DANMARKS
NATIONALBANK

WORKING PAPERS

January 2016 | No. 104

GEOGRAPHICAL JOB MOBILITY AND WAGE FLEXIBILITY IN DENMARK

Mark Strøm Kristoffersen

Danmarks Nationalbank

DANMARKS
NATIONALBANK

The Working Papers of Danmarks Nationalbank describe research and development, often still ongoing, as a contribution to the professional debate.

The viewpoints and conclusions stated are the responsibility of the individual contributors, and do not necessarily reflect the views of Danmarks Nationalbank.

As a general rule, Working Papers are not translated, but are available in the original language used by the contributor.

Danmarks Nationalbank's Working Papers are published in PDF format at www.nationalbanken.dk. A free electronic subscription is also available at this Web site.

The subscriber receives an e-mail notification whenever a new Working Paper is published.

Please direct any enquiries to
Danmarks Nationalbank,
Communications,
Havnegade 5,
DK-1093 Copenhagen K
Denmark
E-mail: kommunikation@nationalbanken.dk

Nationalbankens Working Papers beskriver forsknings- og udviklingsarbejde, ofte af foreløbig karakter, med henblik på at bidrage til en faglig debat.

Synspunkter og konklusioner står for forfatternes regning og er derfor ikke nødvendigvis udtryk for Nationalbankens holdninger.

Working Papers vil som regel ikke blive oversat, men vil kun foreligge på det sprog, forfatterne har brugt.

Danmarks Nationalbanks Working Papers er tilgængelige på www.nationalbanken.dk i pdf-format. På hjemmesiden er det muligt at oprette et gratis elektronisk abonnement, der leverer en e-mail notifikation ved enhver udgivelse af et Working Paper.

Henvendelser kan rettes til:
Danmarks Nationalbank,
Kommunikation,
Havnegade 5,
1093 København K.
E-mail: kommunikation@nationalbanken.dk

ISSN (online) 1602-1193

DANMARKS
NATIONALBANK
WORKING PAPERS

GEOGRAPHICAL JOB MOBILITY AND WAGE FLEXIBILITY AND IN DENMARK

Contact for this working paper:

Mark Strøm Kristoffersen
Danmarks Nationalbank
msk@nationalbanken.dk

RESUME

Geografisk jobmobilitet og lønfleksibilitet i Danmark
Fleksibilitet på arbejdsmarkedet er afgørende for den makroøkonomiske stabilitet. I en international sammenhæng fremhæves det danske arbejdsmarked ofte for dets fleksibilitet, hvilket bekræftes i dette studie ved hjælp af mikrodata fra perioden siden 1980. Ledighedsforsikrede lønmodtagere er ifølge analysen mindre geografisk jobmobile end lønmodtagere, der ikke er forsikret imod ledighed. Forskellen er særligt udtalt for yngre lønmodtagere. Men de seneste 25 års arbejdsmarkedsreformer virker til at have forbedret den geografiske jobmobilitet, især blandt ledighedsforsikrede lønmodtagere, der rammes af ledighed. Vurderet på baggrund af data siden 1998 findes endvidere, at det danske arbejdsmarked er kendetegnet ved relativt små nedadrettede lønstivheder sammenlignet med andre lande. Lønfleksibiliteten er især høj i eksportorienterede erhverv. Reallønninger udviser større nedadrettede stivheder i begyndelsen af konjunkturnedgange, men disse stivheder mindskes i løbet af konjunkturnedgangen. I analyserne benyttes danske registerdata, som gør det muligt at koble lønmodtagere med deres arbejdsgivere.

ABSTRACT

Geographical job mobility and wage flexibility in Denmark
Flexibility in the labour market is important for macroeconomic stability. The Danish labour market has been highlighted as being flexible, which this study confirms using micro data from 1980 to the present. Unemployment insured workers are found to be less geographical job mobile than workers not insured against unemployment, especially for young workers. However, the substantial labour-market measures taken in the last 25 years seem to have improved geographical job mobility, especially among workers with unemployment insurance who experience unemployment during the year. Based on data since 1998, it is found that the incidence of downward wage rigidity is low in Denmark when compared to other countries. Wage flexibility is particularly high in export-oriented industries. Real wages are found to be downward rigid in the beginning of an economic downturn, but this rigidity declines during the downturn. The analyses employ matched employer-employee data from Denmark.

KEY WORDS

Geographical job mobility; Wage flexibility; Unemployment insurance.

JEL CLASSIFICATION

J30; J61; J65.

ACKNOWLEDGEMENTS

The author wishes to thank Kim Abildgren, Andreas Kuchler, Jesper Pedersen and seminar participants in an Economic Policy Research Unit (EPRU) policy seminar, at the Danish Economic Councils (DØRS) and at Danmarks Nationalbank for valuable comments and suggestions on preliminary versions of this paper. The author alone is responsible for any remaining errors.

1. INTRODUCTION AND SUMMARY OF MAIN RESEARCH FINDINGS

Labour-market flexibility is important for how the economy adjusts to economic shocks, and hence, for macroeconomic stability. For example, it has been argued that labour-market flexibility was both necessary and appropriate in order to allow production factors to be redistributed between industries following the recent crisis, cf. Isaksen et al. (2012). Furthermore, a flexible labour market has been found to reduce unemployment, both cyclical and structural, cf. e.g. Bernal-Verdugo et al. (2012).

The Danish labour market has been highlighted for combining a flexible labour market with generous social security and active labour-market policies; a combination which has been coined *flexicurity* (OECD, 2004; Andersen and Svarer, 2008; Pedersen and Riishøj, 2007; Nellemann and Pedersen, 2012). Job mobility as well as occupational mobility is relatively high, cf. the Confederation of Danish Employers (2013). Also, it characterises the Danish labour-market model that job turnover remains high even in a recession, cf. Nellemann and Pedersen (2012). This should presumably be viewed in light of the comprehensive reforms of the labour market that have been launched since the mid-1990s, cf. the list in Appendix C.

In this paper, we analyse two important aspects of labour-market flexibility, which have not received much attention, neither in the economics literature nor in the Danish policy debate, i.e. geographical job mobility and wage flexibility.

Geographical job mobility is an important aspect of labour-market flexibility. Despite the characterisation of the Danish labour market as being flexible in many aspects, previous studies have found that geographical mobility is relatively modest in an international comparison. Geographical job mobility is central for avoiding regional employment inertia and excess wage pressure in some geographical areas. Furthermore, willingness to be geographically mobile may shorten individual unemployment spells considerably. It should presumably be viewed in this light that attaining higher geographical mobility is considered as one of the ways to achieve the objective of full employment in Europe, cf. European Commission (2001).

In this paper, we consider geographical job mobility defined as the share of workers who switch job to another geographical area within the country. Using matched employer-employee data we analyse the extent of geographical job mobility in Denmark, and what characterises individuals with a high degree of geographical job mobility. We add to the literature by studying whether workers with unemployment insurance are less geographical job mobile than workers without unemployment insurance, as suggested by e.g. the standard theory of job search. This analysis is possible in a Danish context because membership of an unemployment insurance fund is voluntary, and therefore not all workers are covered by unemployment insurance.

We find that personal characteristics such as age and marital status are important determinants for geographical job mobility. Unemployment insured workers are found to exhibit a significantly lower degree of geographical job mobility than workers not insured against unemployment, especially among young workers. This holds across geographical regions; in a subsample with only workers not experiencing unemployment during the year; as well as in subsamples with only workers who experience some extent of unemployment during the year. However, the substantial labour-market measures taken in the last 25 years seem to have improved geographical job

mobility, especially among workers with unemployment insurance who experience unemployment during the year. The largest improvement in geographical job mobility has happened in the period after 2004.

Wage flexibility is another important part of labour-market flexibility. Wage formation is key to the development in prices and costs, cf. Storgaard (2009). In many firms, labour is an important production factor, and therefore the development in firms' costs is highly dependent on the wage development. By affecting costs, wages become an important element in the price setting. In an open economy such as the Danish one, wages also play a key role in relation to competitiveness. Higher wage increases than abroad deteriorates competitiveness, unless the excess wage increase is based on a more advantageous development in productivity. Through the impact on competitiveness, wage flexibility is potentially important in relation to reducing cyclical fluctuations in economies with substantial foreign trade. It is, however, worth emphasising that enhanced wage flexibility does not necessarily cause faster adjustment following economic shocks and increased macroeconomic stability. Fast and stable adjustment to transitory shocks depends, among other things, on how quickly export prices adjust to the change in wages, cf. Hansen (1998a).

Broadly speaking, wage flexibility can be measured using two main approaches: a Phillips-curve approach using macroeconomic data and a distributional approach using micro-level data (either at the industry level or at the worker level). While in this study we will follow the latter approach, examples of the former approach are Blanchard and Katz (1999), Arpaia and Pichelmann (2007) and Rusinova et al. (2015) in an international context, and Hansen (1998b), Storgaard (2009, 2011) and Hansen et al. (2013) in a Danish context. According to Arpaia and Pichelmann (2007) there are significant differences between the wage formation processes across euro area countries. Rusinova et al. (2015) find that the degree of real wage flexibility tends to be larger in the central and eastern European countries than in the euro area. Furthermore, the flexibility is weaker in downturns than during upswings.

In recent years, a number of studies have used micro-level data to measure the degree of wage flexibility, especially the extent of downward wage rigidity. Using industry-level data for 19 OECD countries over the period 1973-1999, Holden and Wulfsberg (2008) study the extent of downward *nominal* wage rigidity (DNWR). They find that nominal wage cuts are less prevalent in countries with high union density and strict employment protection legislation. Holden and Wulfsberg (2009) also use industry-level data for 19 OECD countries over the period 1973-1999 to study the extent of downward *real* wage rigidity (DRWR). In this study, they find that real wage cuts are less prevalent in countries with high union density and strict employment protection legislation. Furthermore, they find stronger evidence for DNWR than for DRWR.

Evidence from worker-level data was provided across 16 different countries in the International Wage Flexibility Project (IWFP), see Dickens et al. (2006, 2007). The IWFP focused particularly on downward wage rigidity, both nominal and real. Based on various samples from the early 1970s to the beginning of the 2000s, they conclude that wage changes are not normally distributed; instead the upper tail of the distribution looks more like a Weibull distribution. Furthermore, the wage change distributions show two key asymmetries: one is a spike at zero implying a nominal wage freeze (unchanged wage), while the other is a clustering of wage changes around a level consistent with a real wage freeze. While the first observation can be viewed as evidence for nominal wage rigidity, the second observation is likely due to real wage rigidity.

There are substantial differences across countries. Across all years considered, the average fraction of workers covered by downward nominal wage rigidity was estimated to 28 percent across all countries, i.e. 28 percent of the nominal wage cuts that would have happened under a flexible wage setting were prevented by downward nominal rigidity. It ranges from 4 percent in Ireland to 58 percent in Portugal. The fraction potentially affected by downward real wage rigidity was estimated to 26 percent on average, i.e. 26 percent of the real wage cuts that would have happened under a flexible wage setting were prevented by downward real rigidity. It ranges from 1 percent in the Netherlands to 68 percent in Sweden. Finally, it was found that countries with larger union density have a significantly larger incidence of downward real wage rigidity.

The IWFP methodology has been used by e.g. Du Caju et al. (2007). Using Belgian data from the period 1990-2002 they find strong evidence of downward real wage rigidity but almost no evidence of nominal wage rigidity. These results are probably explained by the institutional settings in Belgium for this period where base wages were subject to full automatic price indexation. With the use of information on worker and firm characteristics they conclude that DRWR is more prevalent among white-collar workers than among blue-collar workers, and less prevalent in firms facing adverse economic conditions, e.g. negative profits or negative employment growth.

Messina et al. (2010) consider sectoral differences in the incidence of DNWR and DRWR using the IWFP methodology on worker-level data for 13 sectors in four different countries, Belgium, Denmark, Spain and Portugal, in the period 1990-2007 (for Denmark 1997-2005). For Denmark they find that 29 per cent of workers are potentially subject to DRWR, while 22 per cent are potentially subject to DNWR. They find that institutional differences across countries are much more important for the prevalence of downward rigidity than differences across sectors. Country effects explain 46 per cent of the variability in DNWR and 36 per cent of the variability in DRWR, whereas sectoral effects only explain 5 per cent and 0.3 per cent, respectively. There are, however, still significant differences in the prevalence of downward wage rigidities within countries. Real wages are found to be less downward rigid in industries with a high degree of firm-level wage bargaining. Nominal wages are found to be less downward rigid in industries with a high degree of product market competition, a finding consistent with rent-sharing models. Finally, flexibility in base wages is found be a complement to the use of flexible wage components, i.e. industries in which bonuses etc. constitute a large share of the pay check tend to have a lower incidence of downward rigid base wages.

Downward wage rigidity is only one aspect of wage flexibility, but we consider it to be a crucial dimension. Downward wage rigidity is a potentially important barrier to wage flexibility. Nominal wage cuts are often prevented by both economic reasons and legal constraints. In a fixed-exchange-rate regime like the Danish one, it is important that wages and prices can adjust to the current economic situation, cf. Mundell (1961). Also, the existence of downward rigidity in nominal wages reduces the possibility of real wages to adjust when inflation is low, cf. Tobin (1972). Other studies have highlighted that real wage rigidity is of equal importance, see e.g. Hall (2005) and Blanchard and Galí (2007).

In this paper, we use matched employer-employee micro data to analyse the wage flexibility in the Danish labour market. Specifically, we examine the prevalence of downward wage rigidity, i.e. to what extent are wages (both nominal and real) prevented from adjusting downwards. We add to the literature by studying to what extent

individual wages have adjusted downward during the most recent economic downturn, and whether there are differences across industries.

In line with previous evidence we find that the incidence of downward wage rigidity is low in Denmark when compared to other countries, both in nominal and real terms. However, there are large differences across industries. Downward wage rigidity is low within the export-oriented manufacturing industry and within construction, while it is higher within e.g. transportation and finance. We also find that downward real wage rigidity follows a cyclical pattern. Real wages are found to be downward rigid in the beginning of an economic downturn, but this rigidity declines during the downturn.

The remainder of this paper is organised as follows: Section 2 describes the data and methodology. Section 3 contains the results, while concluding remarks are offered in Section 4.

2. DATA AND METHODOLOGY

2.1 DATA

The data sets used in the analyses below is constructed by merging various Statistics Denmark micro-data registers, enabling us to match employers and employees. In general, the population consists of all employees in Denmark aged 15-66.

The sample used for analysing geographical job mobility is mainly derived from the Integrated Database for Labour Market Research (IDA), which tracks the employment record in November, cf. Statistics Denmark (1991). We restrict attention to workers employed at a workplace for which the municipality is reported in two consecutive years. Furthermore, we exclude self-employed as well as workers whose workplace changes address compared to the previous year. These data cover 1980 to 2012, i.e. we observe workplace changes in the period 1981 to 2012.

We measure geographical job mobility as the propensity to change to a workplace in a different municipality during the year. As part of the so-called Structural Reform (*Strukturreformen*) in 2007, the number of municipalities was lowered to 98 (from 270 in 2006; 271 in 2003-2005; 275 before 2003), implying a break in the degree of geographical job mobility when using the actual municipality. For consistency throughout the time period, we will therefore base our measure of geographical job mobility on the after-reform municipalities, which we track back in time.[1]

The geographical job mobility analysis also includes a number of observable background variables, all of which must be expected to affect the propensity to change to a workplace in a different municipality (our measure of geographical job mobility, to be explained below). The background variables include personal characteristics, i.e. gender, age, age squared, job experience, job experience squared, annual unemployment rate (proportion of the year spent unemployed), immigrant background (from 1986 onwards), children living at home, and marital status. We also control for educational background (completion only of primary and lower secondary education, upper secondary education, vocational education, short-cycle, medium-cycle or long-cycle education) and job function (top management, work at a high level of competency, work at a medium level of competency, office work, sales and service work, work in agriculture and horticulture, process and machine operator work, other work; there is a break in the job function variable in 1996). Finally, we control for firm characteristics, i.e. firm size measured by the number of employees in the firm. In total, we have 58,679,755 observations in our final geographical job mobility sample.

For the wage flexibility analysis, hourly earnings data is derived from the Services Register of the Earnings Statistics, see e.g. Statistics Denmark (2015). This register contains information on employees employed by firms with 10 or more full-time equivalent employees, who have been employed for at least one month and have average weekly working hours exceeding eight hours. The register does not include employees in agriculture and fisheries. Another requirement is that employees are employed under "normal conditions", entailing e.g. that employees who are paid exceptionally low earnings rates due to disability, etc., and employees who are not taxed under ordinary

[1] It should be noted that it is not possible with the available information to match the old and new municipalities one-to-one since some of the old municipalities were split up. This is, however, very unlikely to affect the results presented below since it only affects a minor share of the population.

tax conditions in Denmark are not included. The register includes all employment relationships for each individual during the year, but the analysis below focuses exclusively on the employment relationship with the most hours worked during the year. Industries are grouped into 19 sub-groups, of which estimates of downward wage rigidity has been obtained for 10 industries, cf. Section 3.

The sample used for estimating downward wage flexibility only includes workers employed in the private sector. Since we focus on job stayers we only include workers with the same employer for two consecutive years. In principle it would be preferable to focus only on those who remain in the same job function with the same employer, but due to the quality of this data we refrain from doing so. The data covers 1997 to 2010, i.e. we observe wage change distributions in the period 1998 to 2010. The wage measure used is remuneration per hour worked, which is most naturally thought of as the base wage.[2] The IWFP methodology, to be explained below, is employed for each industry separately, since the expected rate of inflation which is relevant to the firm's product mix is likely to differ across industries. Therefore, estimates for each industry separately are presumably better when measuring the degree of downward real wage rigidity. In total, we have 6,449,162 observations in the wage flexibility sample.

2.2 METHODOLOGY FOR ESTIMATING DOWNWARD WAGE RIGIDITY

We use the methodology developed in the International Wage Flexibility Project (IWFP) for estimating downward nominal and real wage rigidity. The IWFP methodology is described in detail in Dickens and Goette (2005). In short, the IWFP methodology is a two-stage method-of-moments procedure.

In the first stage, the method corrects the observed distribution of individual wage changes for so-called measurement errors (or data errors). It does so by assuming that an observed wage cut that is compensated the following year with a wage increase of similar size constitutes a measurement error. Using US data, Gottschalk (2005) argues that accounting for measurement error is crucial when estimating the degree of downward nominal wage flexibility. Many observed wage cuts are not true wage cuts, but merely due to measurement errors. This correction is presumably more important when using survey data than when using high-quality register data like in this paper, cf. Dickens et al. (2007).[3]

In the second stage, a so-called notional wage change distribution is estimated by what Dickens and Goette (2005) refer to as the Mixed Method of Moments. The notional wage change distribution is the distribution that would prevail under full flexibility. In this stage, the method jointly estimates the notional distribution and two other parameters: the fraction of workers potentially subject to downward nominal and downward real wage rigidity. Notional wage changes are assumed to follow a two-

[2] In the period considered, the Services Register of the Earnings Statistics uses the following decomposition of earnings: *Total earnings = Remuneration + Nuisance bonus + Sickness absence pay, etc. + Holiday pay, etc. + Pension contributions + Fringe benefits + Other*, where all components are calculated per hour worked. *Fringe benefits* cover only fringe benefits subject to income tax (class A tax), such as free car and free board and lodging, whereas there is no available information on fringe benefits subject to tax on income not collected at source (class B tax), share-based incentive schemes, etc. *Other* covers, inter alia, the 'Free Choice Scheme' (from 2008 onwards).

[3] Another potential concern is that we record too many zero wage changes due to reporting biases. However, this concern is likely to be small in our case since we apply high-quality register data, which draw on the reporting from Danish firms with more than 10 employees, cf. above, which are all likely to use automated wage reporting systems when reporting the earnings of their employees to the tax authorities.

sided Weibull distribution. This has proved to provide a good fit for the upper tail of the distribution. This procedure is carried out in each year for each of the industries.

A fraction of the population is potentially subject to downward real wage rigidity. If their notional wage change is below their (or their firm's) reference point (e.g. expected rate of inflation), they will receive a wage change equal to that reference point rather than equal to their notional wage change.

A fraction of the population is potentially subject to downward nominal wage rigidity. Such workers who have a notional wage change of less than zero, and who are not subject to downward real wage rigidity, receive a wage freeze instead of a wage cut.[4]

The wage rigidity measures vary between 0 and 1. A value of 0 indicates perfect flexibility (no one is subject to rigidity), and 1 indicates perfect rigidity (all workers are potentially subject to rigidity).

The method employs a bin size of 1 percentage point, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent. One disadvantage of the IWFP methodology is that it may fail to correctly identify downward nominal wage rigidity and downward real wage rigidity when inflation is very low, but it can be argued that a distinction between the two is less relevant in this case. On the other hand, two advantages of the methodology are that it simultaneously estimates downward nominal wage rigidity and downward real wage rigidity, and that it estimates (rather than assumes) the reference point for real wage rigidity.

[4] In principle, a nominal wage freeze could also be the result of symmetrical menu cost type nominal wage rigidity, i.e. workers who have a notional wage change close to zero (positive or negative). The IWFP methodology controls for this possibility to avoid overestimating the role of downward nominal wage rigidity, cf. Dickens and Goette (2005) and Dickens et al. (2006).

3. RESULTS

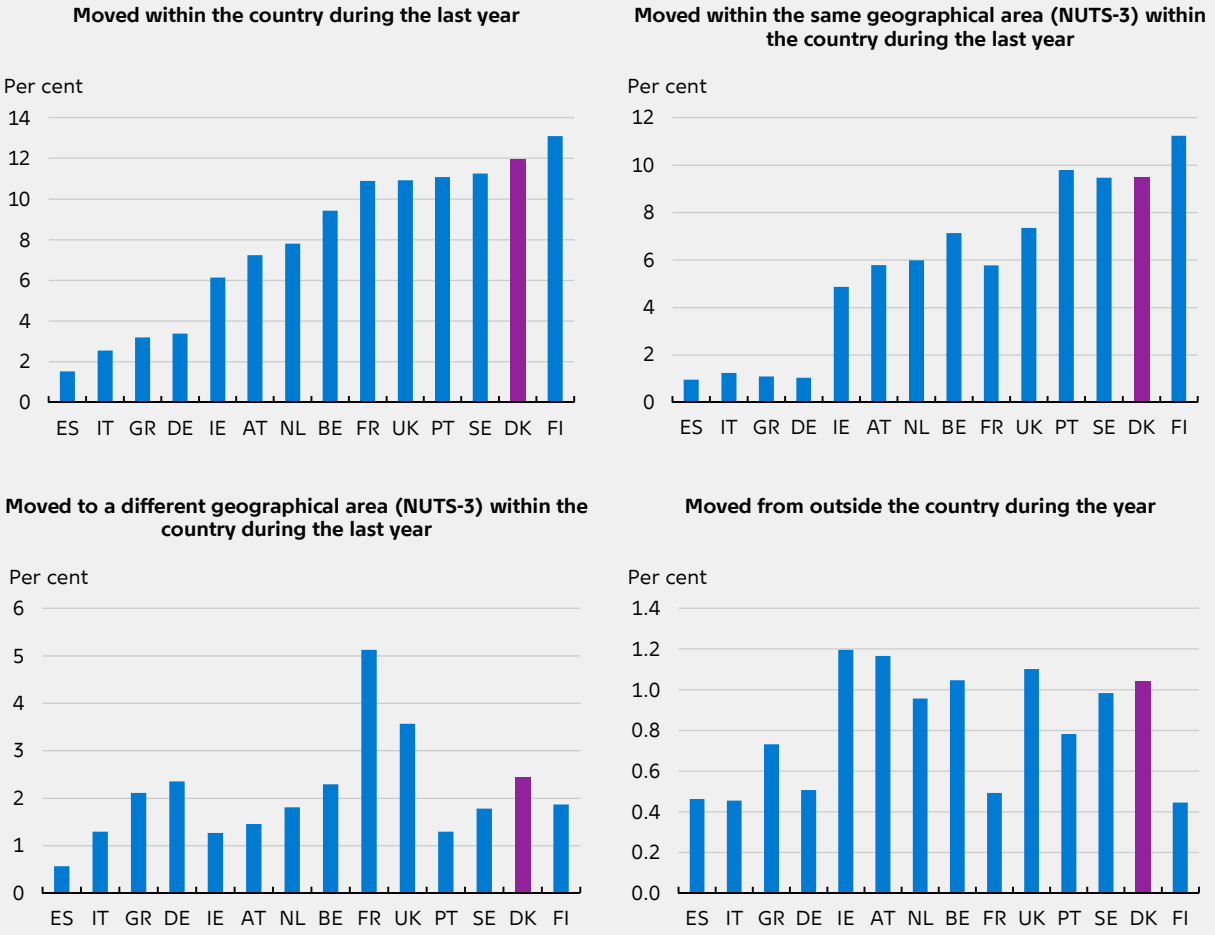
3.1 GEOGRAPHICAL JOB MOBILITY

Even though the Danish labour market is usually characterised as flexible in many aspects, geographical mobility is relatively modest in an international comparison. The Economic Council (2002) finds that despite the high job turnover rates in Denmark, the extent of geographical mobility is rather limited. Danish residential mobility is found to be on the same level as in other continental European countries, but lower than for instance in Sweden. Looking instead at the commuting distance, i.e. distance between residence and work, the Confederation of Danish Employers (2013) reaches a similar conclusion: Geographical mobility in Denmark is only moderate.

Compared to other EU-15 countries, a relatively large share of the Danish population moved from 2010 to 2011, cf. Chart 3.1. This was, however, mostly due to people moving within the same geographical area. The share of the Danish population who moved to another geographical area within the country was only moderate compared to other EU-15 countries. Finally, the share of the population who moved from abroad is relatively low across EU-15 countries.

Residential mobility in the EU-15, 2011

Chart 3.1



Note: The Nomenclature of Territorial Units for Statistics, (NUTS, for the French *nomenclature d'unités territoriales statistiques*), is a geocode standard developed by the European Union. As an example, there are 11 NUTS-3 regions in Denmark, corresponding to the so-called *landsdele*. Luxembourg is not included in the chart since it constitutes one NUTS-3 region. Eurostat notes that the data for France has low reliability.

Source: Eurostat.

However, geographical mobility rates are low in the European Union in general, within as well as between countries, when compared to e.g. Australia and the USA, cf. European Commission (2008a) and OECD (2007). In the European Union, the tendency for workers and people in general to move to another EU country or to another region of the same country is much lower than in the USA, cf. European Commission (2008b).

The low mobility of workers across European countries can to some extent be attributed to cultural and linguistic differences, but these differences cannot explain the low regional mobility rates within countries. Potential explanations include institutional characteristics and personal characteristics such as labour-market status and home-ownership.[5]

The early part of the literature focused on the relation between labour-market status and geographical mobility. Several studies have showed that unemployed workers are

[5] Employment protection legislation has been suggested as another explanation, cf. Bertola (1999). Another explanation could be centralised wage agreements since these tend to reduce regional wage differentials, which are necessary in order to compensate migrants for their costs of moving.

more likely to move relative to employed workers, cf. e.g. DaVanzo (1978) for the USA, Pissarides and Wadsworth (1989) for the UK, and Antolin and Bover (1997) for Spain.

Munch et al. (2006) find that homeownership hampers the propensity to move for job reasons, but improves the chances of finding local jobs. Overall, they find a negative correlation between homeownership and unemployment duration, despite a positive correlation between the unemployment rate and the proportion of homeowners at the regional level. The latter finding is, however, in line with previous evidence in Oswald (1996).

Using a survey from 2001 and register data from 1998, Deding and Filges (2004) examines the tendency to move in Denmark. They conclude that Danes primarily move due to family reasons, i.e. at first the individuals choose to move to a new region of residence and only afterwards they change to a different workplace. Similarly, Deding and Filges (2010) consider the geographical mobility of Danish families and find that region of residence seems to matter more for the determination of the region of work, than the work region matters for the determination of the residence region.

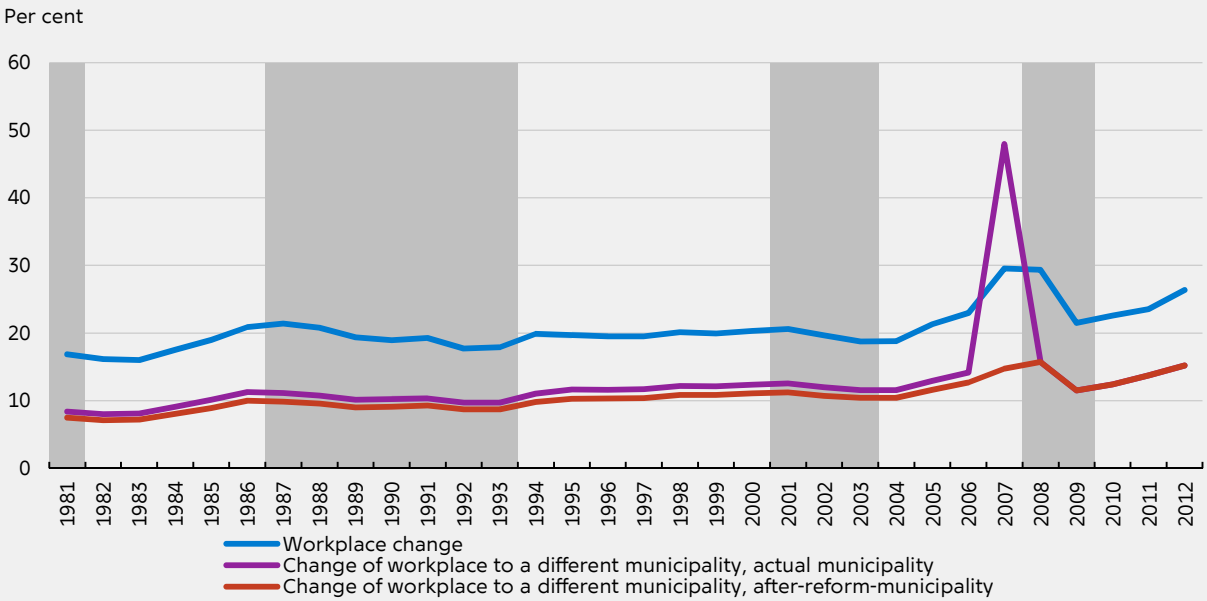
Job mobility in Denmark has fluctuated around 20 per cent in the period 1981-2004 when defined as the share of workers who changes to a different workplace compared to the previous year, cf. Chart 3.2. Job mobility rose markedly in the years leading up to the recent financial crisis, decreased during the economic downturn, and has been increasing in the aftermath of the downturn. In general, job mobility has been increasing in economic upturns and slightly decreasing in economic downturns.

The focus in this part of the paper is on geographical job mobility, i.e. how many workers change to a workplace in a different municipality compared to the previous year. Defined in this way, geographical job mobility has been around 8-16 per cent when using the actual municipality. Measuring geographical job mobility as the share of workers who change to a workplace in a different geographical area is in line with the literature. However, other measures might also be relevant to consider, e.g. commuting distance. Also, the relevant geographical unit could be changed from the municipality level to e.g. the regional level or commuting areas, cf. Andersen (2000). We leave these alternative measures for future research.

The break in 2007 is due to the so-called Structural Reform (*Strukturreformen*) where the number of municipalities was lowered to 98, cf. Section 2. For consistency throughout the time period, in the following we will therefore base our measure of geographical job mobility on the after-reform municipalities. Measured in this way, geographical job mobility has increased from around 7 per cent per year in the beginning of the 1980's to around 15 per cent in 2012. The largest improvement in geographical job mobility has happened in the period after 2004. Furthermore, it seems to follow the same cyclical pattern as job mobility in general, i.e. it increases during economic upturns and decreases slightly during economic downturns.

Job mobility and geographical job mobility

Chart 3.2



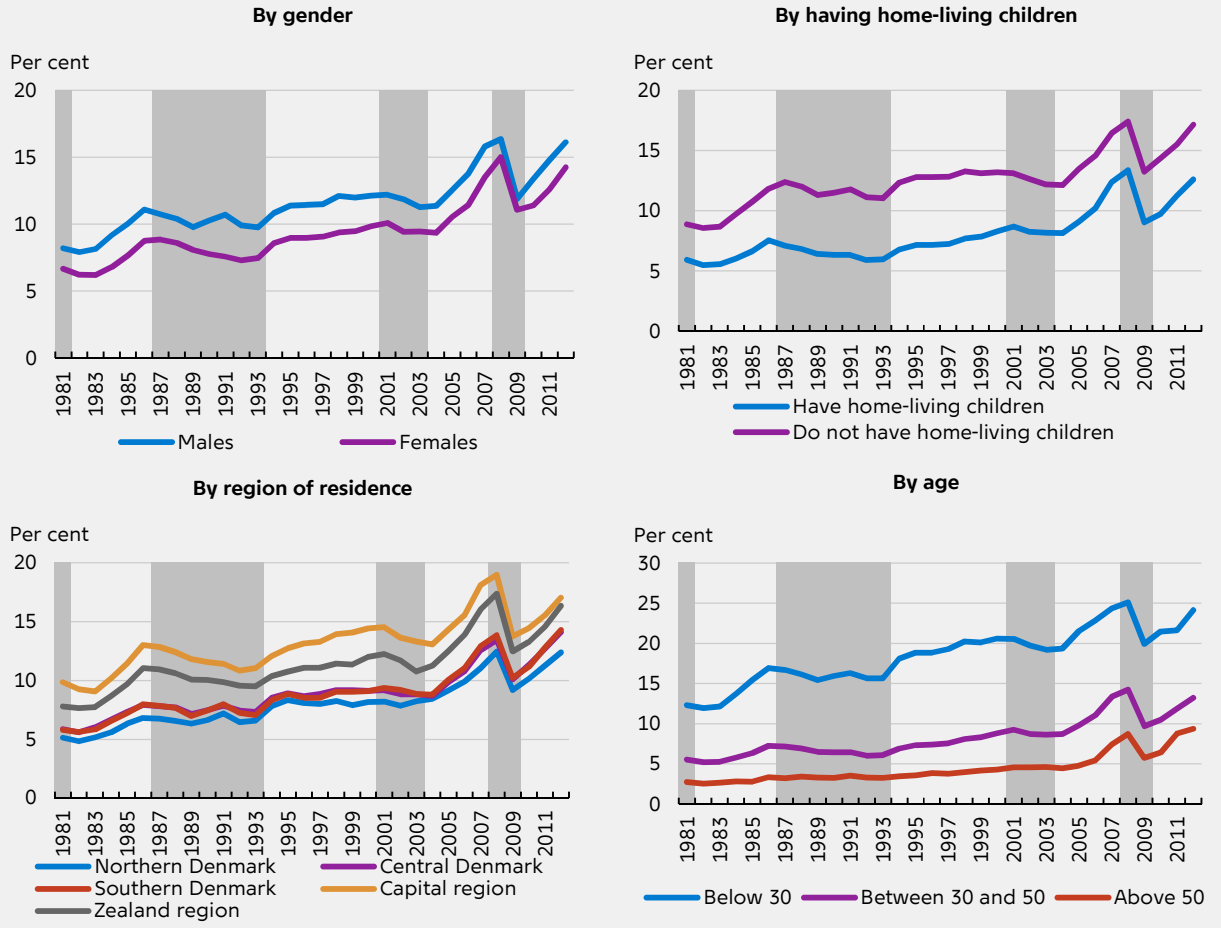
Note: The grey areas show periods with economic downturn, cf. Abildgren et al. (2011). The blue line shows the share of workers who changes to a different workplace compared to the previous year. The purple line shows the share of workers who changes to a workplace in a different municipality compared to the previous year, when the actual municipality is used. The break in 2007 is due to the so-called Structural Reform ("Strukturreformen") where the number of municipalities was lowered to 98 (from 270 in 2006; 271 in 2003-2005; 275 before 2003). The red line shows the share of workers who changes to a workplace in a different municipality compared to the previous year, when the after-reform-municipality is used. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Next, we turn to the question of what determines geographical mobility. In general, males seem to be more geographical job mobile than females, cf. Chart 3.3. Individuals without home-living children are more mobile than individuals with home-living children. Young workers are much more geographical job mobile than other workers, which illustrates that young workers constitute an important part of a flexible labour market.

Individuals living in the Capital region of Denmark are more geographical job mobile than individuals living in the rest of the country, especially compared to the North Denmark Region (Northern Jutland). This is probably partly explained by the fact that the time and geographical distance between municipalities is larger in Northern Jutland than in the Capital region, which can be viewed as a minor drawback of the measure of geographical job mobility employed in this paper. In the analysis below we therefore check the robustness of the results by dividing the sample into subsamples by region of residence.

Geographical job mobility – the importance of personal characteristics Chart 3.3



Note: The grey areas show periods with economic downturn, cf. Abildgren et al. (2011). The charts show the fraction of workers who change to a workplace in a different municipality (after-reform) compared to the previous year. All personal characteristics are predetermined, i.e. measured in the previous year. The region of residence refers to the after-reform region. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

One hypothesis is that individuals who are insured against unemployment are less geographical job mobile than individuals without unemployment insurance, because the outside option of the former is better, *ceteris paribus*. It has been suggested that the generous unemployment insurance schemes in many European countries is part of the explanation for the relatively low regional mobility in Europe. A standard result from the theory of job search suggests that unemployment benefits increase reservation wages and reduce the search effort exerted by benefit recipients, which in turn lowers the probability of finding a job, cf. e.g. Mortensen (1977). Consequently, unemployment benefits are considered to dampen geographical mobility because the probability of finding a job in another geographical area is reduced and geographical attachment is strengthened.

Hassler et al. (2005) set up a dynamic general equilibrium model to explain cross-country evidence on geographical mobility, unemployment and labour-market institutions. Their model has two steady states: One with generous unemployment insurance, high unemployment and low geographical mobility (which they interpret as Europe), and one with less generous unemployment insurance, low unemployment and high geographical mobility (which they interpret as the USA). In their model, forward-

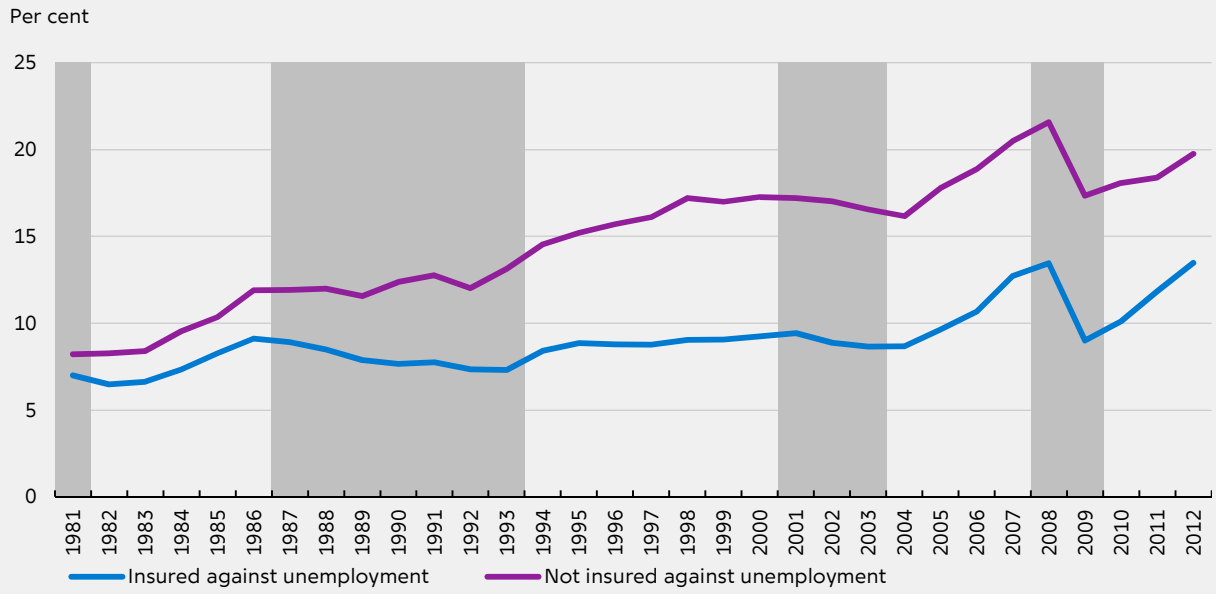
looking agents vote over the insurance policy, and the main mechanism is that in a low-mobility society where more workers perceive migration as costly, there will be a stronger political demand for unemployment insurance. Generous unemployment insurance weakens mobility, making individuals perceive the costs of moving as high, which in turn creates a high demand for unemployment insurance over time.

Tatsiramos (2009), on the other hand, proposes a model where the effect of unemployment insurance on geographical labour mobility is ambiguous under the assumption that unemployment benefits relax the financial constraints faced by the unemployed because of the costs associated with a move. In this model, there are two counteracting mechanisms: 1) benefits reduce the opportunity cost of rejecting a job offer which makes the unemployed rejecting more often by choosing a higher reservation wage; 2) higher benefits relax liquidity constraints making recipients more willing and capable to accept a job offer which requires a move. Using data from the period 1994-2001, Tatsiramos, *op cit.*, finds no significant difference in the likelihood to move between recipients of unemployment benefits and non-recipients in France, Spain, and the UK. However, in Germany recipients of unemployment benefits are less likely to move relative to non-recipients.

Similarly to the latter result, Antolin and Bover (1997) use data from Spain 1987-1991 and find that the estimated probability of migration is higher among unemployed workers who do not receive benefits than it is among other groups. Using Danish data, the Economic Council (2002) find that higher compensation rates for the insured unemployed workers reduce the propensity to find a job in a different geographical area more than it reduces the propensity to find a job locally.

The first descriptive evidence seems to support the previous findings. Workers with unemployment insurance are less likely to change to a workplace in a different municipality than workers without unemployment insurance, cf. Chart 3.4. On average, the difference in geographical job mobility between the two groups has been around 6 percentage points in the period 1981-2012.

Geographical job mobility and unemployment insurance Chart 3.4



Note: The grey areas show periods with economic downturn, cf. Abildgren et al. (2011). The charts show the fraction of workers who change to a workplace in a different municipality (after-reform) compared to the previous year. The unemployment insurance status is predetermined, i.e. measured in the previous year. See Section 2 for a description of the sample.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

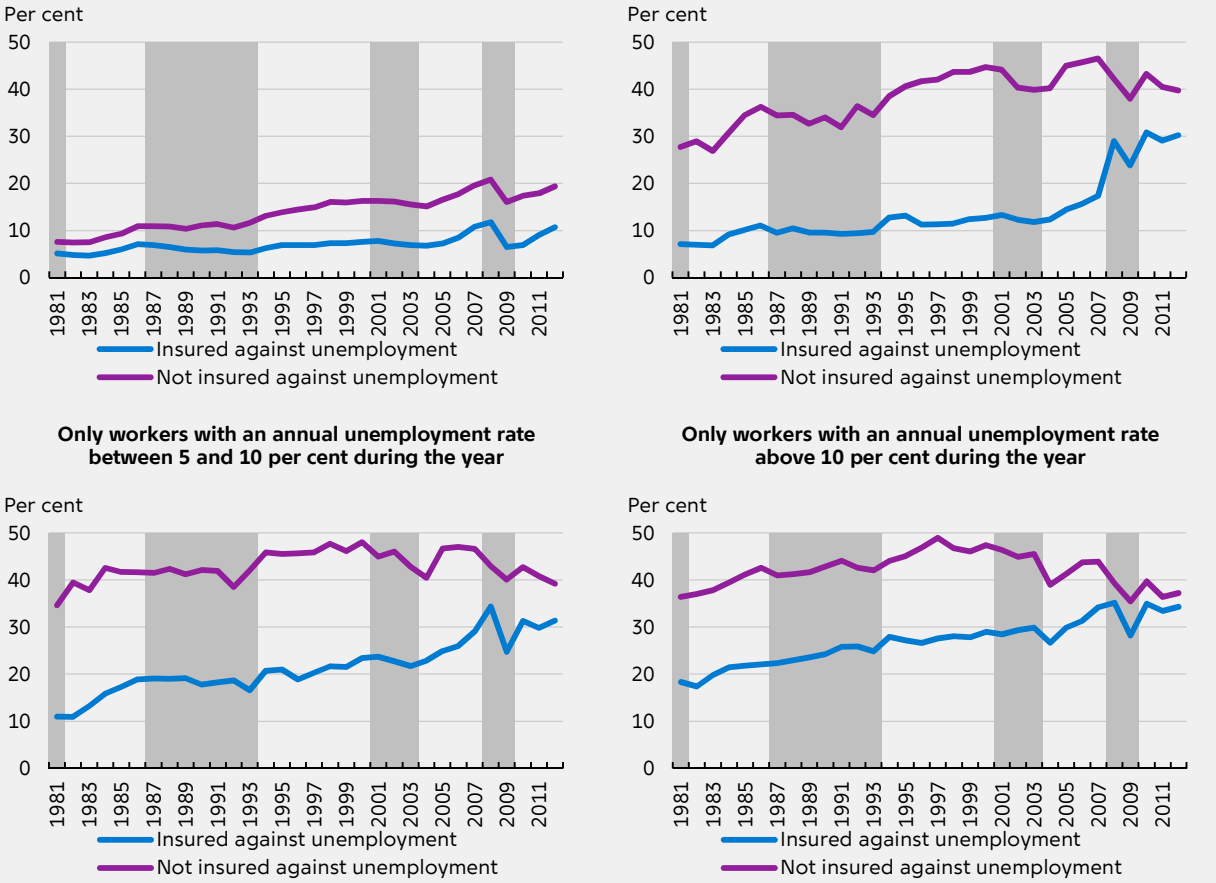
One concern when interpreting the results from Chart 3.4 could be that there are systematic differences between the two groups which are not caused by unemployment insurance status. As an example, those without unemployment insurance could be workers with a weaker labour-market attachment. If workers without unemployment insurance are more likely to experience unemployment spells during the year, they are more likely to move to a different workplace. As reviewed above, several studies have showed that unemployed workers are more likely to move relative to employed workers.

To address this concern, in Chart 3.5 the sample is split in those who do not experience unemployment during the year and those who do. In all subsamples, unemployment insured workers are less geographical job mobile. Whereas the difference between those insured and those not insured has widened among those not experiencing unemployment during the year, it has narrowed among those experiencing unemployment during the year. The latter result is primarily driven by increased geographical job mobility among workers with unemployment insurance who experience unemployment during the year, which is likely to be a result of the substantial labour-market measures taken since 1990, cf. Appendix C.[6] The narrowing of the spread in geographical job mobility between insured and non-insured workers who experience unemployment during the year is confirmed by Chart A.1 in Appendix A, which shows the geographical job mobility of non-insured workers relative to the geographical job mobility of insured workers. Further analysis show that the same result is obtained across all regions in Denmark, and it is therefore not driven by specific regions such as the Capital region of Denmark.

6 Of course, this development is merely an indication of the effect of the labour-market reforms on geographical job mobility, since it is not a formal impact evaluation of a specific reform, which is considered to be outside the scope of this paper.

In line with the previous evidence, workers experiencing unemployment during the year are more geographical job mobile than workers not experiencing unemployment, cf. Chart 3.5. This finding is probably partly explained by unemployment insurance legislation. In Denmark unemployed workers receiving unemployment insurance benefits are required to accept up to 3 daily hours of public transportation, and after 3 months of unemployment more than 3 daily hours of transportation, cf. Ministry of Employment (2015). Furthermore, workers with medium-cycle or long-cycle education are required to accept a job offer regardless of the transportation time if this is necessary in order to fill the job vacancy with qualified labour. Similar rules apply in other countries, cf. Venn (2012) and Bjørn and Høj (2014).

Geographical job mobility and unemployment insurance Chart 3.5



Note: The grey areas show periods with economic downturn, cf. Abildgren et al. (2011). The charts show the fraction of workers who change to a workplace in a different municipality (after-reform) compared to the previous year. The annual unemployment rate measures the proportion of the year which the worker is unemployed The unemployment insurance status is predetermined, i.e. measured in the previous year. See Section 2 for a description of the sample.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

3.1.1 MAIN REGRESSION RESULTS

Above we saw that there is descriptive evidence that unemployment insured workers are less geographical job mobile than workers without unemployment insurance. Chart 3.3, however, showed that other factors are also important for the degree of geographical job mobility, e.g. age. Since these factors are likely to be correlated with the probability of having an unemployment insurance, in this subsection we present the results from an empirical regression analysis. Below we will present various robustness checks.

Being unemployment insured decreases the probability of changing workplace to a different municipality in the following year by around 6 percentage points according to our linear probability model when no other factors are taken into account, cf. Table 3.1. When controlling for observable personal characteristics such as gender, age, job experience and marital status, unemployment insured are around 2 percentage points less geographical job mobile. Finally, unemployment insured are one half percentage points less likely to change workplace to a different municipality when we also include a range of other factors like level of education, firm size as well as time and region of residence dummies. One half percentage points correspond to around 5 per cent as the average geographical job mobility is around 10 per cent. In all cases the unemployment insurance coefficient is significantly different from zero at the 1 per cent significance level.

Estimation of the probability of changing workplace to a different municipality, linear probability model (OLS), effect of adding control variables, 1981-2012

Table 3.1

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment insured	-0.0559***	-0.0174***	-0.0098***	-0.0096***	-0.0096***	-0.0051***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Background variables included						
Personal characteristics (age etc.)	-	+	+	+	+	+
Level of education and job function	-	-	+	+	+	+
Firm characteristics	-	-	-	+	+	+
Time dummies	-	-	-	-	+	+
Region of residence dummies	-	-	-	-	-	+
Number of observations (thousands)	59,641	59,633	58,730	58,680	58,680	58,680

Note: *, ** and *** denote significance at the 10, 5 and 1 per cent level, respectively. The left-hand-side variable is an indicator for change of workplace to a different municipality from year *t* to year *t+1*. In parentheses are shown standard errors clustered at the worker level. All background variables are predetermined, i.e. measured in year *t*. Personal characteristics include gender, age, age squared, job experience, job experience squared, annual unemployment rate and indicators for immigrant background, have children living at home, are married or cohabiting. Firm characteristics include the natural logarithm of the number of employees in the firm. A "+" next to background variables included denotes that the variable has been included. See Section 2 for a description of the sample.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Above it was discussed whether the results could be driven by unemployment insured workers having a stronger labour market attachment, see Chart 3.5. The sample is therefore split in those who do not experience unemployment during the year and those who do. Even when controlling for a range of factors, unemployment insured workers are significantly less geographical job mobile, whether or not they have experienced unemployment during the year, cf. Table 3.2.

The difference in geographical job mobility among insured and uninsured workers is larger for those experiencing unemployment during the year. This is plausible since the unemployment insurance status is more important for workers actually experiencing unemployment.

Estimation of the probability of changing workplace to a different municipality, linear probability model (OLS), by unemployment status during the year, 1981-2012 Table 3.2

	= 0 per cent	]0; 5] per cent	]5; 10] per cent	> 10 per cent
Unemployment insured	-0.0155***	-0.1555***	-0.0979***	-0.0418***
	(0.0001)	(0.0015)	(0.0019)	(0.0011)
Background variables included				
Personal characteristics (age ect.)	+	+	+	+
Level of education and job function	+	+	+	+
Firm characteristics	+	+	+	+
Time dummies	+	+	+	+
Region dummies	+	+	+	+
Number of observations (thousands)	51,632	2,624	1,076	3,348

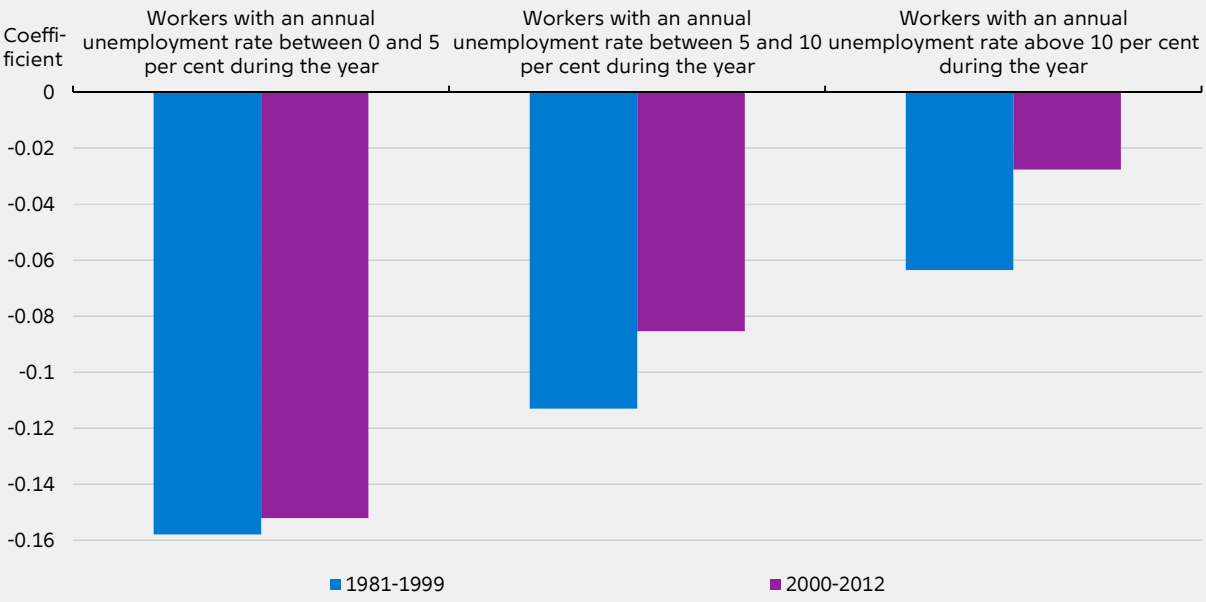
Note: *, ** and *** denote significance at the 10, 5 and 1 per cent level, respectively. The left-hand-side variable is an indicator for change of workplace to a different municipality from year *t* to year *t+1*. In parentheses are shown standard errors clustered at the worker level. All background variables are predetermined, i.e. measured in year *t*. Personal characteristics include gender, age, age squared, job experience, job experience squared, annual unemployment rate and indicators for immigrant background, have children living at home, are married or cohabiting. Firm characteristics include the natural logarithm of the number of employees in the firm. A "+" next to background variables included denotes that the variable has been included. The individual annual unemployment rate measures the proportion of the year that the workers spent unemployed during year *t+1*. See Section 2 for a description of the sample. Note that the coefficients do not compare directly to those from Table 3.1 since unemployment status in the current year is not included as an explanatory variable in the benchmark model.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

In Table 3.2 it is implicitly assumed that the difference in geographical mobility between unemployment insured and non-insured workers is constant over the entire period 1981-2012. Chart 3.5, however, indicated that this difference has been diminishing over the last 15 years for those experiencing unemployment. In a formal econometric analysis where we also take other variables into account, we still find this narrowing of the difference in geographical mobility between insured and non-insured workers among those experiencing unemployment during the year, cf. Chart 3.6.

Effect of unemployment insurance on the probability of changing workplace to a different municipality, by unemployment status during the year, 1981-1999 and 2000-2012

Chart 3.6



Note: The chart shows the coefficients to the unemployment insurance variable from regressing an indicator for change of workplace to a different municipality from year *t* to year *t+1* on unemployment insurance status and a number of covariates, cf. Table 3.3. The estimations have been carried out separately for each group in each of the two specified time periods. Only workers experiencing unemployment during the year have been included. All coefficients shown are significant at the 1 per cent level.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

3.1.2 ROBUSTNESS AND HETEROGENEOUS EFFECTS

Chart 3.3 illustrated that there are large differences in geographical job mobility across regions of residence. As a robustness check, the linear probability model is estimated for each of the five Danish regions (after-reform) separately. The results reveal that unemployment insured workers are significantly less geographical job mobile in all five regions, cf. Table 3.3. In the Capital region of Denmark being unemployment insured decreases the probability of changing workplace to a different municipality in the following year by around 0.75 percentage points, whereas the number is 0.37 percentage points in the Central Denmark Region.

Estimation of the probability of changing workplace to a different municipality, linear probability model (OLS), by region of residence, 1981-2012 Table 3.3

	Northern Denmark	Central Denmark	Southern Denmark	Capital region	Zealand region
Unemployment insured	-0.0039***	-0.0037***	-0.0050***	-0.0075***	-0.0049***
	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0004)
Background variables included					
Personal characteristics (age etc.)	+	+	+	+	+
Level of education and job function	+	+	+	+	+
Firm characteristics	+	+	+	+	+
Time dummies	+	+	+	+	+
Number of observations (thousands)	5,969	13,180	12,555	18,359	8,611

Note: *, ** and *** denote significance at the 10, 5 and 1 per cent level, respectively. The left-hand-side variable is an indicator for change of workplace to a different municipality from year *t* to year *t+1*. In parentheses are shown standard errors clustered at the worker level. All background variables are predetermined, i.e. measured in year *t*. Personal characteristics include gender, age, age squared, job experience, job experience squared, annual unemployment rate and indicators for immigrant background, have children living at home, are married or cohabiting. Firm characteristics include the natural logarithm of the number of employees in the firm. A "+" next to background variables included denotes that the variable has been included. Region of residence is based on the after-reform regions and is measured in year *t*. See Section 2 for a description of the sample.
Source: Own calculations based matched employer-employee data from Statistics Denmark.

In Table 3.4 is shown the results of further robustness checks. First, when we include labour income in the set of control variables we still find that insured workers are less geographical job mobile than non-insured workers, although the difference drops to 0.3 percentage points compared to 0.5 percentage points in the benchmark from Table 3.1.

Second, the full sample includes all workers, also students working part time. By disregarding students, the estimated difference in geographical job mobility increases to 0.8 percentage points. Hence, our main results are not driven by students working part time during their studies, who move to a different municipality when they complete their education. On the contrary, the estimated coefficient is higher when we exclude students from the sample.

Third, the difference in geographical job mobility between insured and non-insured workers is heterogeneous across age groups. For workers below the age of 30, the difference is 1.21 percentage points, while it is insignificant for workers of age 30 or more. This illustrates that the estimated difference in geographical job mobility between insured and non-insured workers is primarily driven by young workers. We know from Chart 3.3 that young workers are more flexible in the sense that their geographical job mobility is much higher than for older workers. This could reflect that younger workers have not settled yet and therefore respond more to incentives, but it should also be viewed in light of the special (and stricter) rules for young workers in terms of active labour market policies and social assistance.

It should also be noted that although we control extensively for observable differences between the insured and non-insured workers, there may remain systematic but unobservable differences.[7]

[7] However, a fixed-effects estimation confirm the main result: Non-insured workers are significantly more geographical job mobile than insured workers.

Estimation of the probability of changing workplace to a different municipality, linear probability model (OLS), robustness and heterogeneous effects, 1981-2012

Table 3.4

	Benchmark	Controlling for labour income	Excluding students	Only workers below 30 years old	Only workers of age 30 or more
Unemployment insured	-0.0051***	-0.0026***	-0.0079***	-0.0121***	-0.0002
	(0.0001)	(0.0001)	(0.0002)	(0.0003)	(0.0002)
Background variables included					
Personal characteristics (age etc.)	+	+	+	+	+
Level of education and job function	+	+	+	+	+
Firm characteristics	+	+	+	+	+
Time dummies	+	+	+	+	+
Number of observations (thousands)	58,680	58,650	52,039	17,714	40,966

Note: *, ** and *** denote significance at the 10, 5 and 1 per cent level, respectively. The benchmark is column (6) in Table 3.1. The left-hand-side variable is an indicator for change of workplace to a different municipality from year *t* to year *t+1*. In parentheses are shown standard errors clustered at the worker level. All background variables are predetermined, i.e. measured in year *t*. Personal characteristics include gender, age, age squared, job experience, job experience squared, annual unemployment rate and indicators for immigrant background, have children living at home, are married or cohabiting. Firm characteristics include the natural logarithm of the number of employees in the firm. A "+" next to background variables included denotes that the variable has been included. Labour income, student status and age are all measured in year *t*. See Section 2 for a description of the sample.
Source: Own calculations based matched employer-employee data from Statistics Denmark.

All estimations until now have employed a linear probability model. One disadvantage of this model is that it may predict probabilities outsight the plausible range (0 to 1). As a final robustness check, the analysis is carried out within a non-linear framework, cf. Table 3.5. A so-called probit estimation delivers the same conclusions as the linear probability model: Insured workers are significantly less geographical job mobile than uninsured workers.

Estimation of the probability of changing workplace to a different municipality, probit, effect of adding control variables, 1981-2012

Table 3.5

	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment insured	-0.2829***	-0.0808***	-0.0460***	-0.0448***	-0.0441***	-0.0162***
	(0.0006)	(0.0007)	(0.0008)	(0.0008)	(0.0008)	(0.0008)
	[-0.0559]	[-0.0139]	[-0.0078]	[-0.0075]	[-0.0074]	[-0.0027]
Background variables included						
Personal characteristics (age etc.)	-	+	+	+	+	+
Level of education and job function	-	-	+	+	+	+
Firm characteristics	-	-	-	+	+	+
Time dummies	-	-	-	-	+	+
Region of residence dummies	-	-	-	-	-	+
Number of observations (thousands)	59,641	59,633	58,730	58,680	58,680	58,680

Note: *, ** and *** denote significance at the 10, 5 and 1 per cent level, respectively. The left-hand-side variable is an indicator for change of work place to a different municipality from year *t* to year *t+1*. In parentheses are shown standard errors clustered at the worker level, while marginal effects are shown in square brackets. The marginal effects are evaluated at the mean of the explanatory variables. All background variables are predetermined, i.e. measured in year *t*. Personal characteristics include gender, age, age squared, job experience, job experience squared, annual unemployment rate and indicators for immigrant background, have children living at home, are married or cohabiting. Firm characteristics include the natural logarithm of the number of employees in the firm. A "+" next to background variables included denotes that the variable has been included. See Section 2 for a description of the sample.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

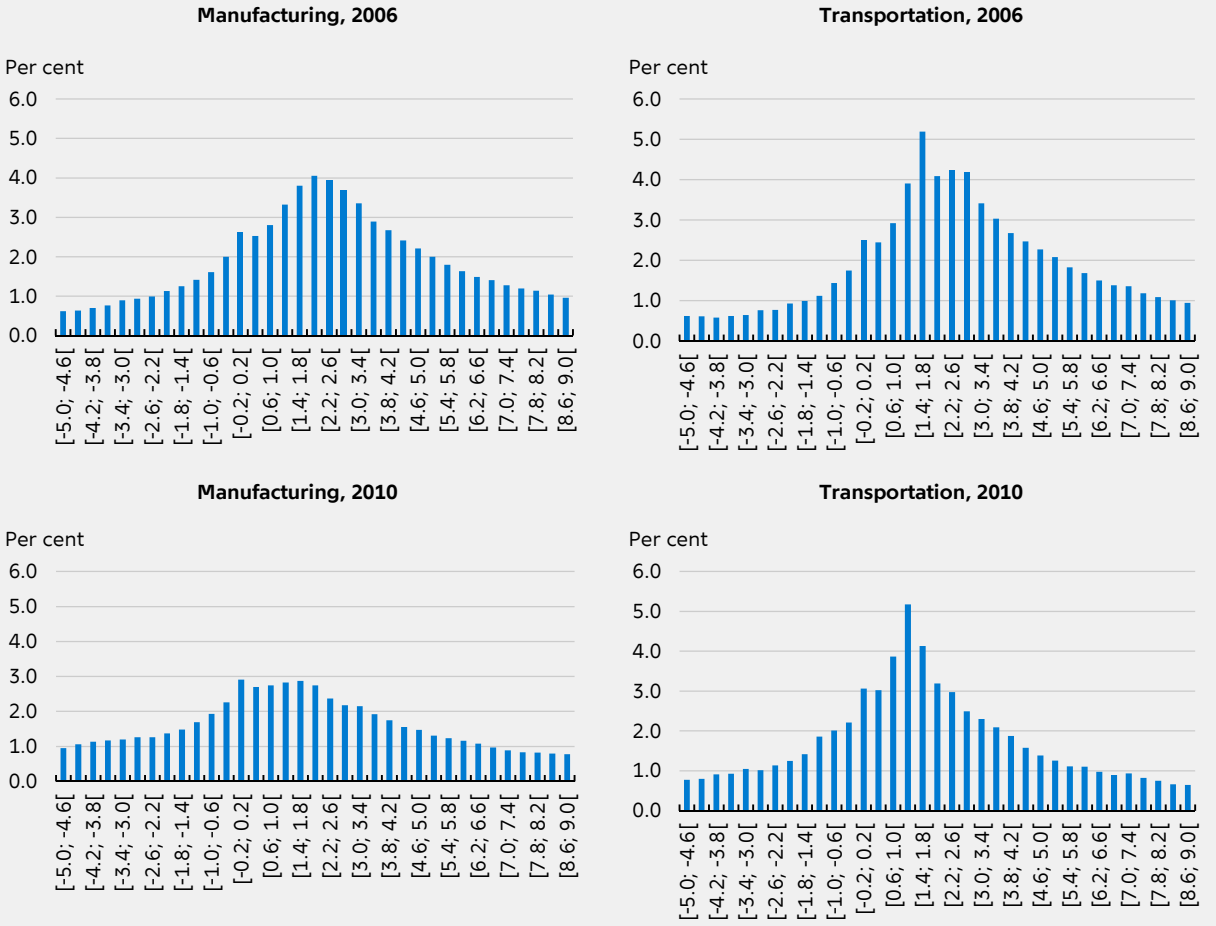
3.2 WAGE FLEXIBILITY

Wage changes within manufacturing show indications of both types of downward wage rigidity in 2006, especially real wage rigidity, cf. Chart 3.7. The asymmetries are even more evident within transportation in 2006, indicating that the incidence of downward real wage rigidity is relatively high.

In contrast, wage changes in 2010 have an almost symmetrical distribution, and hence, there are no clear signs of downward wage rigidity, neither nominal nor real, e.g. within transportation. In Appendix B we present wage change histograms, depicted in a way similar to what is standard in the literature, for all considered industries. In general, the charts show that the distributions of annual wage changes for job stayers became more symmetric during the latest economic downturn, a finding consistent with previous studies for the euro area (Verdugo, 2015) and the USA (Guvenen et al., 2014). Furthermore, the wage change histograms show large dispersion, illustrating that wages in the Danish labour market are relatively flexible.

As described in Section 2, the wage flexibility analysis only includes job stayers. This focus is chosen in order to obtain the cleanest identification of wage rigidity, since workers who change job are likely to experience wage changes. For a recent Danish study focusing instead on wage mobility among job switchers, see the Ministry of Economic Affairs and the Interior (2014). Similar to the present paper, they find that the wage mobility is relatively high in the Danish labour market.

Wage change histograms, selected industries in selected years Chart 3.7



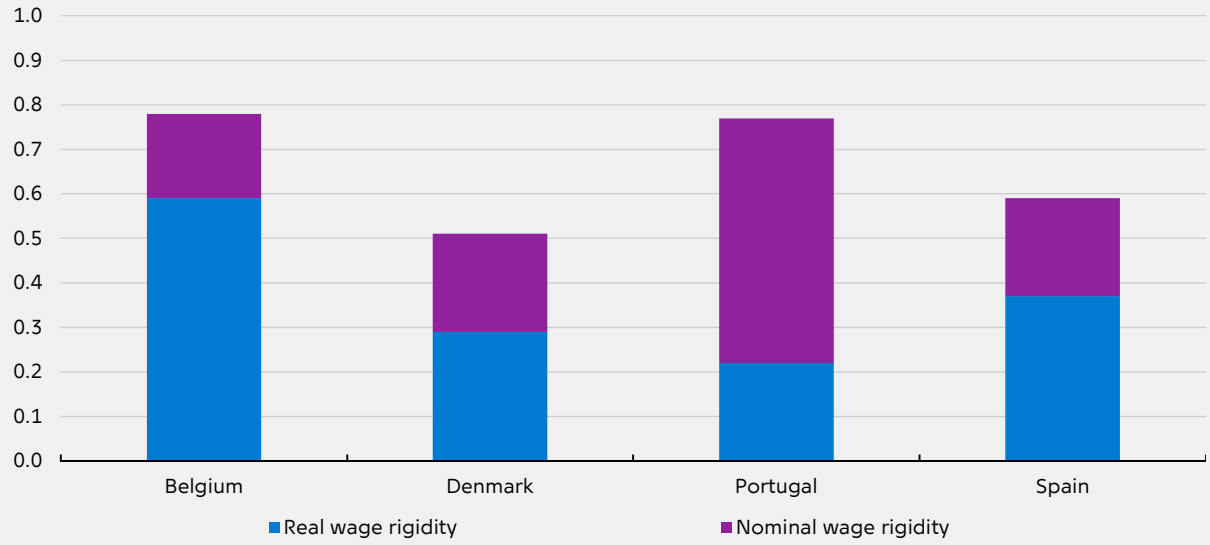
Note: Annual percentage changes in remuneration per hour worked. See Section 2 for a description of the sample.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

The histograms in Chart 3.7 and Appendix B show the raw wage changes. These histograms serve as the basis in the estimation of downward wage rigidity, which we turn to next.

Averaging over all considered industries, we find that 29 per cent of workers are potentially subject to downward real wage rigidity, while 22 per cent are potentially subject to downward nominal wage rigidity. These results are in line with previous evidence from Messina et. al. (2010), and it underlines that wages in the Danish labour market are relatively flexible in an international comparison, cf. Chart 3.8.

As mentioned in Section 1, Holden and Wulfsberg (2008, 2009) found that both nominal and real wage cuts are less prevalent in countries with high union density. Since the Danish labour market is characterised by both high union density and relatively flexible wages, Denmark is clearly an outlier in this respect. This should probably be viewed in light of the Danish labour-market model, where the social partners collectively determine wages and working conditions, and in light of the trend towards decentralisation in collective bargaining to be explained below, cf. also Messina et al. (2010) who found that real wages are less downward rigid in industries with a high degree of firm-level wage bargaining.

Downward wage rigidity in an international comparison Chart 3.8



Note: For Denmark: Simple average over all considered industries using data in the period 1997-2010. For Belgium, Portugal and Spain the results are from Messina et al. (2010) who use data from various sources over the period 1990-2007. For presentational reasons the two types of downward wage rigidity are shown additively.
Source: Own calculations based on matched employer-employee data from Statistics Denmark and Messina et al. (2010)

There are substantial differences in the incidence of downward wage rigidity across industries, cf. Chart 3.9. As indicated by the wage change histograms, the incidence of downward wage rigidity has been higher within transportation than within manufacturing. Within manufacturing the fraction of workers potentially affected by downward real wage rigidity is around 16 per cent on average over the years 1998-2010, and the fraction of workers potentially affected by downward nominal wage rigidity is also around 16 per cent. These estimates are very low in an international comparison, cf. above, and it illustrates that Danish wages are relatively flexible in export-oriented industries.

It is worth noting that there has been a trend towards decentralisation in collective bargaining in Denmark in the most recent decades, cf. the Economic Council (2007) as well as Hansen and Storgaard (2011). Since the late 1980s the wage systems have changed towards more flexible pay systems (minimum-wage agreements, minimum-pay agreements and agreements without minimum rate), where the actual pay is determined at the firm level. In 2014 these flexible wage systems covered 81 per cent of the LO/DA-covered area[8] compared to 66 per cent in 1989, cf. The Confederation of Danish Employers (2001, 2014).

The normal wage agreements, in which pay is mainly determined at a central level by the main organisations, have declined correspondingly from 34 per cent in 1989 to 19 per cent in 2014. While the minimum-wage/minimum-pay area is mainly dominated by the large manufacturing industry, normal wage systems have been typical in the public sector and agriculture, both excluded from the wage flexibility analysis in this paper, as well as in the financial sector, within transportation, and for workers within wood processing and related trades, cf. Hansen and Storgaard (2011). Although the

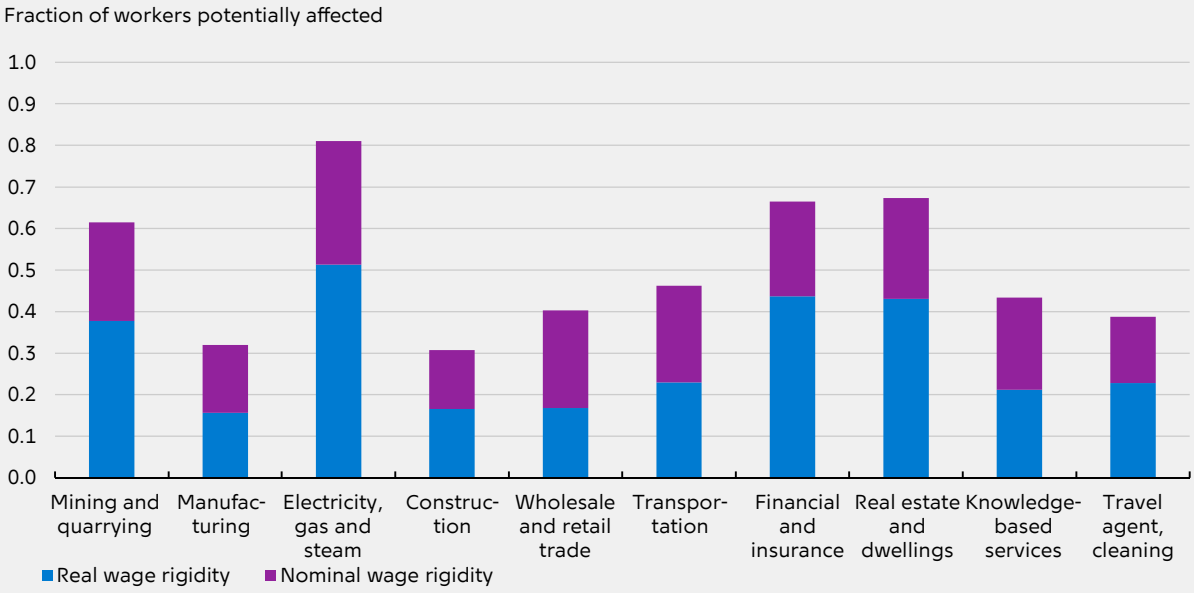
8 LO (The Danish Confederation of Trade Unions) is the main national federation of workers, while DA (The Confederation of Danish Employers) is the main private employer organisation.

normal wage system is more centralised, the general trend towards decentralisation has implied that it is now more common for individual firms covered by normal wage agreements to be allowed to use agreed-upon performance-dependent wage systems. This development implies that the difference between the normal wage system and the minimum-wage/minimum-pay system has declined, cf. Hansen and Storgaard, *op cit.* Perhaps not surprisingly, the incidence of downward wage rigidity has been smallest within construction where individual contracts with piecework wages are more prevalent, cf. Chart 3.9.

The incidence of downward real wage rigidity has been higher within transportation than within manufacturing in most of the years 1998-2010, cf. Chart 3.10. Within both these industries the incidence of downward real wage rigidity has been higher in the first phase of an economic downturn than in later stages. These results are in line with evidence from the euro area, cf. Anderton et al. (2015). Their findings suggest that the wage response in the euro area was rather limited during the first phase of the most recent crisis, whereas wages were more responsive in the second phase of the crisis.

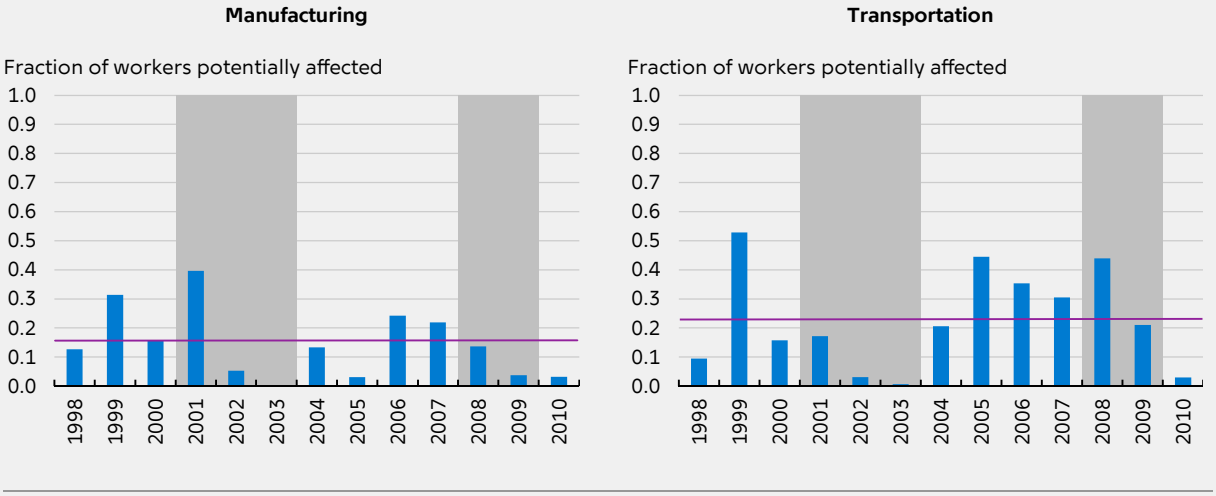
Incidence of downward wage rigidity across industries, averages over the period 1998-2010

Chart 3.9



Note: Downward wage rigidity is estimated as described in Section 2. For presentational reasons the two types of downward wage rigidity are shown additively. See Section 2 for a description of the sample and the method.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Incidence of downward real wage rigidity over time, manufacturing and transportation Chart 3.10



Note: The grey areas show periods with economic downturn, cf. Abildgren et al. (2011). The purple line shows the industry average. Downward real wage rigidity is estimated as described in Section 2. See Section 2 for a description of the sample and the method. There were collective agreements in 1998, 2000, 2004, 2007 and 2010.
Source: Own calculations based on matched employer-employee data from Statistics Denmark.

The finding that wages did not adjust fully downward in the beginning of the recent economic downturn may also be viewed in light of the US discussion of *pent-up wage deflation*, cf. Yellen (2014) and Daly and Hobijn (2014). According to this line of reasoning, downward wage rigidity prevents real and nominal wages from adjusting downward when the labour market is weak, and therefore wages do not have to increase as much coming out of an economic downturn in order to align wages with productivity. As a result, wages might rise relatively slowly as the labour market strengthens. If pent-up wage deflation is holding down wage growth, moderate wage growth in the first years after an economic downturn could be a misleading signal of the degree of remaining slack, and wages could be expected to rise at a noticeably more rapid pace once pent-up wage deflation has been absorbed.

It is worth mentioning that the average duration of collective agreements has increased from the standard two years up until the mid-1990s to the current three years.[9] At first sight, long wage contracts may be viewed as a barrier to wage flexibility. However, this development should presumably be viewed in light of increasing price stability and the trend towards the minimum-wage/minimum-pay system, cf. above. Abildgren (2009) highlights that labour-market structures are endogenous. He finds that the lengths of collective agreements in the Danish industrial sector have been longer in periods with low and stable inflation, e.g. towards the end of the classical gold standard period and during the period since the mid-1990s with a hard peg vis-à-vis the D-mark and later the euro. The same periods have been characterised by limited use of cost-of-living indexation of wages. Contrarily, the interwar period with unstable inflation resulted in short contract lengths, and inflation indexation of wages were more extensively used in the Bretton Woods period and during the soft peg in the 1970s with high and raising inflation. Thanks to the possibility of wage regulation within the agreement period, the longer duration of wage agreements does not necessarily reduce flexibility. Especially not in industries with a minimum-wage/minimum-pay system

[9] The duration was, however, back to two years in the first years after the most recent financial crisis. In the relatively large manufacturing sector, for example, the duration of collective agreements was: 1998: 2 years; 2000: 4 years; 2004: 3 years; 2007: 3 years; 2010: 2 years; 2012: 2 years; 2014: 3 years, cf. Abildgren (2011) and the Confederation of Danish Employers (2014).

where collective agreements only stipulate a minimum rate and the final wage is negotiated at the individual firm level, cf. also Storgaard (2011).

Our measure of base wages, i.e. remuneration per hour worked, also include irregular payments such as bonuses and profit sharing. For the two large industries manufacturing and transportation we have been able to estimate the incidence of downward rigidity when subtracting these irregular payments from our base wage measure. When bonuses etc. are not included in the wage measure, we find that a higher incidence of downward real wage rigidity both within manufacturing (18 per cent) and transportation (28 per cent).[10] This indicates that flexibility in irregular payments to some extent counterbalance the downward rigidity in real base wages excl. bonuses etc.

[10] The results regarding downward nominal wage rigidity are, however, slightly more ambiguous. The incidence of downward nominal wage rigidity is higher within manufacturing (18 per cent) but lower within transportation (20 per cent) when subtracting irregular payments from the wage measure.

4. CONCLUDING REMARKS

In this paper we considered two important aspects of labour-market flexibility, which have not received much attention, i.e. geographical job mobility and wage flexibility.

In our analysis of geographical job mobility we found that personal characteristics such as age and marital status are important determinants for geographical job mobility. We added to the literature by studying whether workers with unemployment insurance are less geographical job mobile than workers without unemployment insurance, as suggested by e.g. the standard theory of job search. Unemployment insured workers were found to exhibit a significantly lower degree of geographical job mobility than workers not insured against unemployment, especially for young workers. This was found across geographical regions of residence, and in a subsample with only workers not experiencing unemployment during the year as well as in subsamples with only workers who experience some extent of unemployment during the year. However, the substantial labour-market measures taken in the last 25 years seem to have improved geographical job mobility, especially among workers with unemployment insurance who experience unemployment during the year. The largest improvement in geographical job mobility has happened in the period after 2004.

In our wage flexibility analysis we confirmed the finding from previous studies that the incidence of downward wage rigidity is low in Denmark when compared to other countries, both in nominal and real terms. We added to the literature by studying to what extent individual wages have adjusted downward during the most recent economic downturn, and whether there are differences across industries. There are, in fact, large differences across industries. Downward wage rigidity is low within the export-oriented manufacturing industry and within construction, while it is higher within e.g. transportation and finance. We also find that downward real wage rigidity follows a cyclical pattern. Real wages are found to be downward rigid in the beginning of an economic downturn, but this rigidity declines during the downturn.

REFERENCES

Abildgren, Kim (2009), Monetary Regimes and the Endogeneity of Labour Market Structures: Empirical Evidence from Denmark, 1875-2007, *European Review of Economic History*, Vol. 13.

Abildgren, Kim, Birgitte Vølund Buchholst, Jonas Staghøj and Atef Qureshi (2011), Real Economic Consequences of Financial Crises, *Danmarks Nationalbank Monetary Review*, Vol. 50, No. 3, Part 2.

Andersen, Anne Kaag (2000), *Commuting areas in Denmark*, AKF Forlaget.

Andersen, Torben M. and Michael Svarer (2008), Flexicurity in Denmark, *CESIfo DICE report*, Vol. 6, No. 4.

Anderton, Robert, Boele Bonthuis, Thomas Conefrey, Paolo Gurda, Mario Izquierdo, Valerie Jarvis, Alexander Karšay, José R. Maria, Marek Micuch, Peter Beck Nellemann, Daphne Nicolitsas, Orsolya Soosaar, Béla Szörfi, Alfred Stiglbauer, Pietro Tommasino, Mathilde Périnet, Pavlos Petroulas, Cindy Veiga, Gregory Verdugo and Roberta Zizza (2015), Comparisons and Contrasts of the Impact of the Crisis on Euro Area Labour Markets, *ECB Occasional Paper Series*, No. 159.

Antolin, Pablo and Olympia Bover (1997), Regional Migration in Spain: the Effect of Personal Characteristics and of Unemployment, Wage and House Price Differentials Using Pooled Cross Sections, *Oxford Bulletin of Economics and Statistics*, Vol. 59, No. 2:

Arpaia, Alfonso and Karl Pichelmann (2007), Nominal and Real Wage Flexibility in EMU, *International Economics and Economic Policy*, Vol. 4, No. 3.

Bernal-Verdugo, Lorenzo E., Davide Furceri and Dominique Guillaume (2012), Labor Market Flexibility and Unemployment: New Empirical Evidence of Static and Dynamic Effects, *IMF Working Paper*, No. WP/12/64.

Bertola, Giuseppe (1999), Labor Markets in the European Union, *Background paper* for a Lecture at EALE 1999 (Regensburg).

Bjørn, Niels Henning og Anne Kristine Høj (2014), Understøttelse ved ledighed i syv lande (Unemployment benefit and social assistance during unemployment in seven countries – in Danish only), *De Økonomiske Råds Sekretariat Arbejdspapir*, No. 2014:2.

Blanchard, Olivier and Jordi Galí (2007), Real Wage Rigidities and the New Keynesian Model, *Journal of Money, Credit and Banking*, Vol. 39, No. 1.

Blanchard, Olivier and Lawrence F. Katz (1999), Wage Dynamics: Reconciling Theory and Evidence, *American Economic Review: Papers and Proceedings*, Vol. 89, No. 2.

DaVanzo, Julie (1978), Does Unemployment Affect Migration? Evidence from Micro Data, *Review of Economics and Statistics*, Vol. 60, No. 4:

Daly, Mary C. and Bart Hobijn (2014), Downward Nominal Wage Rigidities Bend the Phillips Curve, *Federal Reserve Bank of San Francisco Working Paper Series,* No. 2013-08.

Deding, Mette and Trine Filges (2004), Derfor flytter vi – geografisk mobilitet i den danske arbejdsstyrke*, the Danish National Institute of Social Research report 04:19*, Socialforskningsinstituttet.

Deding, Mette and Trine Filges (2010), Geographical Mobility of Danish Dual-Earner Couples – the Relationship Between Change of Job and Change of Residence, *Journal of Regional Science*, Vol. 50, No. 2.

Dickens, Wiilam T. and Lorenz Goette (2005), Estimating Wage Rigidity for the International Wage Flexibility Project, Mimeo, Brookings Institution, Version 7.0.

Dickens, William T., Lorenz Goette, Erica L. Groshen, Steinar Holden, Julian Messina, Mark E. Schweitzer, Jarkko Turunen and Melanie E. Ward (2006), The Interaction of Labor Markets and Inflation: Analysis of Micro Data from the International Wage Flexibility Project, *Mimeo*.

Dickens, William T., Lorenz Goette, Erica L. Groshen, Steinar Holden, Julian Messina, Mark E. Schweitzer, Jarkko Turunen and Melanie E. Ward (2007), How Wages Change: Micro Evidence from the International Wage Flexibility Project, *Journal of Economic Perspectives*, Vol. 21, No. 2.

Du Caju, Philip, Catherine Fuss and Ladislav Wintr (2007), Downward Wage Rigidity for Different Workers and Firms: an Evaluation for Belgium Using the IWFP Procedure, *National Bank of Belgium Working Paper Research*, No. 124.

European Commission (2001), *High Level Task Force on Skills and Mobility*, Final report.

European Commission (2008a), *Geographic Mobility in the European Union: Optimising its Economic and Social Benefits*, Final report prepared by the Institute for the Study of Labor (IZA), NIRAS Consultants and the Swedish National Labour Market Board.

European Commission (2008b), Labour Mobility between the Regions of the EU-27 and a Comparison with the USA, *Regional Focus*, No. 02/2008.

Gottschalk, Peter (2005), Downward Nominal Wage Flexibility – Real or Measurement Error?, *Review of Economics and Statistics*, Vol. 87, No. 3.

Guvenen, Fatih, Ozkan, Serdar and Song, Jae, (2014), The Nature of Countercyclical Income Risk, *Journal of Political Economy*, Vol. 122, No. 3.

Hall, Robert E. (2005), Employment Fluctuations with Equilibrium Wage Stickiness, *American Economic Review*, Vol. 95, No. 1.

Hansen, Ester, Morten Hedegaard Rasmussen and Jonas Staghøj (2013), Price Formation in Denmark, *Danmarks Nationalbank Monetary Review*, Vol. 52, No. 3, Part 2.

Hansen, Niels Lynggård (1998a), Lønfleksibilitet og makrostabilitet – en analyse af langsigtsmultiplikatorer, *Danish Journal of Economics*, Vol. 136, No. 2.

Hansen, Niels Lynggård (1998b), Wage Development in Denmark, *Danmarks Nationalbank Monetary Review*, Vol. 37, No. 2.

Hansen, Niels Lynggård og Peter Ejler Storgaard (2011), *Løn, priser og indkomster* (Wages, prices and income – in Danish only), Handelshøjskolens forlag, 1. udgave.

Hassler, John, José V. Rodrigues Mora, Kjetil Storesletten and Fabrizio Zilibotti (2005), A Postive Theory of Geographic Mobility and Social Insurance, *International Economic Review*, Vol. 46, No. 1.

Holden, Steinar and Fredrik Wulfsberg (2008), Downward Nominal Wage Rigidity in the OECD, *The B.E. Journal of Macroeconomics*, Vol. 8, No. 1.

Holden, Steinar and Fredrik Wulfsberg (2009), How Strong is the Macroeconomic Case for Downward Real Wage Rigidity?, *Journal of Monetary Economics*, Vol. 56, No. 4.

Isaksen, Jakob, Uffe Mikkelsen and Peter Beck Nellemann (2012), Labour-Market Reforms in Denmark and Germany, *Danmarks Nationalbank Monetary Review*, Vol. 51, No. 3, Part 1.

Messina, Julián, Philip Du Caju, Cláudia Filipa Duarte, Niels Lynggård Hansen and Mario Izquierdo (2010), The Incidence of Nominal and Real Wage Rigidity: An Individual-Based Sectoral Approach, *Journal of European Economic Association*, Vol. 8, No. 2-3.

Ministry of Economic Affairs and the Interior (2014), *Familiernes økonomi – fordeling, fattigdom og incitamenter* (The families' economic situation - distribution, poverty and incentives – in Danish only), chapter 3 – Lønmobilitet i Danmark (Wage mobility in Denmark).

Ministry of Employment (2015), Bekendtgørelse nr. 701 af 27. maj 2015 om rådighed (Statutory order no. 701 of 27 May 2015 regarding availability – in Danish only).

Ministry of Finance (2013), Ny og bedre indfasning af dagpengereformen (New and better phase-in of the unemployment insurance reform – in Danish only).

Ministry of Finance (2014), Væsentlige arbejdsmarkedsreformer siden starten af 1990'erne (Important labour-market reforms since the beginning of the 1990's – in Danish only), *Finansredegørelse 2014 (Financial Review)*, Appendix 5A.

Mortensen, Dale T. (1977), Job Search, the Duration of Unemployment and the Phillips curve, *Industrial and Labor Relations Review*, Vol. 30.

Munch, Jakob Roland, Michael Rosholm and Michael Svarer (2006), Are Homeowners Really More Unemployed?, *Economic Journal*, Vol. 116, No. 514.

Mundell, Robert A. (1961), A Theory of Optimum Currency Areas, *American Economic Review*, Vol. 51 No. 4.

Nellemann, Peter Beck and Erik Haller Pedersen (2012), Developments in the Danish Labour Market in Recent Years, *Danmarks Nationalbank Monetary Review*, Vol. 51, No. 2, Part 1.

OECD (2004), *OECD Employment Outlook*, Organisation for Economic Co-operation and Development.

OECD (2007), European Union, *OECD Economic Surveys*, Vol. 2007/11, Organisation for Economic Co-operation and Development.

Oswald, Andrew J. (1996), A conjecture of the explanation for high unemployment in the industrialised nations: part I, *Warwick University Economic Research Paper,* No. 475.

Pedersen, Erik Haller and Johanne Dinesen Riishøj (2007), Flexicurity – the Danish Labour-Market Model, *Danmarks Nationalbank Monetary Review*, Vol. 46, No. 4.

Pissarides, Christopher A. and Jonathan Wadsworth (1989), Unemployment and the - Inter-Regional Mobility of Labour, *Economic Journal,* Vol. 99.

Rusinova, Desislava, Vilen Lipatov and Frigyes Ferdinand Heinz (2015), How Flexible Are Real Wages in the EU Countries? A Wage Panel Investigation, *Journal of Macroeconomics*, Vol. 43.

Statistics Denmark (1991), *IDA – en integreret database for arbejdsmarkedsforskning: Hovedrapport* (IDA, an integrated data base for labour market research: Main report – in Danish only), Danmarks Statistik.

Statistics Denmark (2015), *Dokumentation - Lønstatistikken* (Dokumentation – Earnings Statistics – in Danish only), Danmarks Statistik, January.

Storgaard, Peter Ejler (2009), Wage Development in Denmark, *Danmarks Nationalbank Monetary Review*, Vol. 48, No. 2.

Storgaard, Peter Ejler (2011), Wage Dynamics in Denmark, *Danmarks Nationalbank Working Papers*, No. 76.

Tatsiramos, Konstantinos (2009), Geographic Labour Mobility and Unemployment Insurance in Europe, *Journal of Population Economics*, Vol. 22, No. 2.

The Confederation of Danish Employers (2001), *Arbejdsmarkedsrapport 2001* (Labour market report 2001 – in Danish only), Dansk Arbejdsgiverforening.

The Confederation of Danish Employers (2013), *Arbejdsmarkedsrapport 2013* (Labour market report 2013 – in Danish only), Dansk Arbejdsgiverforening.

The Confederation of Danish Employers (2014), *Arbejdsmarkedsrapport 2014* (Labour market report 2014 – in Danish only), Dansk Arbejdsgiverforening.

The Economic Council (2002*), Dansk Økonomi – efterår 2002* (The Danish economy, fall 2002 – in Danish only), Det Økonomiske Råd.

The Economic Council (2007*), Dansk Økonomi – forår 2007* (The Danish economy, spring 2007 – in Danish only), Det Økonomiske Råd.

Tobin, James (1972), Inflation and Unemployment, *American Economic Review*, Vol. 62.

Venn, Danielle (2012), Eligibility Criteria for Unemployment Benefits – Quantitative Indicators for OECD and EU Countries, *OECD Working Paper*, No. 131.

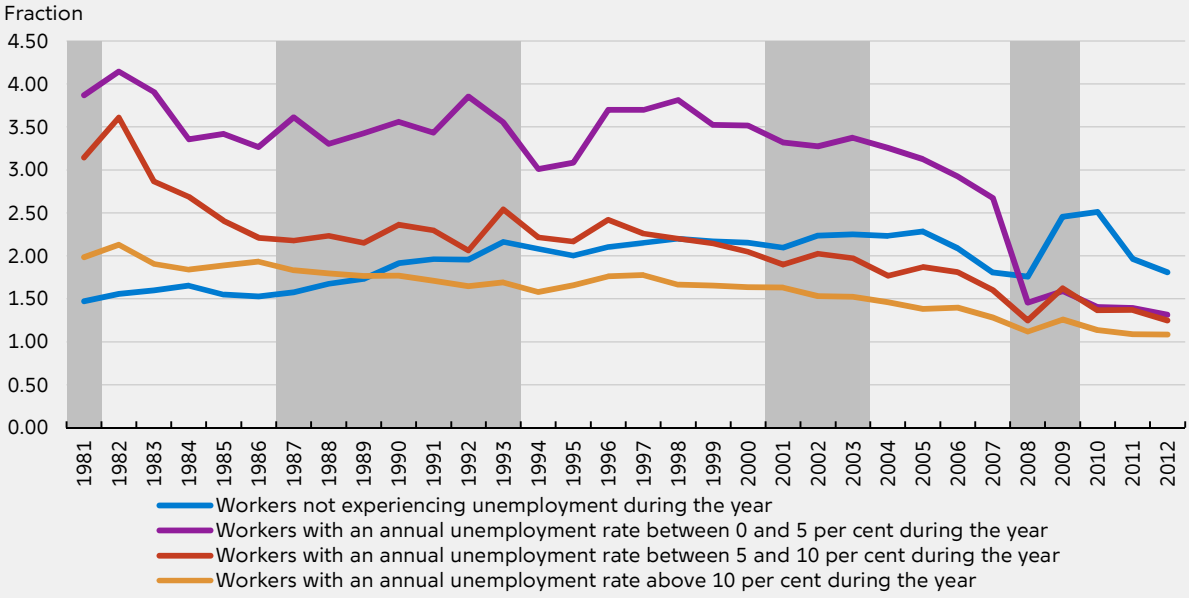
Verdugo, Gregory (2015), Real Wage Cyclicality in the Eurozone Before and During the Great Recession: Evidence from Micro Data, *Banque de France Document de travail*, No. 570.

Yellen, Janet (2014), Labor Market Dynamics and Monetary Policy, *Speech*, delivered at the Federal Reserve Bank of Kansas City Economic Symposium in Jackson Hole, August 22.

APPENDIX A – RELATIVE GEOGRAPHICAL JOB MOBILITY

Geographical job mobility of non-insured workers relative to geographical job mobility of insured workers

Chart A.1



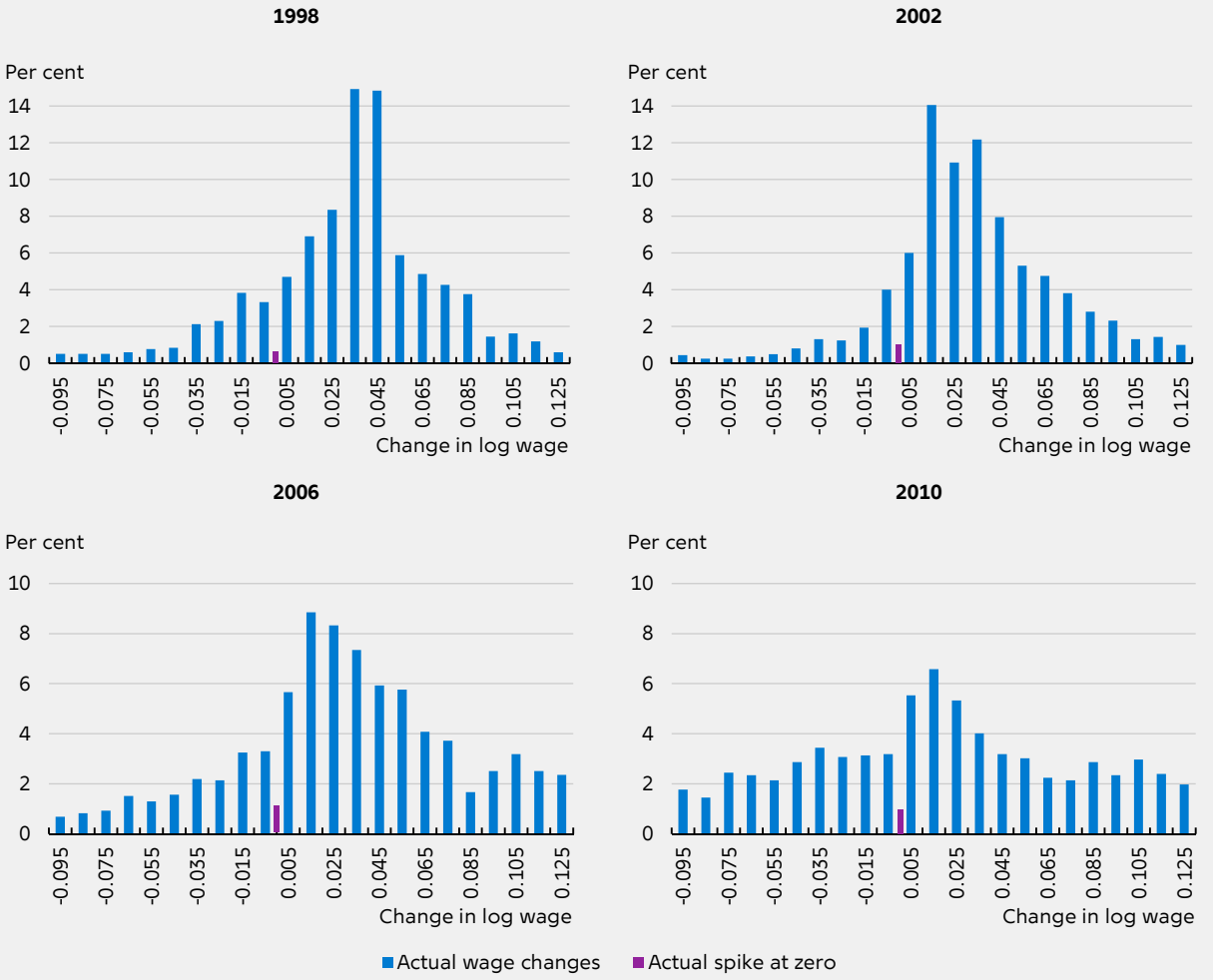
Note: The grey areas show periods with economic downturn, cf. Abildgren et al. (2011). The annual unemployment rate measures the proportion of the year which the worker is unemployed The unemployment insurance status is predetermined, i.e. measured in the previous year. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

APPENDIX B – WAGE CHANGE HISTOGRAMS

Wage change histograms for Mining and quarrying, selected years

Chart B.1

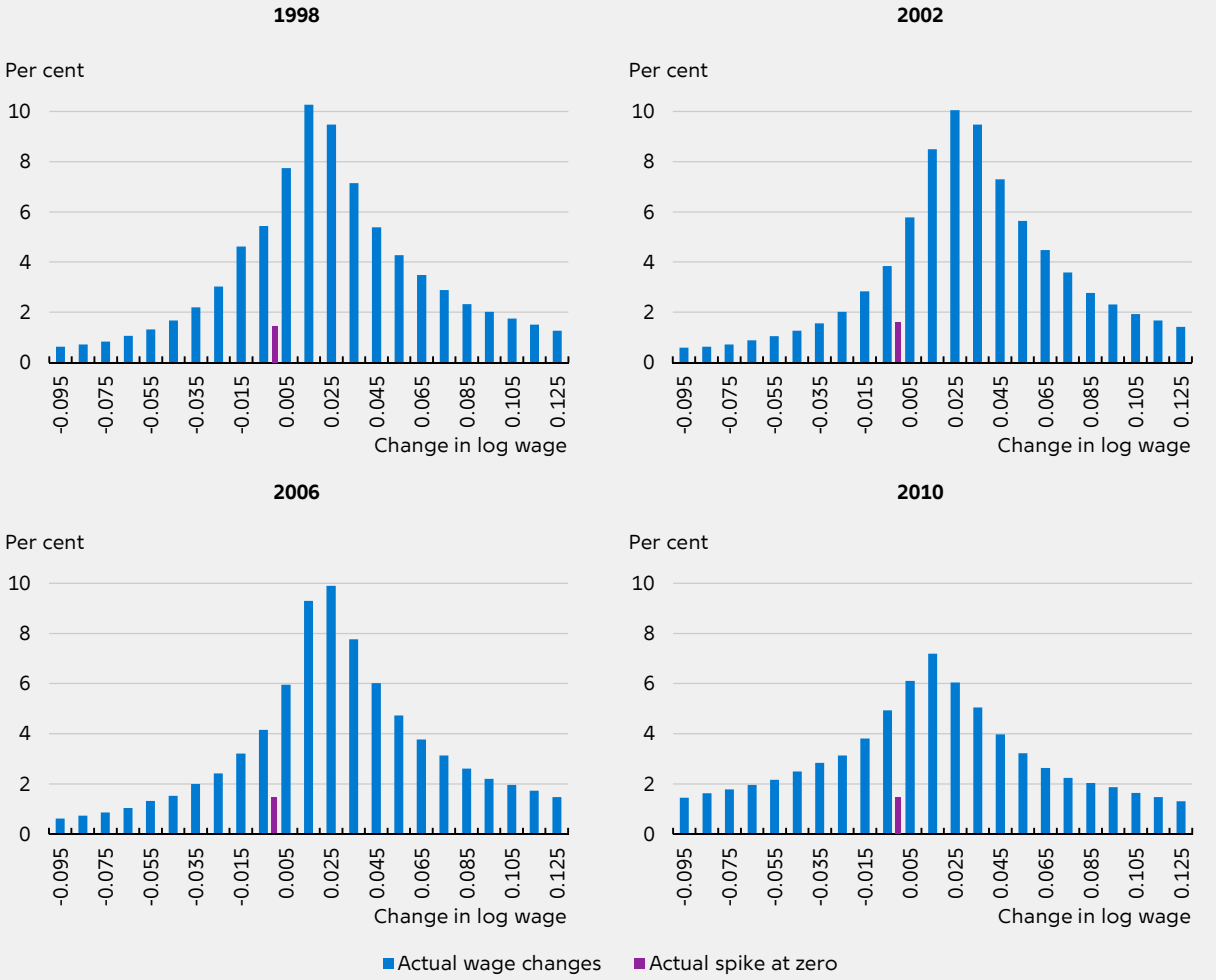


Note: The number of observations in each year is: 1998 1,173; 2002 1,601; 2006 1,909; 2010 1,915. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Manufacturing, selected years

Chart B.2

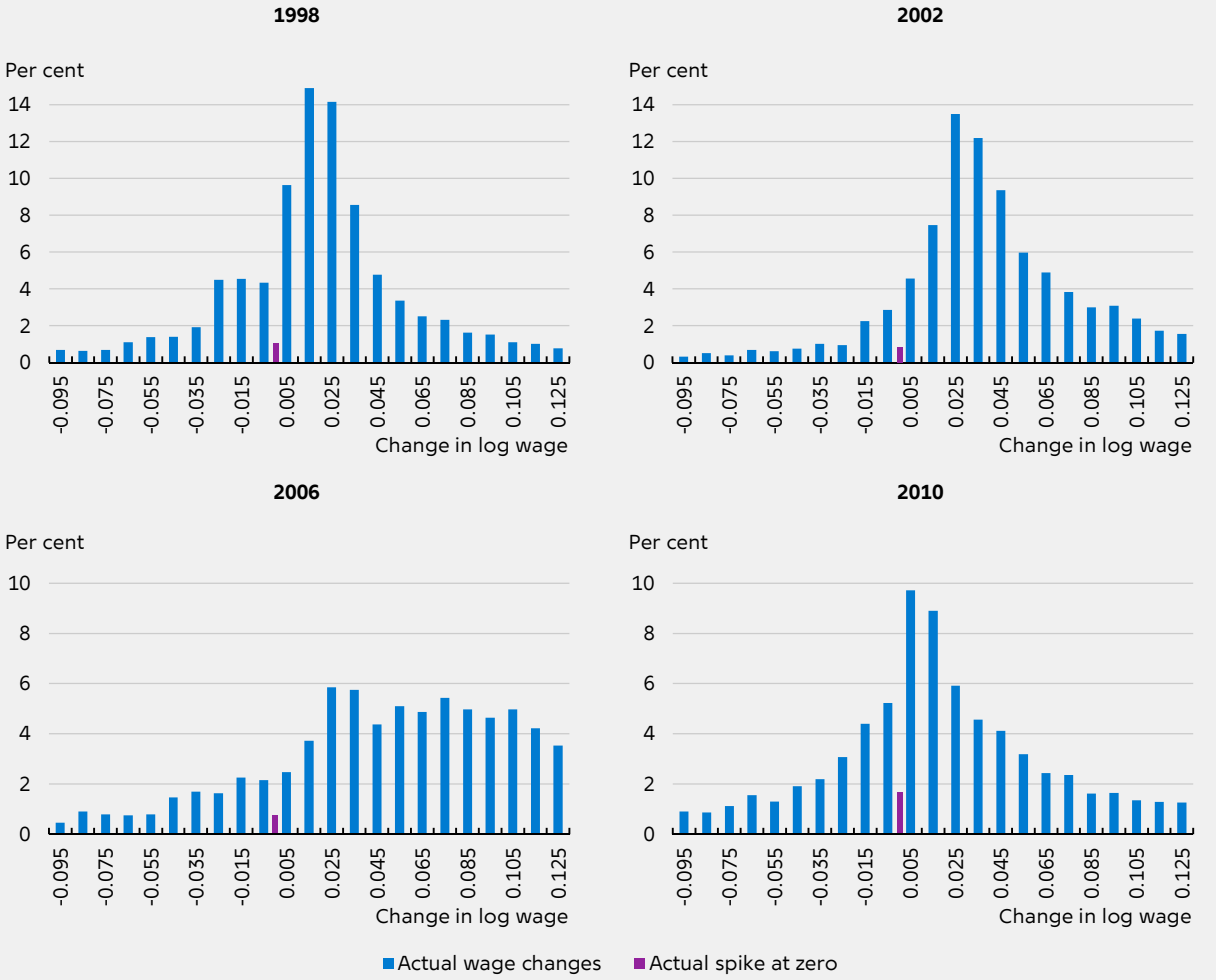


Note: The number of observations in each year is: 1998 149,826; 2002 182,147; 2006 205,780; 2010 175,288. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Electricity, gas and steam, selected years

Chart B.3

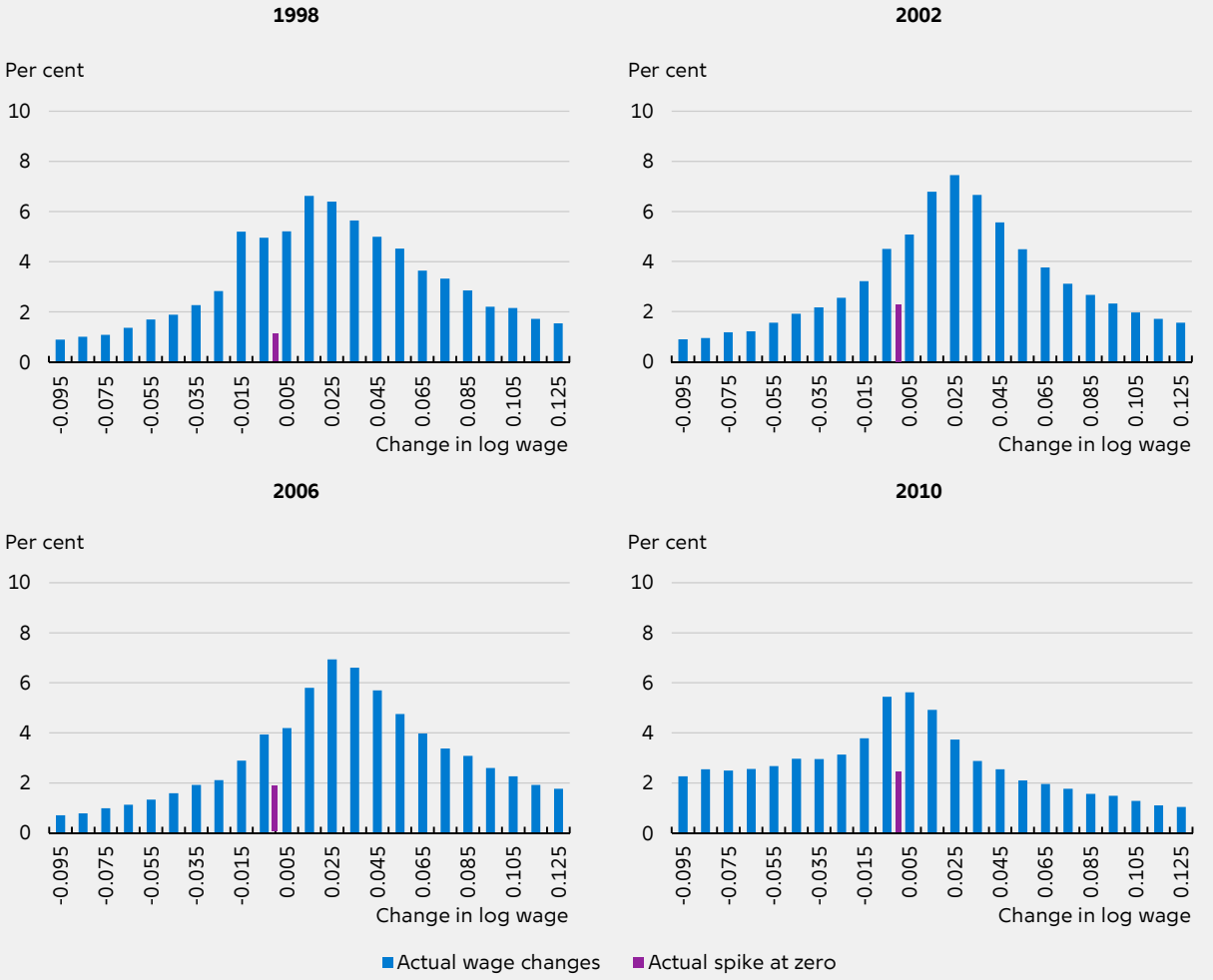


Note: The number of observations in each year is: 1998 3,631; 2002 2,764; 2006 3,061; 2010 6,043. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Construction, selected years

Chart B.4

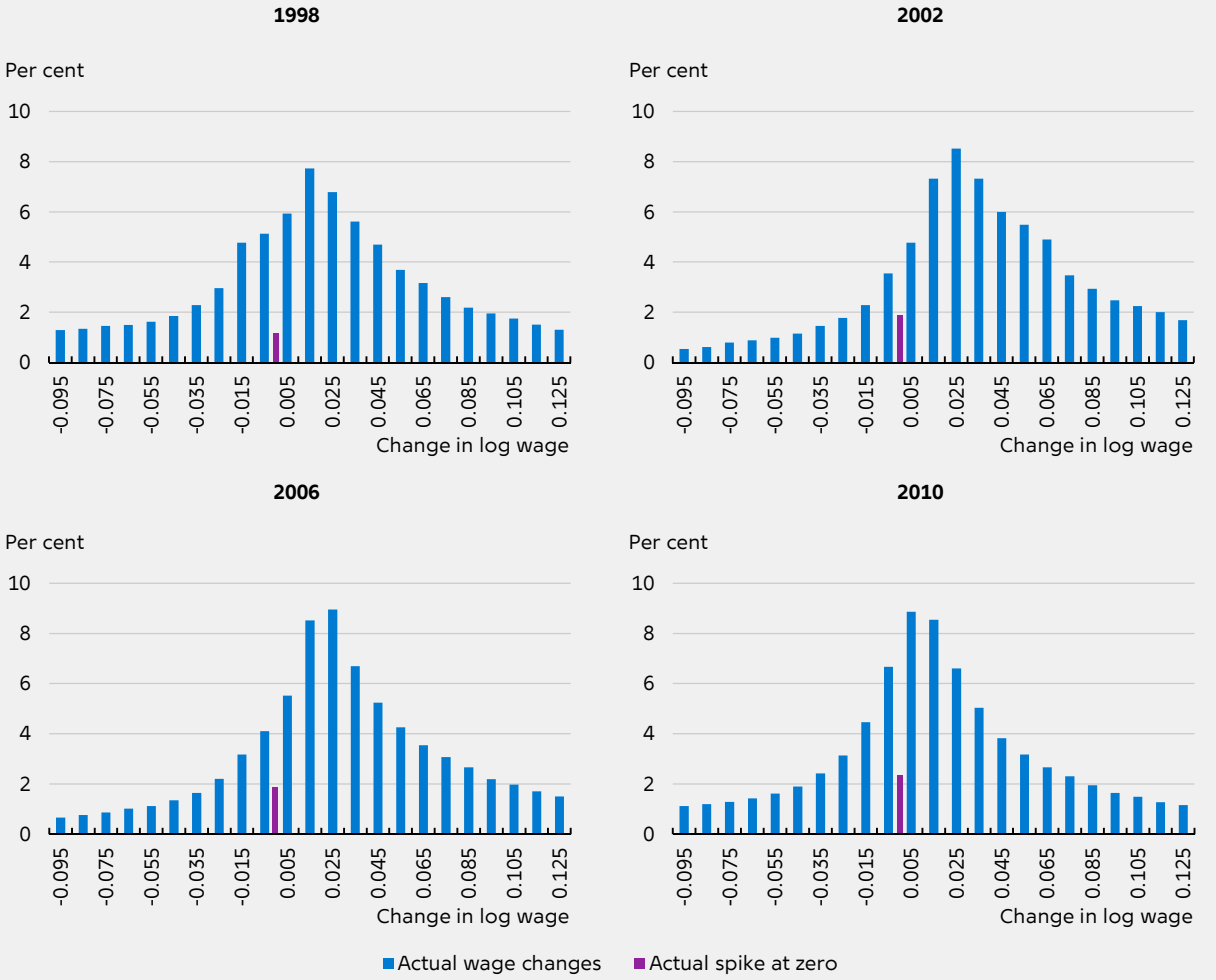


Note: The number of observations in each year is: 1998 37,214; 2002 44,134; 2006 53,900; 2010 60,291. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Wholesale and retail trade, selected years

Chart B.5

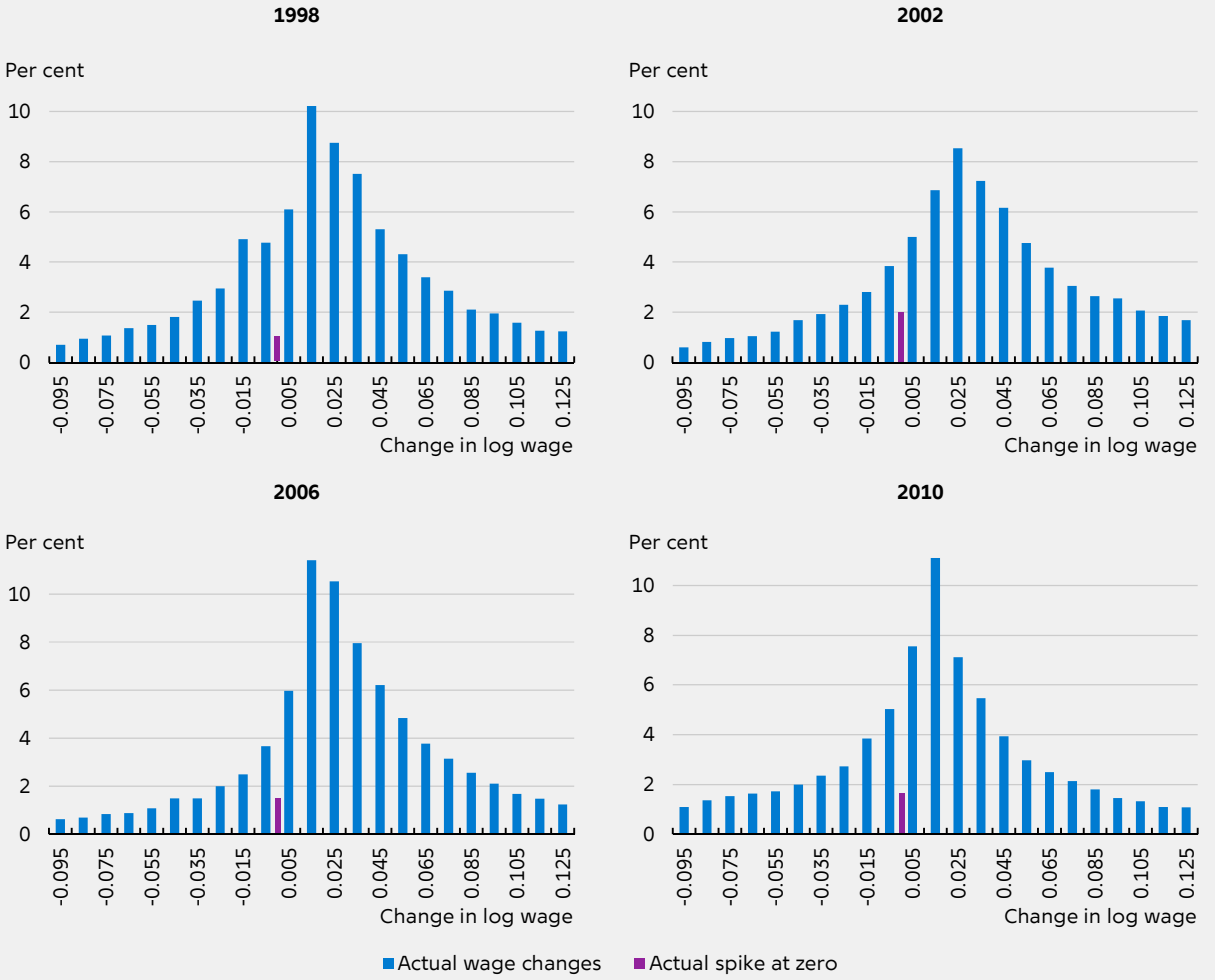


Note: The number of observations in each year is: 1998 109,393; 2002 115,635; 2006 125,497; 2010 148,695. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Transportation, selected years

Chart B.6

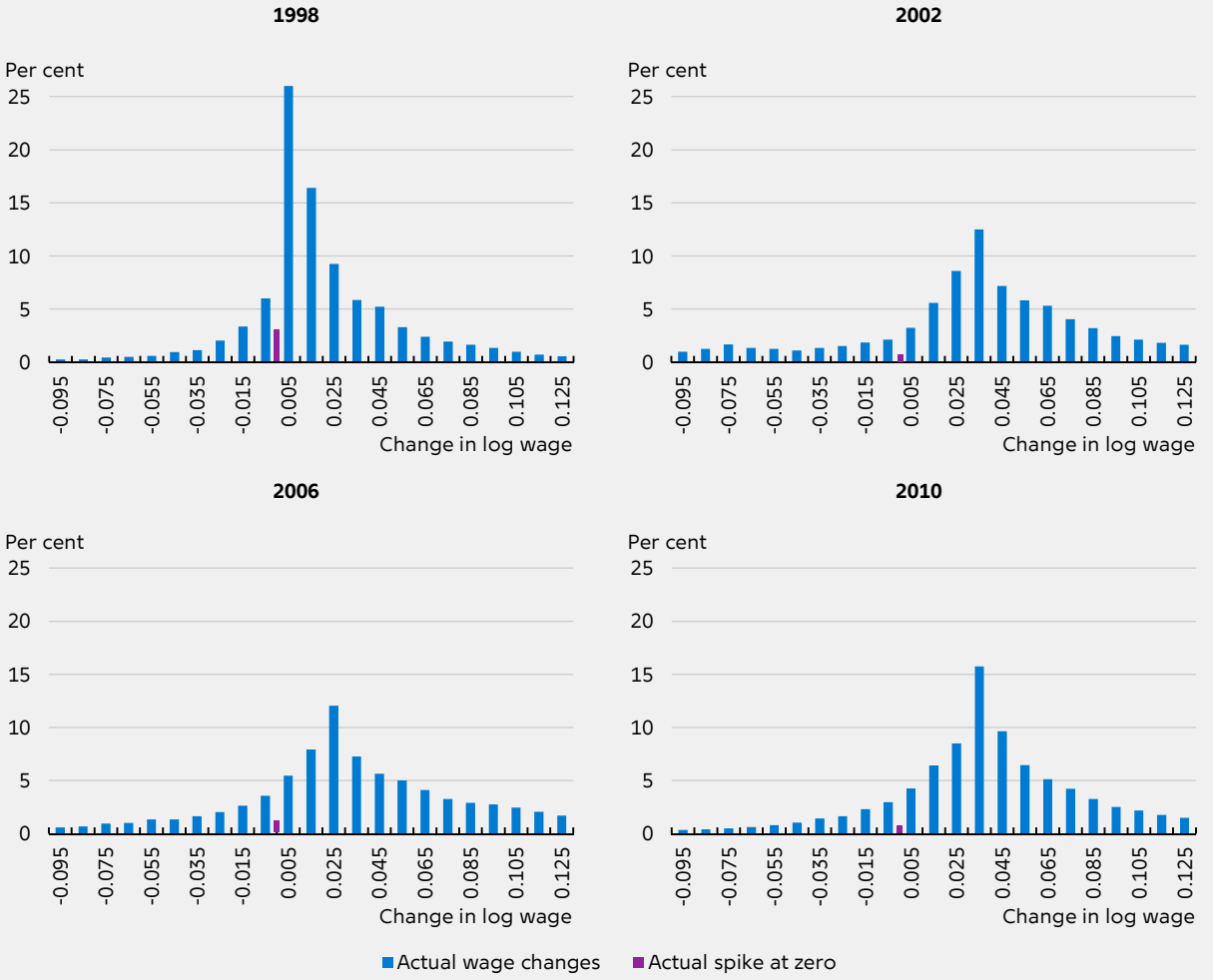


Note: The number of observations in each year is: 1998 19,486; 2002 16,291; 2006 50,727; 2010 53,770. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Financial and insurance, selected years

Chart B.7

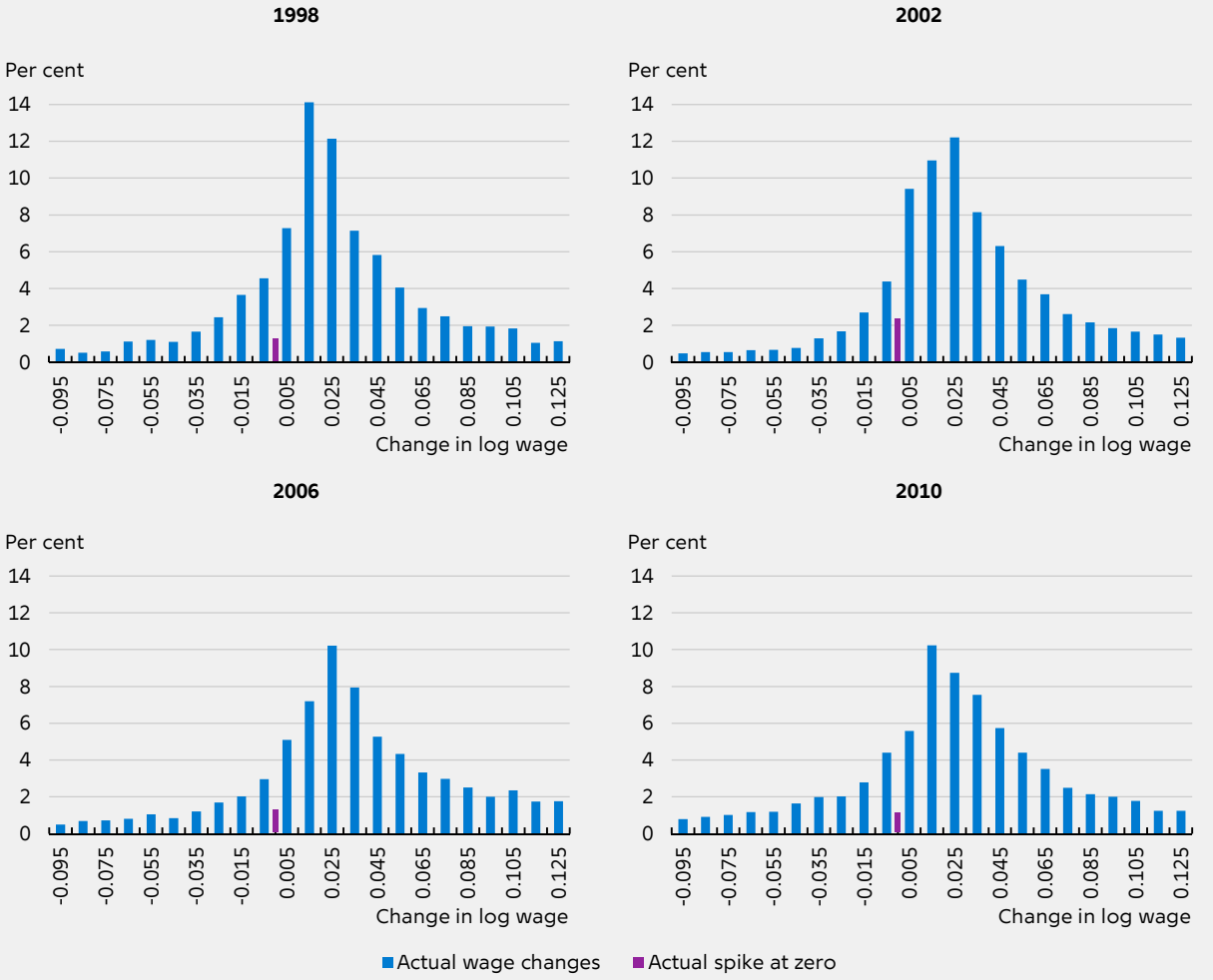


Note: The number of observations in each year is: 1998 48,630; 2002 51,028; 2006 44,705; 2010 59,855. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Real estate and dwellings, selected years

Chart B.8

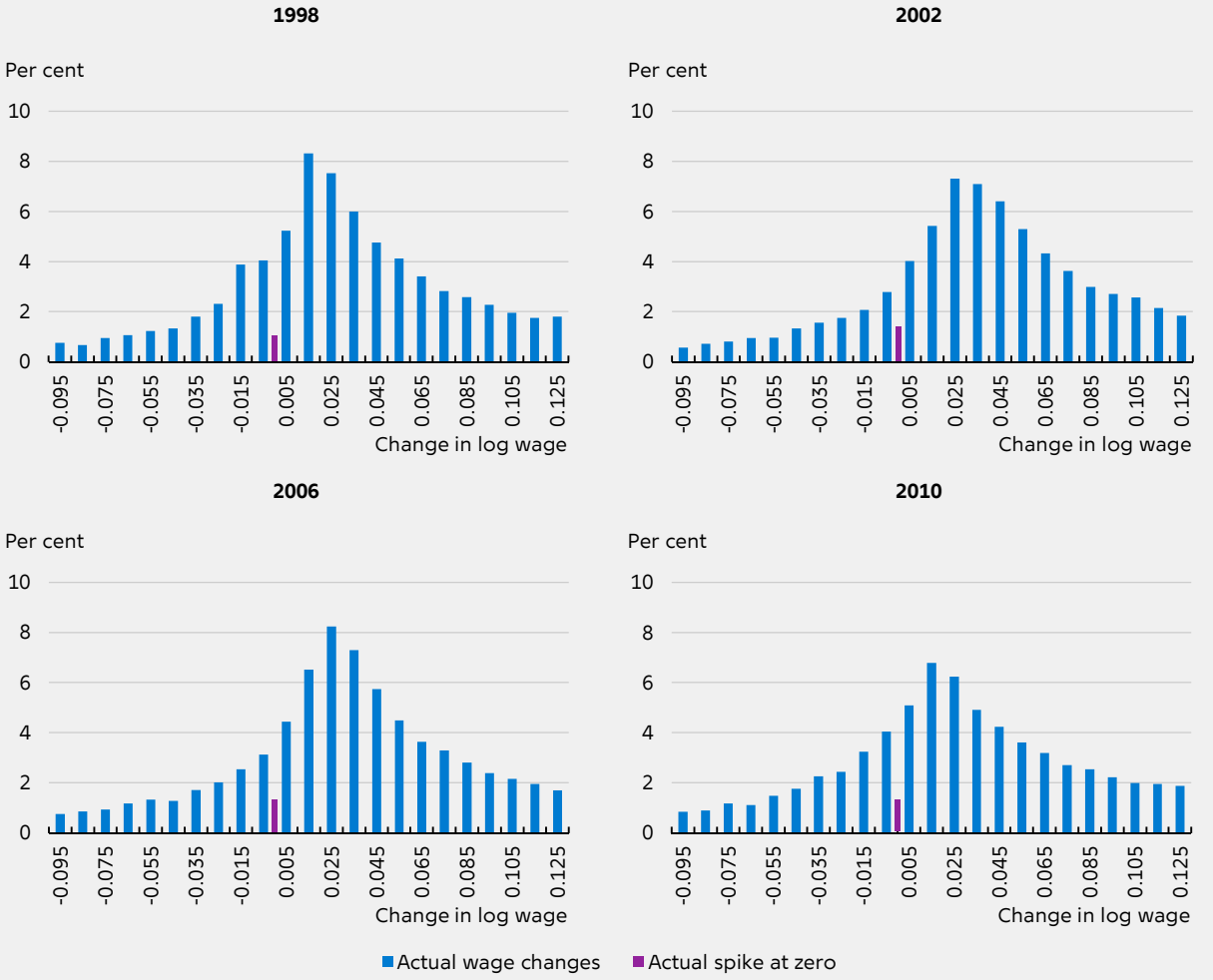


Note: The number of observations in each year is: 1998 7,564; 2002 8,474; 2006 7,053; 2010 8,734. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Knowledge-based services, selected years

Chart B.9

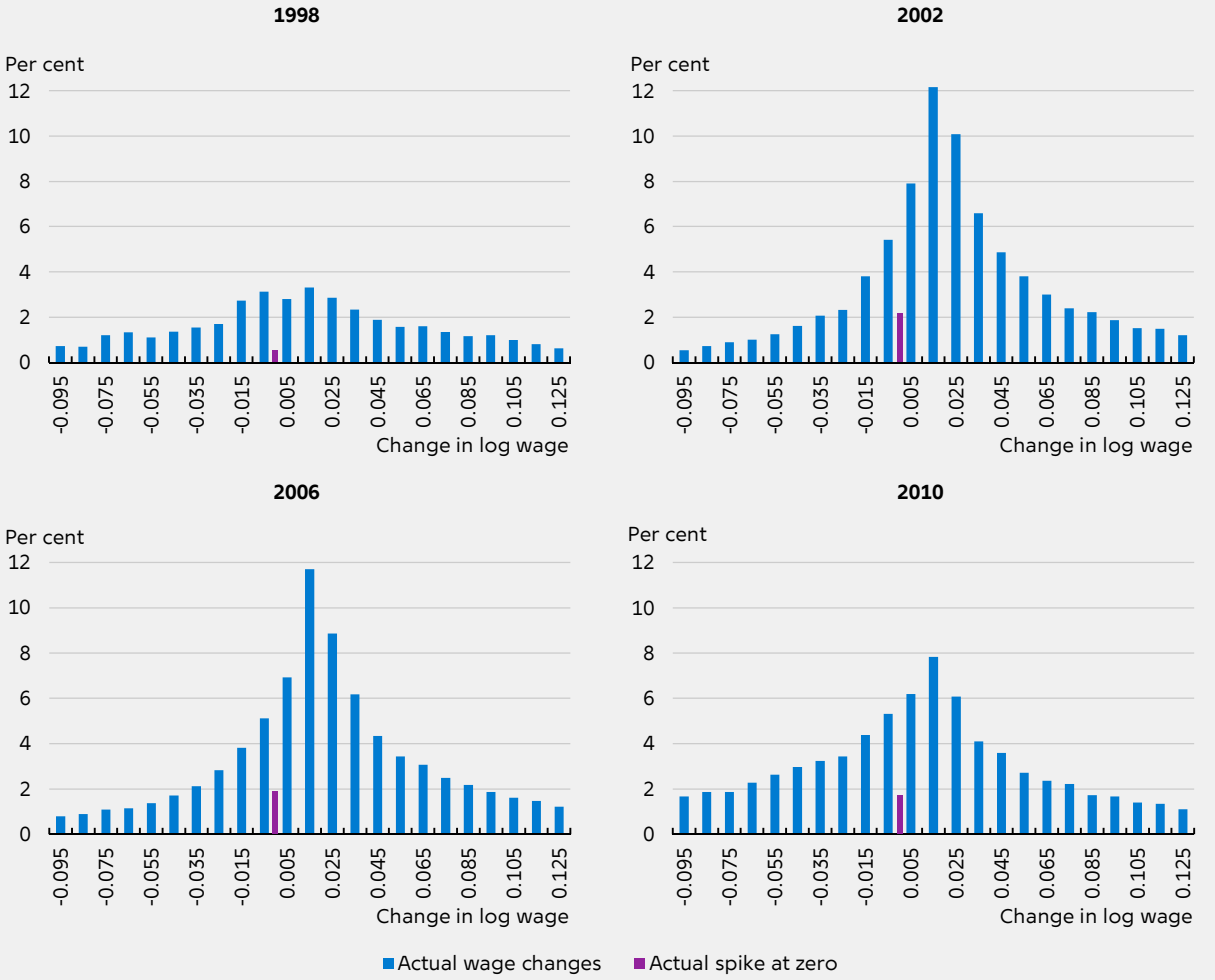


Note: The number of observations in each year is: 1998 19,150; 2002 31,009; 2006 35,564; 2010 45,532. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms for Travel agent, cleaning, etc., selected years

Chart B.10

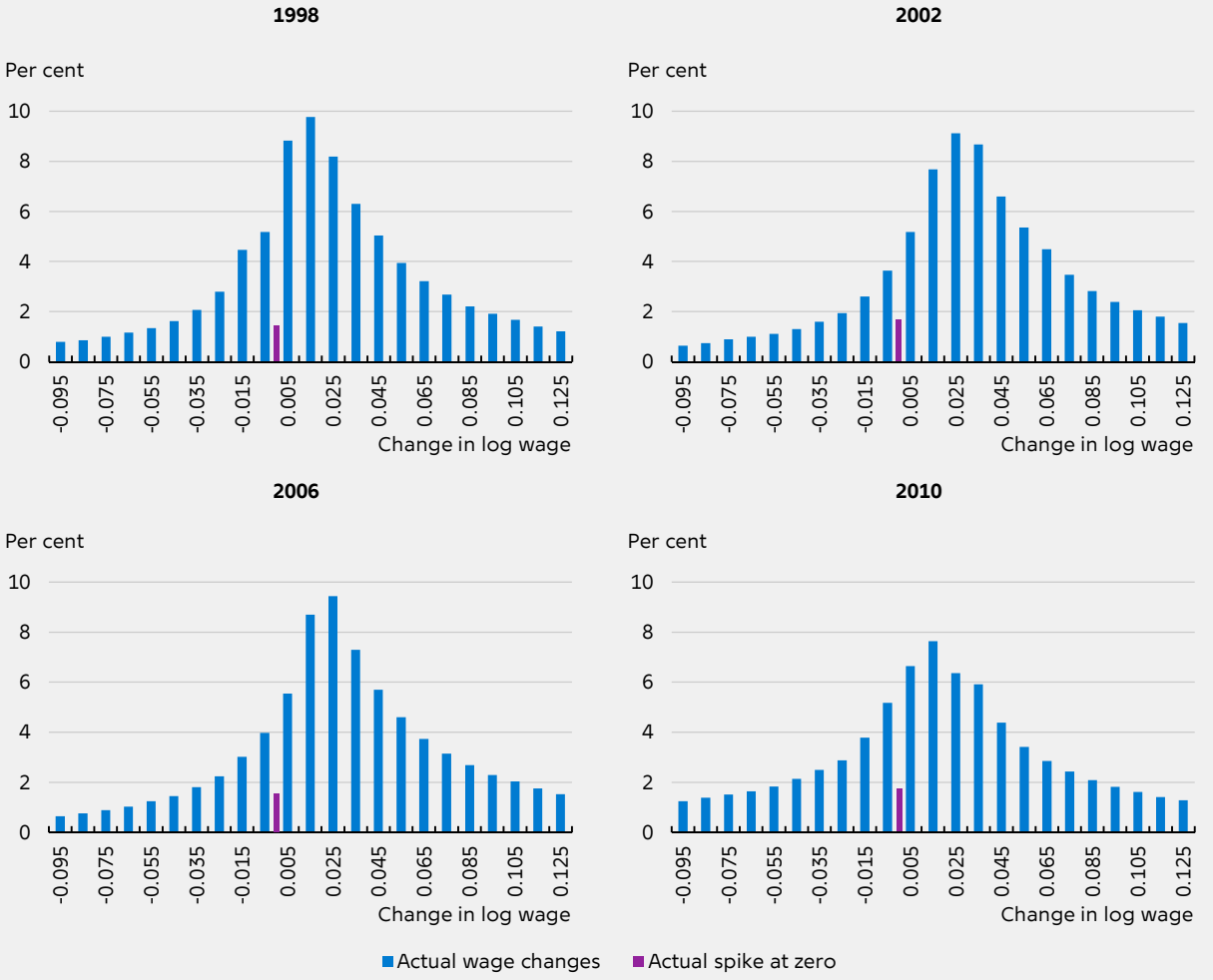


Note: The number of observations in each year is: 1998 12,113; 2002 19,293; 2006 26,084; 2010 23,394. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

Wage change histograms across all considered industries, selected years

Chart B.11



Note: The industries included are those shown in Charts A.1-A.10. The number of observations in each year is: 1998 412,981; 2002 478,981; 2006 560,630; 2010 592,191. Annual changes in the natural logarithm of remuneration per hour worked. The bins in the histograms are 1 percentage point wide, except from the two bins closest to zero, as the zero bin includes wage changes from -0.1 to 0.1 per cent, and the numbers shown on the x-axis are the mid-points of the intervals. See Section 2 for a description of the sample.

Source: Own calculations based on matched employer-employee data from Statistics Denmark.

APPENDIX C – SELECTED LIST OF IMPORTANT LABOUR-MARKET MEASURES TAKEN IN THE PERIOD 1990-2013

This appendix contains a list of important Danish labour-market reforms since 1990. The list builds on Pedersen and Riishøj (2007), but also uses Ministry of Finance (2014) as a source.

1993

- Cash-benefit recipients ("kontanthjælpsmodtagere") obtain the same right and obligation to activation that unemployment benefit recipients have had since 1978

1994 (Labour-market reform I)

- Discontinuation of the right to regain the right to unemployment benefits by activation
- Period of entitlement to unemployment benefits fixed at 7 years
- Possibility of transitional allowance for the 50-59 age group
- Improved access to take leave

1995

- Tightening of the availability rules and possible sanctions
- Right and obligation to activation after 4 years of unemployment
- Admission to transitional allowance scheme stopped

1996 (Labour-market reform II)

- Reduction of the unemployment benefit entitlement period to 5 years with full effect from 1998
- Earlier offer of activation and tightening of sanctions
- Programme aimed specifically at combating youth unemployment: After six months of unemployment, young people under the age of 25 without a qualifying education, who were entitled to unemployment benefits, obtained a right and obligation to activation at an allowance corresponding to 50 per cent of the unemployment benefits. If a young person rejected the activation offer, he or she would lose the entitlement to unemployment benefits and be transferred to reduced cash benefits.
- Unemployment benefit recipients aged 25 or more obtained a right and obligation to activation after 2 years of unemployment

1998

- Obligation for unemployed persons to take jobs outside their own field after 6 months of unemployment
- More in-depth availability assessment of cash-benefit recipients
- Cash-benefit recipients registered by the employment service

1999 (Labour-market reform III)

- Reduction of the unemployment benefit entitlement period to 4 years with full effect from 2001
- Earlier offer of activation
- Limitation of access to take leave
- All young people under the age of 25 obtained the right and obligation to activation after 6 months of unemployment
- Early-retirement reform with a view to reducing admission to the scheme

2000

- Educational leave discontinued

2001

- Tightening of availability rules

2002

- Introduction of start help benefits and reduction of introductory benefits. Granted to unemployed persons who have not been in Denmark for 7 out of 8 years
- Phasing-out of child-minding leave

2003 (Labour-market reform "More people in jobs")

- Unemployed persons must be available for work from the first day of unemployment
- Earlier offer of activation
- Standardisation and tightening of the availability rules for recipients of cash and unemployment benefits
- Tightening of sanctions against unemployed persons who are not actively seeking jobs or who fail to appear for interviews, etc.
- Reduction of the cash benefit level for certain groups

2006

- Requirement for 300 hours of work during a 2-year period for spouses who both receive cash benefits

2007 (Welfare agreement)

- Increased activation and tightened availability assessment
- Raising the early-retirement age by two years from 2019 to 2022, raising the retirement age by two years from 2024 to 2027 and indexation of age limits after 2025 based on the remaining life expectancy of 60-year-olds
- Discontinuation of the extended entitlement to unemployment benefits for persons aged 55-59 and granting of a right and obligation to activation for persons aged 58-59 in line with other unemployed persons

2010 (Fiscal consolidation agreement)

- Reduction of the unemployment benefits entitlement period from 4 to 2 years with effect from 2012 (later, in 2011, postponed to 2013).
- The work requirement for reentitlement to unemployment benefits is raised from 26 to 52 weeks of employment within three years.

2011 (Agreement on later retirement)

- By the reform the voluntary early retirement age rises from 60 years to 60½ years in 2014. The reform is fully implemented in 2023, where the voluntary early retirement age is 64 years, the pension age is 67. Thereby the eligibility period for voluntarily early retirement pension has been shortened from 5 to 3 years compared to the Welfare agreement in 2007. Thereafter both the early retirement age and the retirement age will be indexed to life expectancy.

2012 (Reform of early retirement pension and reduced-hours jobs)

- The subsidy for reduced-hours jobs is changed, and individuals with a high income can no longer receive the highest possible subsidy.
- The access to early retirement pension ("førtidspension") is limited.

2013 (Agreements on Vækstplan DK)

- The social assistance benefit level is reduced for cash-benefit recipients under the age of 30 available for education or job receives
- The implementation of the unemployment insurance reform is partly postponed in the agreement "New and better phase-in of the unemployment insurance reform", cf. Ministry of Finance (2013).