure 2 for the period 1988-96. There is a level shift between 1993 and 1994 indicating a cyclical mobility rate where the worker mobility rate changes with the business cycle. However, the Spearman rank correlation coefficient between the numbers in Figure 2 and the inverse unemployment rate in Figure 1 is only 0.21 for the inflow mobility rate and -0.26 for the outflow mobility rate. Although both correlation coefficients are insignificant it indicates that the hiring process is procyclical and that the firing or separation process is countercyclical.

The signs of the correlation coefficients match the findings in Bingley et al (1999) where they use the employment stock to characterise the business cycle. Ekeland (2000) also finds a procyclical inflow mobility pattern for workers who move from job-to-job, i.e. the narrow mobility rate in Figure 3. The insignificant correlation fit with the opposite movements of countercyclical job search and procyclical firm hiring for the inflows (hires) and the procyclical quits and countercyclical lay-offs for the outflows (separations).

Figure 2: The in- and out-flow mobility rates in Denmark in 1988-97. Pct.



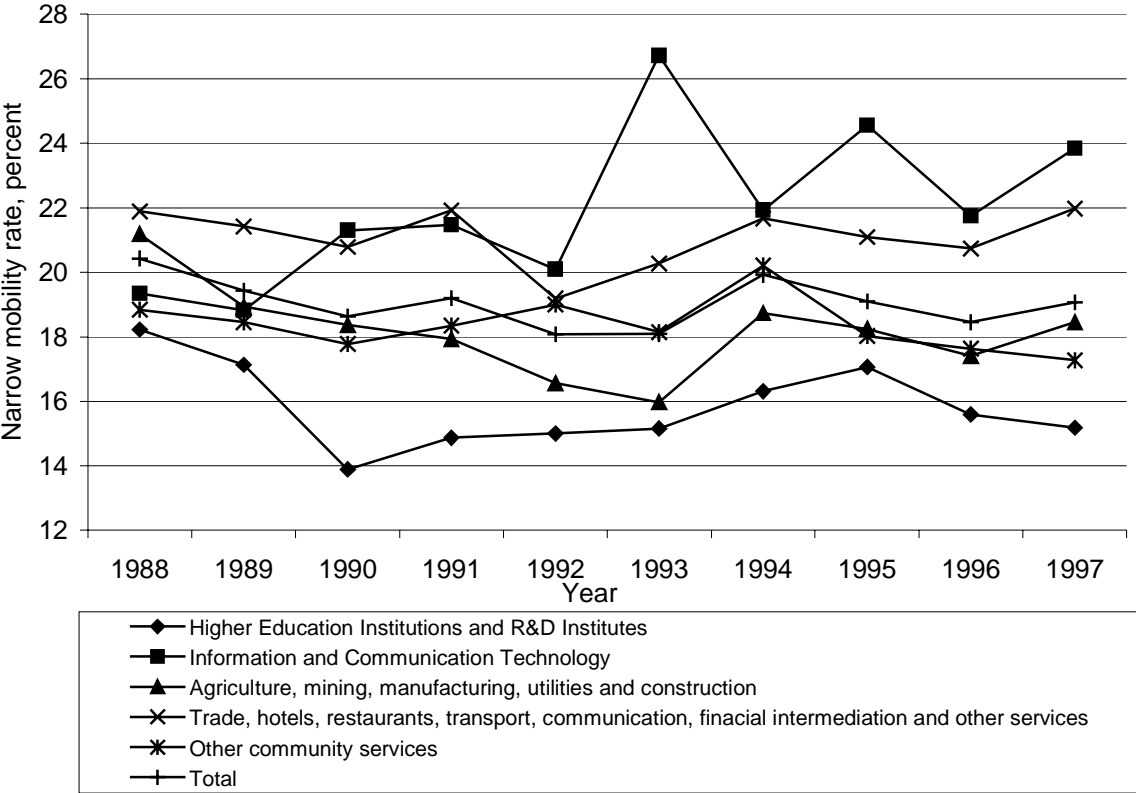
Source: Own data. A data break caused a peak in the outflow mobility rate in 1990 according to our data. It has been corrected using the development for comparable figures in Bingley et al (1999).

4. Mobility rates over the decade

Mobility rates for various subgroups can be drawn similar to Figure 2. The first two, Figure 3 and Figure 4, gives the inflow mobility rates for five aggregated industrial sectors in the economy.⁴ In Figure 3, only workers employed the previous year are included, while all newcomers also are included in Figure 4. Hence, the job-to-job (narrow) mobility rates in Figure 3 are a subsample of the (wide) mobility rates in Figure 4 since the denominator is the same in the two while the nominator is largest in the latter mobility rate. The number of employees in the five sectors differs considerably. The Information and Communication Technology sector, ICT, is smallest while the community service sector is largest. The ICT-sector represents the ‘new’ and expanding knowledge based economy. The manufacturing sector represents the ‘old’ industrial economy, while the two service sectors represents the tertiary sector, service. Lastly, the research sector representing the innovation and R&D is separated out. The overall mobility is given under total.

⁴ The five industrial classifications are suggested in Åkerblom (2000) together with a corresponding 20-sector classification.

Figure 3: The inflow job-to-job mobility rates by sectors, 1988-97. Pct.

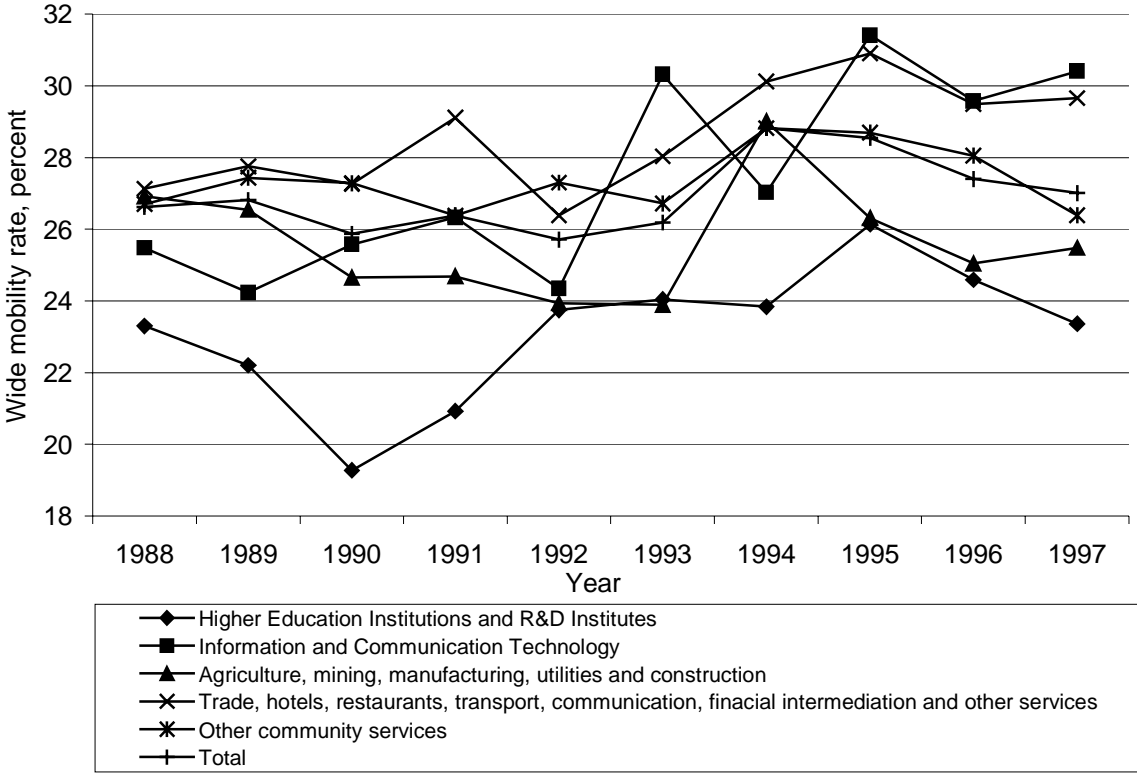


Note: The 'narrow' mobility rate covers inflow mobility of workers employed in year t-1 to a job at a new employer in year t.

Below average mobility rates is mainly found in the research sector and in the manufacturing sector. Hence, these sectors hire less often compared to the remaining economy. It may be caused by longer tenure, fewer open positions or shrinking industries. The product services sector presents mobility rates above average. A striking trend seems to be that the mobility rates for the human services sector is close to the average of the 'narrow' mobility rate in Figure 3 but above average of the 'wide' mobility rate in Figure 4. This indicates a higher than average recruitment share in this sector of workers not previously employed. The opposite seems to be the case for the ICT-sector, which recruit new employees among already employed workers by a rate higher than average in Figure 3 but not seems to deviate from the average in Figure 4. Since experience is important in this sector and since it is a growing industry, the result could partly be expected if inexperienced workers are useless. Spearman rank correlation coefficients with the business cycle for the subgroups are presented in Table 2 in Section 5.

According to Figures 3 and 4, both the wide and the narrow mobility rates tell parts of the full story on where, how and when knowledge circulation is present.

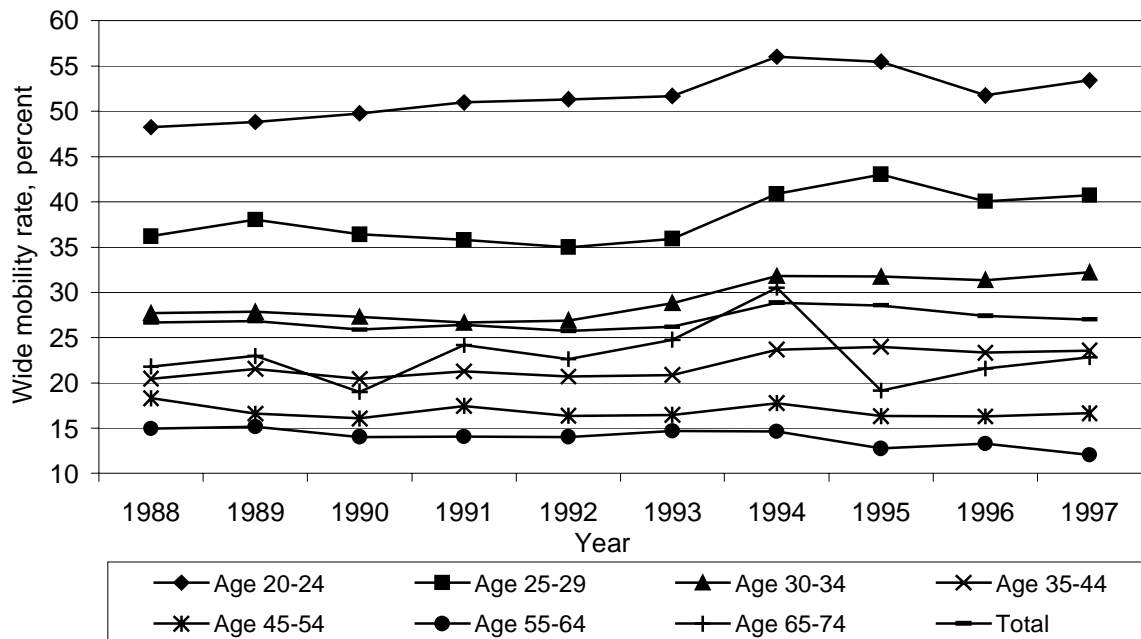
Figure 4: The inflow mobility rates by sectors for the entire labour force, 1988-97. Pct.



Note: The 'wide' mobility rate covers inflow mobility of workers employed or not employed in year t-1 to a job at a new employer in year t.

Another pattern regarding the mobility rates is fairly common agreed on. The mobility rates are expected to decrease by age, since both the employer and the employees search for the perfect match. Over time and/or age this match becomes more and more likely to happen. However, at the same time inflow mobility rates may be higher for experienced workers in negative parts of the business cycles. Figure 5 presents wide mobility rates for selected age groups. A similar (not presented) figure of outflow mobility rates shows the same pattern as found in Figure 5. The only rate, which does not fulfil the expected pattern, is the rates for the age group 65-74. However, shifts in retirement possibilities, pension system and job types among these individuals cause this non-regular pattern. Retirement reduces the stock of individuals in the age group (especially in recessions, i.e. until 1994 in Figure 5) and the jobs they take are often part time short-term jobs.

Figure 5: The inflow mobility rates by age groups for the entire labour force, 1988-97. Pct.



The educational level of the employees is expected to influence the mobility rates although the direction is less clear. On average, the differences may equal out. The less educated employees have lower start up costs but lower incomes. Hence, they may be easy to replace but difficult to attract through wages, i.e. the sum of high and low. The opposite is the case for the high educated. Figure 6 shows the mobility rates over time for four groups defined by educational levels in the ISCED standard.

Figure 6: The inflow mobility rates by educational level for the entire labour force, 1988-97. Pct.

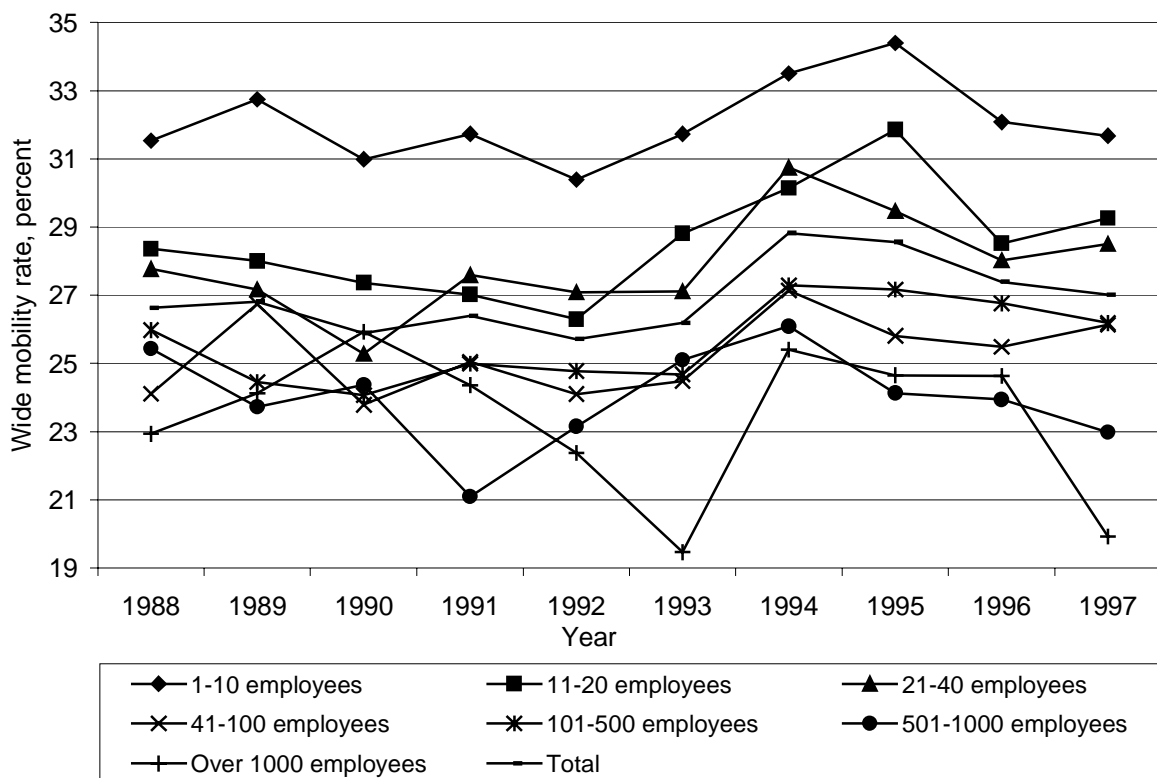
Table 6 shows that

It is also expected that larger work places have a higher internal recruitment and therefore have smaller mobility rates. Figure 7 presents mobility rates by establishment size. The establishment size is calculated as the number of employees in November. There is a tendency although not very clear of an inverse relationship between the inflow mobility rate and the establishment size. Especially the small establishments with less than 40 employees have as higher mobility rate compared to the remaining establishments. This is in line with Bingley et al (1999) who finds a

decreasing pattern up to an establishment size on 40 employees and a stable and smaller mobility rate for the larger establishments.

Using the average number of employees in two consecutive years to measure the establishment size does not change the mobility rates significantly. Although, this way of calculating the establishment size decreases the number of establishments that shifts size groups between two following years, the difference in mobility rates compared to the establishment size definition used in Figure 7 is only minor.

Figure 7: The inflow mobility rates by establishment size for the entire labour force, 1988-97. Pct.



Note: The establishment size is calculated as the number of employees in November.

The findings in Section 4 are summarized in Table 1 below. The Figures 3-7 show varying levels in the mobility rates depending on sectors, mobility definition, age of the workers, and establishment size. The higher education institutions and R&D institutes have the lowest average inflow rates while the ICT sector has the highest. Similarly, the youngest workers have the highest average inflow mobility rate; the oldest workers have the lowest. Small establishment have the highest average inflow mobility rates while establishments with 40 or more employees seem to have smaller and still decreasing rates.

Text on outflow rates summary in Table 1

Table 1: Trends in mobility rate levels by characteristics

Characteristics	Worker inflow (hires)	Worker outflow (separations)
Sector – Narrow mobility	<ul style="list-style-type: none"> Somewhat volatile mobility rates over time Clear level differences between sectors 	<ul style="list-style-type: none">
Sector – Wide mobility	<ul style="list-style-type: none"> More volatile mobility rates over time Level differences between sectors 	<ul style="list-style-type: none">
Age group	<ul style="list-style-type: none"> Relatively stable mobility rates over time for each age group Clear decreasing rate by age 	<ul style="list-style-type: none">
Educational level	<ul style="list-style-type: none"> 	<ul style="list-style-type: none">
Establishment size	<ul style="list-style-type: none"> More volatile mobility rates over time, although partly stable patterns Decreasing mobility rates by establishment size 	<ul style="list-style-type: none">

Note: For the narrow and wide definition, see Figures 3 and 4.

5. Procyclical or countercyclical mobility rates

Whether the mobility rates are procyclical or countercyclical is also interesting from a policy point of view. The possibility to select different policies for different group at different times is highly recommended especially in the new knowledge economies. Several theoretical studies have tried to build a model for the connection between the business cycle and the mobility rates. However, the models can predict procyclicality as well as countercyclicality depending on the chosen model. Hence, an empirical study is needed to determine the dominating direction, which may shift between the various subgroups.

When the joint distribution of two variables differs considerably from a bivariate normal distribution and when no obvious transformation is clear, the nonparametric rank correlation can be used to make inference on the correlation of two indicators. The Spearman rank correlation coefficient is used this section. However, due to the short time period of data, ten years, it is very difficult to find significant rank correlations from empirical data. A ten percent significance requires a correlation on at least 0.56.

Table 2 shows the Spearman rank correlation coefficients between the inverse unemployment percentage and the mobility rates found in the period 1988-97 for Denmark. For comparison, the conclusion from a number of other studies is given in Table 3. The trends found in the other studies in Table 3 support the present findings in Table 2.

The worker outflow seems to be countercyclical no matter which subgroups the mobility rates refer to. Hence, the separations increase in negative parts of the business cycle which means that the firing argument probably dominates the job search argument.

The correlation between the worker inflow and the business cycle seems to be more variable. As in Bingley et al (1999) and Albæk (1998), the inflow worker mobility rates are procyclical for the entire labour market and for the 'manufacturing' sectors. This is similar to our findings no matter whether the narrow or the wide definition is used although our 'manufacturing' sector is somewhat broader defined. Bingley et al finds a procyclicality for the private sector and countercyclicality for the public sector. Given that our 'manufacturing etc.' sector and our 'trade etc.' sector equals the private sector and that our 'other community services' equals the public sector, then the results in Table 2 indicate the same conclusions using the narrow mobility rates. However, using the wide mobility rates gives the opposite result for the public sector and a no relation result for the 'trade etc.' sector in Table 2.

Looking at the two sectors which are most interesting in the 'new' knowledge based economies, the ICT sector seems to be countercyclical and the 'educational and research institutions' sector seems to be procyclical when the narrow mobility definition is used. Hence, the ICT sector hires fewer employees who are already employed in other jobs in positive parts of the business cycle. The 'educational and research institutions' sector seems to hire more employees already employed elsewhere. Looking at the wide mobility rates, the opposite results come out. Hence, the ICT sector hires more in positive parts of the business cycle, meaning that more employees are hired from the 'not employed' status compensating for the countercyclicality in the narrow mobility rate. The 'educational and research institutions' sector hires countercyclical when the wide mobility rate is used. This means that the sector hires especially few who are not previously employed in positive periods of the business cycle.

Table 2: Cyclicity of mobility rates distributed by various characteristics. Spearman rank correlation coefficients in parenthesis

Group characteristics	Worker inflow (hires)	Worker outflow (separations)
5 sectors - Narrow mobility¹⁾		
Higher Education Institutions and R&D Institutes	Procyclical (0.36)	
Information and Communication Technology	Countercyclical (-0.33)	
Agriculture, mining, manufacturing, utilities and construction	Procyclical (0.54)	
Trade, hotels, restaurants, transport, financial intermediation and other services	Procyclical (0.48)	
Other community services	Countercyclical (-0.50)	
Total	Procyclical (0.27)	Countercyclical (-0.26)
5 sectors - Wide mobility¹⁾		
Higher Education Institutions and R&D Institutes	Countercyclical (-0.24)	
Information and Communication Technology	Countercyclical (-0.03)	
Agriculture, mining, manufacturing, utilities and construction	Procyclical (0.37)	
Trade, hotels, restaurants, transport, financial intermediation and other services	Countercyclical (-0.03)	
Other community services	Countercyclical (-0.26)	
Total	Procyclical (0.21)	Countercyclical (-0.26)
Age groups - Wide mobility¹⁾		
Age 20-24	Countercyclical (-0.28)	Countercyclical (-0.79)
Age 25-29	Procyclical (0.28)	Countercyclical (-0.42)
Age 30-34	Procyclical (0.20)	Countercyclical (-0.54)
Age 35-44	Procyclical (0.01)	Countercyclical (-0.32)
Age 45-54	Procyclical (0.04)	Countercyclical (-0.07)
Age 55-64	Countercyclical (-0.27)	Noncyclical (0.00)
Age 65-74	Countercyclical (-0.50)	Countercyclical (-0.25)
Total	Procyclical (0.21)	Countercyclical (-0.26)
Educational level – Wide mobility¹⁾		
ISCED 1-2		
ISCED 3-4		
ISCED 5		
ISCED 6-7		
Total	Procyclical (0.21)	Countercyclical (-0.26)
Establishment size - Wide mobility¹⁾		
1-10 employees	Countercyclical (-0.14)	Countercyclical (-0.07)
11-20 employees	Procyclical (0.03)	Countercyclical (-0.82)
21-40 employees	Procyclical (0.19)	Countercyclical (-0.25)
41-100 employees	Procyclical (0.08)	Countercyclical (-0.18)
101-500 employees	Procyclical (0.07)	Countercyclical (-0.21)
501-1000 employees	Countercyclical (-0.24)	Countercyclical (-0.13)
Over 1000 employees	Countercyclical (-0.04)	Countercyclical (-0.04)
Total	Procyclical (0.21)	Countercyclical (-0.26)

Note: The Spearman rank correlation coefficient is calculated as the correlation between the mobility rate and the inverse of the unemployment rate. ¹⁾For the narrow and wide definition, see Figures 3 and 4.

There seems to be a certain degree of countercyclicality in the inflow worker mobility for the youngest and for the workers aged above 55. This supports a more selective hiring strategy in

negative business cycle periods. It also support that these workers leave the labour force in down periods so the stock of workers in these age groups and not the mobility rate is countercyclical.

Establishment size measured by employees does not seem to explain whether the inflow worker mobility is pro- or countercyclical although there seems to be countercyclicity in the mobility rates for small and for large establishments. Small establishments hire and fire more in downturn than in upturn. Large establishments seem to do similarly.

The findings in the studies by Albæk (1998) and Bingley et al (1999) are referred in Table 3. The findings corresponds relatively well with the findings of the present study in Table 2.

Table 3: Earlier finding on cyclicity of mobility rates in Denmark

Study	Worker inflow (hires)	Worker outflow (separations)	Worker reallocation
Albæk (1998) Manufacturing sector	Procyclical	Countercyclical	Procyclical
Bingley et al (1999) All employees	Procyclical	Countercyclical	Countercyclical
Private sector	Procyclical	Countercyclical	Countercyclical
Manufacturing sector	Procyclical	Countercyclical	Countercyclical
Public sector	Countercyclical	Countercyclical	Countercyclical

Note: Worker reallocation is the net flow from establishments and tells whether the hiring or separation process dominate over time.

6. Conclusion

The present paper gives trends and illustrates differences in mobility rates for the period 1988-97 for the Danish labour market. Mobility rates are given for various subgroups of the work force. The inflow mobility rate seems to be lower than the outflow mobility rates in the negative part of the business cycle and opposite in the positive part. This corresponds to decreasing and increasing employment in negative and positive parts of the business cycle, i.e. changes in the unemployment rates. However, calculating correlation coefficients shows that the inflow mobility rate is procyclical and the outflow mobility rate is countercyclical. The countercyclicity of the outflow mobility rate seems to be persistent over various subgroups while the procyclicity of inflow mobility rate changes to countercyclicity for some of the subgroups, c.f. Table 2.

The inflow mobility rate for 5 selected sectors spanning the entire labour market shows a higher mobility rate for the ICT and 'trade etc.' sectors compared to the other sectors. The lowest mobility rates are found for the higher education institutions and R&D institutes.

As expectable the inflow mobility rates decreases by age from close to 50 percent for the youngest to less than 20 percent for the oldest on the labour market. A closer look on the inflow mobility rates by establishment size measured by employees shows a decreasing rate by size up to 40-100 employees. Hereafter, the trend shows unclear but lowering rates.

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