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## Rent control and unemployment duration

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### Abstract

In this paper we analyse how rent control affects the duration of individual unemployment. In a theoretical search model we distinguish between two effects of rent control. On one hand, rent control reduces housing mobility and hence mobility in the labour market. On the other hand, to maintain rent control benefits, unemployed individuals are more likely to accept job offers in the local labour market. Based on a rich Danish data set, we find that the probability of finding a local job increases with the rent control intensity of the housing unit, whereas the probability of finding a job outside the local labour market decreases with the rent control intensity.

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### 1. Introduction

Rent controls have been a permanent feature of the Danish private rental market for more than 60 years. Recently, Munch and Svarer (2002) have shown that for a typical household in the Danish private rental sector, tenancy duration is more than six years longer if the apartment belongs to the 10 percent most regulated units than if it belongs to

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the 10 percent least regulated units. The purpose of this paper is to investigate whether the reduced mobility in the housing market carries over to the labour market. The proposed mechanism is that since rent control increases costs of moving, unemployed workers enjoying rent control benefits are less likely to search for jobs outside their local labour market and to accept job offers from employers located outside their local labour market. This story is not new, and at least since Hayek's description of the repercussions of rent regulation in the labour market in Vienna in 1929 (Hayek, 1975), there has been some focus on the potential negative impacts of rent control on labour mobility. However, as far as the authors of this paper are aware, there have been no attempts to empirically establish the importance of rent control on labour market dynamics. This paper is a first step in that direction.

In order to investigate whether rent control affects the length of individual unemployment we first present a theoretical model in which unemployed workers can search for new jobs in two regions; their local labour market and the non-local labour market, i.e. the rest of the economy. The prediction from the model is that transitions from unemployment to employment in the non-local labour market is indeed hampered by the presence of rent control. On the other hand, the transition from unemployment to a new job in the local labour market is reinforced by rent control.

Our empirical analysis is based on a rich register-based data set collected by Statistics Denmark. It covers 10 percent of the adult population and contains information on labour market status, housing status and various personal characteristics in the period from 1997 to 2000. Of particular relevance is the fact that the data set allows us to construct a measure of the extent to which each housing unit is rent controlled. The rent control benefit for a housing unit is calculated as the difference between a predicted uncontrolled rent and the actual rent paid.

We find that individuals occupying housing units with relatively high rent control benefits experience longer unemployment spells compared to their less fortunate counterparts, when the transition to a job in the non-local labour market is considered. In contrast, the opposite is true when transitions to a job in the local labour market are considered. Our findings are therefore in complete accordance with the theoretical predictions.

This study contributes to the growing literature on the effects of rent control. Among economists there seems to be consensus on the negative effects of rent control on housing quantity and quality (Alston et al., 1992). Also, the opponents of rent control argue that regulations imply serious inefficiencies in the housing market. These inefficiencies range from inefficient low maintenance due to insufficient low economic profits for landlords (Gyourko and Linneman, 1990) over misallocation of housing (Glaeser and Luttmer, 2003) to reduced mobility in the housing market (Munch and Svarer, 2002). On the other hand, commentators less critical on rent control argue that the regulations provide tenants with security and therefore improve welfare for a large group of socioeconomically weak citizens in the housing market (Arnott, 2003). It has also been argued that the presence of (mild) rent control can be welfare improving since landlords have monopsony power and therefore tend to set rents above marginal cost levels. Hence, a mild rent control can distribute some of the economic rent from landlords to tenants (Arnott and Igarashi, 2000).

In sum, the net effect of rent control on efficiency and equity in the housing market is an open question, and as [Arnott \(2003\)](#) states, “.. since economically sound arguments can be made on both sides of almost any public policy debate, decisions should be based on a quantitative assessment of the proposed policy’s costs and benefits.” This paper is a contribution to the empirical literature on costs and benefits of rent control.

The paper is organized as follows. Section 2 presents a basic theoretical model. Section 3 briefly discusses the main features of the Danish housing market. The characteristics of rent control in Denmark fit well with the description of rental housing markets of several other countries. Hence, the results presented here also have implications for other countries. The data set is described in Section 4 along with a description of the calculation of rent control benefits. Section 5 contains a description of the econometric specification. In Section 6 we present the results, and in Section 7 we conclude.

## 2. The model

In this section we present a search model with two labour markets, a local labour market labelled L, and a non-local labour market labelled N, which excludes the local market. We assume that workers cannot live and work in different regions. Let  $\lambda_L$  and  $\lambda_N$  be the rates at which an unemployed individual receives job offers from region L and N, respectively, and let the wage offer distribution be  $F(w)$ . This distribution is assumed identical across regions. Unemployment benefit, which is received during periods of unemployment, is denoted by  $b$ , and rent control benefit in rent controlled housing is  $r$ . The discount rate is  $\rho$ .

To proceed we first consider an economy without rent control. Jobs are assumed to last forever, implying that the asset value of employment is

$$V^E(w) = w/\rho.$$

The expected discounted lifetime income for an unemployed,  $V^U$ , can be expressed as the solution to the asset pricing equation

$$\rho V^U = b + (\lambda_L + \lambda_N) \int \max(V^E(w) - V^U, 0) dF(w),$$

where the opportunity cost of searching while unemployed is equal to income while unemployed plus the expected capital gain attributable to searching for an acceptable job where acceptance occurs only if the value of employment,  $V^E(w)$ , exceeds that of continued search. Note, since the value of employment increases in the wage,  $w$ , and the value of unemployment does not, there exists a reservation wage,  $w^*$ , for which wages above  $w^*$  make employment more favourable than continued search. The reservation wage can be expressed as

$$w^* = b + \frac{\lambda_L + \lambda_N}{\rho} \int_{w^*}^{\bar{w}} (w - w^*) dF(w).$$

Hence, in this simple setup, the reservation wage is the same for accepting a job offer in the two labour markets.

Now, for a worker in regulated rental housing, the situation is slightly different. First of all, the value of accepting a job now depends on the location of the job. We make the assumption that moving implies a loss of the benefit associated with rent regulation<sup>2</sup>. Hence, the value of employment locally is

$$V^{ER}(w) = \frac{w + r}{\rho},$$

while the value of accepting a job in region N is  $V^E(w)$ .

The asset value of unemployment for an individual in rent regulated housing is

$$\begin{aligned} \rho V^{UR} &= b + r + \lambda_L E \max(V^{ER}(w) - V^{UR}, 0) + \lambda_N E \max(V^E(w) - V^{UR}, 0) \\ &= b + r + \frac{\lambda_L}{\rho} \int_{\rho V^{UR} - r}^{\bar{w}} (w - (\rho V^{UR} - r)) dF(w) + \frac{\lambda_N}{\rho} \int_{\rho V^{UR}}^{\bar{w}} (w - \rho V^{UR}) dF(w). \end{aligned}$$

As the equation shows, this leads to a dual reservation wage strategy; for the local labour market, the reservation wage is  $w_{RL}^* \equiv \rho V^{UR} - r$ , while for the non-local labour market, it equals  $w_{RN}^* \equiv \rho V^{UR}$ . Trivially, we have  $w_{RL}^* < w_{RN}^*$ . Thus the unemployed person is willing to accept a job at a lower wage if she can stay in her regulated apartment. The reservation wage for accepting a job outside the local labour market is higher, because it must compensate the unemployed worker for the lost rent control benefit.

To see how rent control affects the behaviour of unemployed workers, we compare their reservation wages in an economy with rent control and an economy without. That is, we want to determine the size of  $w^*$  relative to  $w_{RL}^*$  and  $w_{RN}^*$ . Rewriting the expression for the value function associated with being unemployed while living in rent regulated housing, we obtain

$$w_{RN}^* = b + r + \frac{\lambda_L}{\rho} \int_{w_{RN}^*}^{\bar{w}} (w - (w_{RN}^* - r)) dF(w) + \frac{\lambda_N}{\rho} \int_{w_{RN}^*}^{\bar{w}} (w - w_{RN}^*) dF(w).$$

<sup>2</sup> Presumably, the probability of obtaining a rent controlled housing unit in the new region is not zero. However, as rent controlled housing units are characterized by excess demand they are hard to obtain. We therefore make the rather plausible assumption that the rent control benefit is lost if the housing unit is vacated. An alternative presentation of this model is that the rent control benefit is simply a moving cost facing all individuals who decide to move. The qualitative results derived below still hold in that case.

Consider the sign of  $w^* - w_{RN}^*$ .

$$w^* - w_{RN}^* = \frac{\lambda_L + \lambda_N}{\rho} \left( \int_{w^*}^{\bar{w}} (w - w^*) dF(w) - \int_{w_{RN}^*}^{\bar{w}} (w - w_{RN}^*) dF(w) \right) - r - \frac{\lambda_L}{\rho} \left( \int_{w_{RL}^*}^{w_{RN}^*} (w - w_{RL}^*) dF(w) + r \int_{w_{RN}^*}^{\bar{w}} dF(w) \right).$$

Now assume  $w^* \geq w_{RN}^*$ . The expression in the first set of brackets is negative; the option value of search is declining in the reservation wage. In addition the remaining terms are always negative. Therefore, by contradiction, we must have  $w^* < w_{RN}^*$ .

After rearranging terms, we can write  $w_{RL}^*$  in the following way:

$$w_{RL}^* = b + \frac{\lambda_L}{\rho} \int_{w_{RL}^*}^{\bar{w}} (w - w_{RL}^*) dF(w) + \frac{\lambda_N}{\rho} \int_{w_{RN}^*}^{\bar{w}} (w - (w_{RN}^* + r)) dF(w).$$

Let us look at  $w^* - w_{RL}^*$ .

$$w^* - w_{RL}^* = \frac{\lambda_L + \lambda_N}{\rho} \left( \int_{w^*}^{\bar{w}} (w - w^*) dF(w) - \int_{w_{RL}^*}^{\bar{w}} (w - w_{RL}^*) dF(w) \right) + \frac{\lambda_N}{\rho} \left( \int_{w_{RL}^*}^{w_{RN}^*} (w - w_{RL}^*) dF(w) + r \int_{w_{RN}^*}^{\bar{w}} dF(w) \right).$$

Assume that  $w \leq w_{RL}^*$ . Now, the first component in this sum is positive, since the reservation wage is inversely related to the option value of search. The remaining components are obviously positive too, which leads to a contradiction.

**Proposition 1.**  $w_{RL}^* < w^* < w_{RN}^*$ .

To envision how the different reservation wages affect individual transitions from unemployment, we state the hazard rate out of unemployment to a job in region L and N, respectively, in a system without rent control (and moving costs), as

$$\theta_L = \lambda_L(1 - F(w^*)) \quad \text{and} \quad \theta_N = \lambda_N(1 - F(w^*)).$$

The exit rate from unemployment is the product of the arrival rate of job offers and the probability that the offer is accepted. In a system with rent control the relevant hazard rates for exit to a new job in the local labour market and the non-local labour market, respectively, are

$$\theta_{RL} = \lambda_L(1 - F(w_{RL}^*)) \quad \text{and} \quad \theta_{RN} = \lambda_N(1 - F(w_{RN}^*)),$$

It follows immediately that  $\theta_{RN} < \theta_N$  and  $\theta_L < \theta_{RL}$  so individuals in rent controlled housing have higher transition rates into employment in the local labour market, while they have lower transition rates into jobs in other regions<sup>3</sup>.

To sum up, the job search model presented in this section demonstrates that geographic mobility of unemployed workers is reduced by the presence of rent control, since unemployed workers would need to be compensated for the lost rent control benefit. Therefore, they set higher reservation wages (or search less actively) outside the local labour market, which prolongs unemployment. On the other hand, in order to maintain their rent control benefit, unemployed individuals set lower reservation wages in the local labour market, which works in the opposite direction, that is, it shortens unemployment.

Of course, if we look beyond unemployment duration, we realize that there may be other effects of rent control on the labour market. First, the willingness to commute, and hence commuting distance, should be higher for unemployed workers in rent controlled housing units. Second, in terms of matching models, by setting a lower reservation wage for local jobs, unemployed workers accept matches with lower productivity (lower wages). This leads to a loss of efficiency for the economy as a whole. Moreover, it implies that employed individuals in rent controlled housing units will conduct more on-the-job search, *ceteris paribus*, because they have more to gain.

In addition, the theoretical results derived above are based on the assumption that rent control is a small programme in the sense that its effect on the functioning of the labour market can be ignored. However, rent control is a nationwide programme, and it may therefore influence the rates at which job offers are received ( $\lambda_L$  and  $\lambda_N$ ) as well as the wage offer distribution ( $F(w)$ ). For instance, in a matching model framework, rent control may be expected to affect both the stock of unfilled local jobs and the stock of unemployed workers, and hence the rates at which job offers are received, and in addition wages may be affected. To deal with this we need to endogenize these model parameters so that they satisfy certain labour market equilibrium conditions. These effects—while potentially important—are ignored in the model above since dealing with them would greatly increase its complexity. Whether a more sophisticated model taking feedback/general equilibrium effects into account would yield the same simple testable assumptions about the effects of rent control on the hazard rates is unclear<sup>4</sup>. However, it is beyond the scope of this paper to analyse these issues in depth.

### 3. The Danish housing market and rent control

There are around 2.5 mill. housing units in the Danish housing market, which comprises four main sectors, each characterized by a different set of legal regulations. The

<sup>3</sup> It would also be of interest to determine the overall impact of rent control on unemployment duration (i.e.  $\theta_L + \theta_N$  compared to  $\theta_{RL} + \theta_{RN}$ ). However, we have been unable to establish an exact analytical relationship between these overall exit rates from unemployment, but in any case such a relationship is partly a consequence of the model specification, which may not carry over to a more general setting. Simulations based on different assumptions concerning the wage offer distribution suggest that rent control has a negative impact on the overall hazard rate out of unemployment. Therefore, we will consider this impact an empirical question.

<sup>4</sup> We are grateful to a referee for pointing this out.

four sectors are owner occupied housing (51 percent), cooperative housing (6 percent), where the occupants own a part of the cooperative and have the right to use a specific apartment, public rental housing (19 percent), which is rented housing provided by housing associations, and private rental housing (18 percent).

Residents in the owner occupied sector receive an implicit subsidy through the tax system, because imputed rents from equity invested in the house are taxed at lower effective rates than private market rents. Specifically, interest payments are deducted from capital income to arrive at taxable income, to which a tax rate of about 33 percent is applied. In contrast the property tax on a typical owner-occupied house is only about 16 percent. The Danish Tax Authorities have developed a hedonic price model to predict prices and thus tax payments for each owner occupied housing unit. This model is based on actual sales and a long list of housing traits for each unit, and we use this model in the empirical analysis below.

Cooperative housing was institutionalized in the 1970s in order to allow tenants in private rented housing to buy their property. These dwellings also receive an implicit subsidy through the tax system, because they do not pay the property tax. Additionally, a number of recently constructed cooperatives receive direct government support, which lowers the expenditure related to interest payments and amortization of the loans.

Public rental housing is basically a post-war undertaking. Housing associations are run as non-profit societies with rents basically being determined from their costs, of which interest payments and amortization of the initial capital outlay are the major components. The housing associations are directly supported by the government through reduced expenditure related to interest payments and amortization of the loans. The public rental housing associations receive an implicit subsidy through the tax system as well, because they are exempted from paying the property tax.

### *3.1. Rent control*

Rent controls have been a permanent feature of the private rental market for more than 60 years. Rents in most private rented dwellings in larger urban areas are cost-based, regulated rents. Landlords are allowed to pass on all costs (property taxes included) actually incurred in the day-to-day operation of the property and a prescribed charge to cover maintenance cost. The cost-based rent also allows for a capital charge, which can vary between 7 and 14 percent depending on the age of the dwelling. However, the capital charge is calculated on the basis of the value of the property in 1973, and allowance for inflation on this part of the rent is not permitted. Also, landlords cannot raise rents due to increased demand for housing. Thus the capital payoff is eroded by inflation and depreciation. Rents in all dwellings constructed after 1991 are exempted from rent control, but only a small number of private rented dwellings (about 6 percent) has been built since 1991.

In minor rural districts, local authorities do not impose rent control in the traditional sense. Instead rents are determined by legislation at the “value of the rental unit”, which is not a market rent. The “value of the rental unit” is determined by comparing with similar housing units in the area, and so it is a rather vague concept. However, also housing units in urban areas can be rented at the “value of the rental unit” if they are thoroughly improved when they become vacant. In this way substantial rent increases are allowed, and landlords sometimes use this route to escape rent control.

Another feature of the private rented sector is that whenever a private rented property is for sale, legislation gives current residents the right to take over the property at the offered price and convert it to a cooperative (it is solely down to the owner to decide if and when the property is put up for sale). The offered price typically reflects controlled rents, so most properties are taken over by residents under favorable conditions. As a result the total number of private rented dwellings has been in decline.

Recently, Lind (2001) has surveyed existing rent regulating systems in a number of European countries and North American cities. The main message is that rent regulation exists in many countries (e.g. Austria, Germany, Sweden, certain states in the United States, and some provinces in Canada), and that traditional rent control that keeps rents below market rents is in decline but still widespread. So even though the present analysis is based on data from the Danish housing market, its implications are valid in a much wider context.

### *3.2. Implications for the empirical procedure*

The characteristics of the Danish rent control system have implications for the empirical procedure applied below. First, the allowed capital charge depends on the age of the dwelling, such that older units yield a lower return. This means that rents tend to rise with distance to a city center, since buildings are typically oldest in city centers. Thus, rent control is least binding in rural areas, which is also reinforced by the fact that local authorities do not impose strict rent control in such areas. Second, since the introduction of rent control there has been migration from rural areas to cities, so that the rate of growth of uncontrolled rents has been higher in cities than in rural areas, and because the rent increases are cost based, this demand component also translates into rent controls being on average more intensive in cities than in rural areas. The consequence is that the intensity with which the private rented dwellings are rent controlled depends on different housing traits, most notably the proximity to a city center. This calls for a continuous measure of rent control that allows each housing unit to be controlled with different intensity. The measure of rent control intensity we propose is the rent control benefit (uncontrolled rent minus actual rent paid) as a share of the uncontrolled rent. We return to the definition of this measure—and in particular how the uncontrolled rent is measured—in Section 4.2 below.

## **4. Data**

To investigate the effect of rent control on the duration of unemployment spells, a very rich data set, which is drawn from administrative registers made available by Statistics Denmark, is employed. The complete data set consists of a 10 percent random sample of the Danish adult population, and it comprises information on a large number of demographic and socioeconomic variables as well as information about physical characteristics of all housing units occupied by the sample population in the years 1997–2000 and information about individuals labour market status. Of particular interest are the dependent variable, the length of unemployment spells, and the measure of the benefit associated with occupying a rent controlled housing unit. These variables are described in more detail below.

#### 4.1. Unemployment spells and geographical mobility

For all individuals in the original sample, weekly event histories for the states in the labour market have been constructed. Here we are interested in unemployment and employment, but other states, such as education, different leave schemes, and early retirement, are also known. The sample has been restricted to the inflow to unemployment during the years 1997–2000, that is, we construct a flow sample of unemployment spells. The duration of each unemployment spell is known in weeks, and if the subsequent destination state is employment then this is known as well.

To distinguish between workers finding jobs by being geographically mobile and workers finding jobs in the local labour market, local labour markets must be defined. A local labour market consists of municipalities between which the internal migration rate is 50 percent higher than the external migration rate, cf. Andersen (2000). There are 51 such commuting areas in Denmark. An unemployed worker is then defined to be geographically mobile if he or she gets a job and moves to another commuting area up to 8 weeks before and 52 weeks after the beginning of the job spell. This definition is based on the fact that the majority of all moves takes place within this interval, reflecting that workers typically first accept a new job and then search for a permanent new residence. Gregg et al. (2003) find a similar pattern for the UK.

The observational units are individuals living in private rental housing units. For these individuals we sample all fresh unemployment spells during the observation period. If an individual moves into another type of housing during the unemployment spell, the unemployment spell is right censored at the time of the move<sup>5</sup>. If an individual moves from one private rental housing unit to another during an unemployment spell, this is dealt with by allowing the rent control benefit to be a time-varying variable.

#### 4.2. The rent control benefit

The dependent variable in our analysis is individual unemployment duration, and during such a spell of unemployment, individuals possibly move between different housing units as noted above, so we treat our measure for rent control as a time varying regressor. The data set contains moving dates for all individuals in the sample, so their unemployment spells are divided into housing unit specific parts. For each part we then need a measure for the extent to which the unit is rent regulated.

The measure for a worker's annual benefit from rent control is taken from Munch and Svarer (2002). That is, the rent control benefit for a housing unit is the difference between the uncontrolled rent predicted for that unit and the actual rent paid on that unit. The predicted uncontrolled rent is derived from the Danish Tax Authorities (henceforth DTA) 1999 model for owner occupied housing. The DTA model is a hedonic price function for prices on the free market for owner occupied dwellings, and it is based on actual sales in the years 1996–1999 and a long list of housing traits for each unit (e.g. square meters,

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<sup>5</sup> As pointed out by a referee, this censoring scheme will lead to bias if, for example, those with a low rent control intensity are more likely to find another type of housing. However, censoring due to this reason occurs for less than 2 percent of all observations, hence we would expect such a bias to be quite small.

number of rooms, construction year, year for major improvements, floor, number of apartments in property, the presence of kitchen, shower, and toilet). In particular there is a high degree of geographical precision as each housing unit has been placed into one of more than 50,000 different areas with their own geographical coefficient. Therefore, this geographical component captures the effect of distance to city centres on the uncontrolled rent. The original purpose of the DTA model is to determine the price of the owner occupied housing units for tax reasons.

The DTA model is applied to all rented housing units to obtain the estimated uncontrolled price. The uncontrolled rent is then derived by multiplying with an estimate of user costs in Denmark<sup>6</sup>. To arrive at the rent control benefit the actual rent paid is subtracted, but this variable is only available for about 50 percent of the rented units in the data. Therefore the missing rents are estimated by the Heckman two step procedure to control for sample selection<sup>7</sup>.

In the econometric model below we use a relative measure of the rent control benefit as an explanatory variable to avoid noise caused by measurement error (see Munch and Svarer, 2002, for details). That is, we divide all housing units into deciles according to their rent control intensity, where the rent control intensity is the rent control benefit divided by the uncontrolled rent.

### 4.3. Explanatory variables and descriptive statistics

In the subsequent empirical model we also include various other explanatory variables. Specifically, we have information on the individual's age, civil status (married/cohabiting), area of residence (Copenhagen, large city, rural area), level of education (basic education, high school, vocational education and further education), unemployment insurance (UI) fund membership, wealth, and finally replacement rate. The latter is the ratio of the UI benefits they receive to the most recent wage. UI fund membership is captured by dummies for not being a member and five important UI funds; Building workers, Metal workers, Manufacturing workers, Unskilled female workers and Academics (other UI funds is the reference).

Means for the explanatory variables in the final sample are presented in Table A1 in the Appendix. Since the rent control intensity of a housing unit is closely associated with the distance to city centres, we have also presented means for the final sample divided into those living in Copenhagen, large cities and rural areas. It appears in particular that those living in Copenhagen and large cities are younger, have more education and are more often not insured against unemployment than those living in rural areas. Additionally, to get a picture of how representative the final sample is compared to the total population, the table also shows means for the total population and renters in private rental housing. It is seen

<sup>6</sup> The user cost is composed of land taxes and assessments of the real interest rate, risk premium, depreciation and expected capital gain. Only the land tax varies over housing units (depending on the municipality), but on average the user cost is 8.9 percent. It could be argued that the expected capital gain is higher in cities due to e.g. migration from rural areas. However, it has not been possible to find clear evidence for this and so this effect is ignored. More details on the derivation of the user cost level can be found in Jespersen and Munch (2001).

<sup>7</sup> For more details on this see Munch and Svarer (2002).

that the unemployed renters in the final sample are younger, have fewer children, are not as often married and have lower wealth than renters in general and even more so when compared to the total population.

In previous studies the rent control benefit has been found to be very poorly targeted among tenants in private rental housing. The tenants with lowest and highest personal wealth receive the highest benefits, while tenants in wealth decile 2, 3, and 4 receive the lowest benefits, and roughly the same picture emerges if the rent control benefit is related to personal income cf. Munch and Svarer (2002). These results are supported by a regression of the rent control benefit on several socioeconomic characteristics where household wealth and income are positively correlated with the rent control benefit cf. Jespersen and Munch (2001). Education is also found to be strongly correlated with the benefit, such that a higher level of education is associated with higher benefits.

## 5. Empirical model

This section describes the econometric model used to investigate how rent control affects individual transitions out of unemployment. We are interested in modelling the transition out of unemployment and into employment either in the local labour market or in the non-local labour market. The empirical counterparts to the transition rates defined in Section 2 are the reduced form hazard rates.

Let the continuous stochastic variable  $T$ ,  $T \in (0, \infty)$ , denote unemployment duration. The hazard rate, which denotes the probability for an individual with observed characteristics  $x$  and unobserved characteristics  $v$  of finding a job in the interval  $t+dt$  given that the individual is still unemployed at time  $t$ , is then given by

$$h(t|x, v) = \lim_{dt \rightarrow 0} \frac{P(t < T \leq t + dt | T > t, x, v)}{dt}. \quad (1)$$

The hazard function is specified as a mixed proportional hazard model. That is, the hazard is the product of the baseline hazard, which captures the time dependence and a function of observed and unobserved characteristics

$$h(t|x, v) = \lambda(t)\varphi(x, v), \quad (2)$$

where  $\lambda(t)$  is the baseline hazard and  $\varphi(x, v)$  is the scaling function specified as  $\exp(x\beta + v)$ .

Since we argued in Section 2 that the effect of rent control on the hazard rate out of unemployment depends on whether the new job is local or not, we specify a competing risks model with two destinations: 1 being employment in a new job in the local labour market and  $n$  being employment with a new employer in another region<sup>8</sup>. Let  $d_1 = \mathbb{1}_{\{j=1\}}$  and  $d_n = \mathbb{1}_{\{j=n\}}$  denote the two destination state indicators for the events in the brackets. Each cause specific hazard rate is specified as a mixed proportional hazard function. We assume that the baseline hazard rates are piecewise constant, that is  $\lambda(t) = \exp(\alpha_k)$ ,  $k=1, \dots, K$ , where  $K$  is the number of intervals for baseline hazard. Notice that the baseline

<sup>8</sup> All other destinations are treated as right censored.

hazard can be made arbitrarily flexible by increasing the number of intervals. The individual contribution to the likelihood function is given by

$$\mathcal{L}(\theta, \beta, \gamma, \nu) = \prod_{j=\{1,n\}} (\lambda_j^{k(t)} \exp[\beta_j x + \gamma_j \text{RC} + \nu_j])^{d_j} \times \exp \left( \begin{array}{c} - \sum_{j=\{1,n\}} \exp[\beta_j x + \gamma_j \text{RC} + \nu_j] \cdot \\ \left( \sum_{h=1}^{k(t)-1} \lambda_j^h (\tau_h - \tau_{h-1}) + \lambda_j^{k(t)} (t - \tau_{k(t)-1}) \right) \end{array} \right). \quad (3)$$

where RC denotes the rent control decile. To obtain the parameter estimates we apply maximum likelihood estimation on the marginal likelihood function<sup>9</sup>

$$\mathcal{L}(\lambda, \beta, \gamma) = \int \int \mathcal{L}(\lambda, \beta, \gamma, \nu) dG(\nu_1, \nu_n).$$

The likelihood function above is modified to take into account that an individual may have more than one unemployment spell. If an individual has several unemployment spells, the likelihood contributions for each spell, conditional on the unobserved variable, are multiplied, and then the unobserved variable is integrated out. The unobserved heterogeneity distribution follows a bivariate discrete distribution with  $2 \times 2$  points of support. We normalize one of the support points in each of the cause specific hazard functions to zero, since the baseline hazard acts as a constant term.

## 6. Results

Table 1 contains the results from the competing risks duration model. The parameter estimates describe the effect of the explanatory variables on the escape rate from unemployment. A positive sign implies that the specific characteristic increases the escape rate from unemployment, or put differently, reduces the expected duration of the unemployment spell. We will focus our discussion on the effect of rent control and simply note that the effects of the other explanatory variables are in accordance with other studies of individual unemployment duration and will not be discussed here.

The novel finding in Table 1 is the effect of rent control<sup>10</sup>. In line with the theoretical predictions in Section 2, unemployed individuals in private rental housing who occupy a housing unit with high levels of rent control benefits, are less likely to

<sup>9</sup> For more details on the likelihood function see e.g., Jensen and Svarer (2003).

<sup>10</sup> As noted by a referee there is a potential missing variable bias. The distance to the local city centre (or in this case the centre of the commuting area) would probably be an important determinant of the decision to accept job offers in the non-local job market. If the individual are living closer to the non-local area this would presumably increase the job acceptance rate. Unfortunately, we have no access to information about specific geographic location in terms of distance to centre of commuting area. Hence, we must interpret our results with caution as the distance effects would possibly bias the non-local effect towards 0 and would bias the local effect upwards.

Table 1  
Effects on unemployment hazard<sup>1</sup>

	New job, non-local		New job, local	
	Coeff.	Std. error	Coeff.	Std. error
Rent control intensity (/10)	<b>-0.5249</b>	0.1753	<b>0.0941</b>	0.0443
Female	<b>-0.2511</b>	0.1029	<b>-0.0586</b>	0.0263
Children in household	<b>-0.5295</b>	0.1413	<b>-0.1757</b>	0.0315
Age, 25–29	-0.1472	0.1200	-0.0308	0.0362
Age, 30–39	<b>-0.7970</b>	0.1410	<b>-0.3239</b>	0.0378
Age, 40–49	<b>-1.7673</b>	0.2162	<b>-0.5572</b>	0.0418
Age, 50+	<b>-2.5634</b>	0.3304	<b>-0.8851</b>	0.0466
Married/cohabiting	<b>0.2654</b>	0.1019	<b>0.0797</b>	0.0248
Large city	<b>1.8828</b>	0.2125	0.0507	0.0358
Rural area	<b>1.8335</b>	0.2102	0.0285	0.0335
Basic education	<b>-1.1780</b>	0.1773	<b>-0.3735</b>	0.0395
High school	0.0037	0.1682	0.0435	0.0447
Vocational education	<b>-0.6462</b>	0.1634	<b>-0.1319</b>	0.0390
UI fund membership:				
Not member of UI fund	0.2325	0.1293	<b>-0.4521</b>	0.0339
Building workers	-0.4220	0.2996	<b>0.5161</b>	0.0597
Metal workers	0.0835	0.2353	<b>0.1113</b>	0.0691
Manufacturing workers	<b>-0.4134</b>	0.1664	-0.0012	0.0340
Unskilled female workers	-0.5874	0.4118	-0.1033	0.0724
Academics	0.2364	0.2130	<b>-0.1823</b>	0.0575
Wealth (/1000000)	-0.0668	0.2717	-0.0709	0.0670
UI replacement rate	<b>-0.8043</b>	0.3468	<b>-0.4103</b>	0.0745
$\nu$	<b>2.9552</b>	0.3074	<b>1.3038</b>	0.0372
Number of individuals	14,169			
Number of spells	33,434			
Transitions to non-local	621			
Fraction right censored	32 percent			

Note: Bold figures indicate a significant coefficient at the 5 percent level.

<sup>1</sup> The estimated baseline hazard rates are not presented in the table. The cause specific hazard functions are depicted in Fig. 1. The reference categories are age 18–24, single, living in Copenhagen, high level of education, and member of a UI fund.

leave unemployment for a job outside their local labour market. Since, the rent control variable enters linearly the effect of moving up 1 decile is a decrease in the hazard rate of  $(100 \cdot (\exp(-0.5249 \cdot 0.1) - 1)) = -5.11$  percent. In contrast they are relatively more inclined to find a job in their local labour market. Here the hazard rate increases by 0.91 percent for an increase by 1 in the rent control benefits deciles. Thus in terms of unemployment duration the direct effect of rent control is ambiguous. We also estimated a single risk version of the model to assess this overall effect of rent control on unemployment duration. Due to the predominance of low mobility across labour markets, the effect is positive (and significant at the 10 percent level).

We assume explicitly that the rent control variable is exogenous. In terms of the analysis in this paper, the crucial point is whether the process that drives the

transition from unemployment to employment is somehow correlated with the process that determines the level of rent control. For example, are people who are more likely to find job quickly also more (or less) likely to obtain accommodation with high levels of rent control benefits? In the situation where the correlation between the two processes is driven by observable characteristics the inclusion of the other controls in the analysis captures these confounding effects. In the situation where the correlation is driven by some unobserved characteristics, say, the individual's attachment to the local community, where some individuals are both more likely to find jobs locally and to end up in heavily subsidized housing, our estimation strategy will give an inconsistent estimate of the effect of rent control. To obtain consistent estimates one possibility is to model the selection process jointly with the unemployment duration process. We tried this in the following way: we estimated the probability of having high vs. low rent control intensity. In this discrete choice model we included all the variables also present in the hazard model, and in addition we included an identifying variable (the exclusion restriction). This variable is the fraction of owner occupied housing units in the municipality (the best instrument available in this data set). We then simultaneously estimated the selection equation with the two hazard equations allowing for correlation between all three processes. The results showed that the sign and the size of the effects of rent control were unaffected. The standard errors on the other hand increased due to the inclusion of more variables in the model. This was especially true in the hazard into non-local jobs (there are only 621 transitions of this type in the data). In the hazard into non-local jobs the effect of rent control was therefore no longer significantly different from zero. Based on the fact that the sign and magnitude of the interesting coefficients did not change we have chosen only to report the more parsimonious model in the paper. Results from the more elaborated model are available upon request.

That individuals are inclined to stay in their local labour market, even though they are living in rental housing, is shown in [Fig. 1](#). Here the two cause specific baseline functions are drawn. The hazard rate into a new job in the local job market is markedly higher than the non-local labour market counterpart, reflecting that very few unemployed are moving to obtain employment. This phenomenon, however, is not a direct consequence of rent control. As shown by [Munch and Svarer \(2002\)](#), households living in highly rent controlled housing units are much less inclined to move, but as this baseline hazard shows, mobility is low irrespective of whether one lives in a controlled housing unit.

Thus, we must look for other potential explanations for the low level of geographical mobility among unemployed workers. In Denmark and in many other European countries, regional mobility is very low due to, e.g., easy access to early retirement schemes and disability pensions. That is, in response to unemployment workers tend to retire on favourable conditions rather than to move to find a job. In a comparison between Europe and the United States, [Decressin and Fatás \(1995\)](#) find that in Europe region-specific shocks are absorbed by adjustments in the participation rate, while workers in the United States move. Also, relatively generous unemployment benefits are typically available in Europe, and the results in [Table 1](#) suggest that the replacement rate

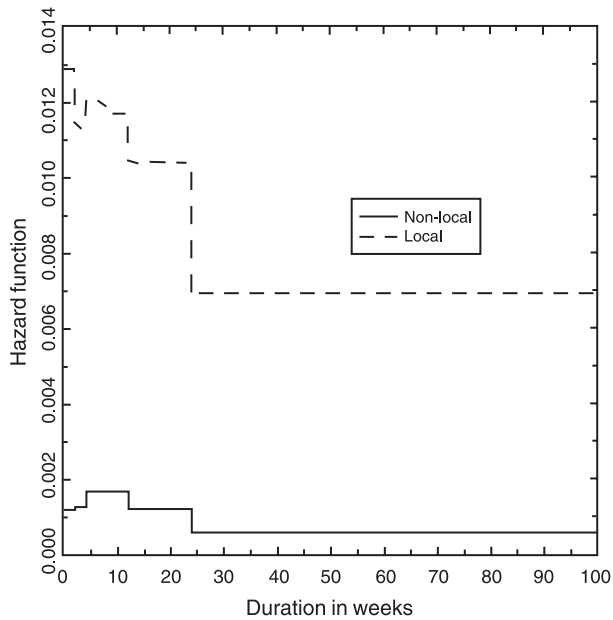


Fig. 1. Cause specific hazard functions.

of UI benefits have a stronger negative effect on the mobility hazard than on the local job hazard. Hence rent control is probably most harmful in countries where regional mobility constitutes an important tool of adjustment to shocks in the labour market (such as the United States).

## 7. Discussion and conclusion

In this paper we have investigated the effect of rent control on individual unemployment duration. We have established that the expected effect of rent control is that individuals occupying more rent controlled housing units are less likely to accept jobs outside their local labour market, whereas they are more likely to accept job offers in their local labour market, i.e., jobs that do not require a change of residence. Our empirical results confirm the theoretical predictions.

As discussed in the theoretical section, prolonged unemployment duration is not the only potential distortionary impact on the labour market generated by rent control. Another potential effect is that unemployed workers living in housing with a high intensity of rent control should be willing to accept jobs that involve longer commuting distances. We were, however, unable to find any significant association between commuting distance and rent control (results from OLS estimations are available upon request).

One interesting implication of our results in combination with the potential matching inefficiency effect discussed above is that they give some support to a proposed

mechanism through which rent control has harmful effects. [Hardman and Ioannides \(1999\)](#) establish in a theoretical growth model that rent control can adversely affect economic growth. Their argument goes as follows: since rent control makes workers less inclined to be geographically mobile, firms find it more difficult to hire the right person for the job. This in turn makes labour a more expensive input factor, and as a reaction firms substitute to capital. This increases the demand for capital, which increases the price of capital—the interest rate. The higher interest rate reduces investments and hence economic growth. The results in this paper indeed suggest that the first part of their line of reasoning finds some empirical support. We have, however, been unable to test the remainder of the argument, which will be left for future research.

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### Appendix A

Table A1  
Means for different samples

	Final sample	Copenhagen	Large city	Rural areas	Total pop.	Renters
Female	0.50	0.49	0.49	0.51	0.49	0.48
Children in household	0.24	0.18	0.16	0.28	0.59	0.33
Age, 25–29	0.25	0.29	0.34	0.22	0.11	0.19
Age, 30–39	0.27	0.30	0.24	0.27	0.23	0.24
Age, 40–49	0.14	0.13	0.09	0.15	0.22	0.15
Age, 50+	0.10	0.11	0.07	0.10	0.30	0.20
Married/cohabiting	0.42	0.37	0.41	0.44	0.65	0.41
Large city	0.21				0.15	0.18
Rural area	0.61				0.73	0.61
Basic education	0.35	0.28	0.25	0.41	0.36	0.37
High school	0.16	0.22	0.26	0.11	0.09	0.16
Vaocational education	0.33	0.24	0.30	0.37	0.35	0.29
UI fund membership:						
Not member of UI fund	0.29	0.37	0.36	0.25	0.31	0.44
Building workers	0.04	0.02	0.03	0.04	0.03	0.02
Metal workers	0.04	0.02	0.05	0.04	0.03	0.03
Manufacturing workers	0.17	0.08	0.12	0.21	0.11	0.10
Unskilled female workers	0.03	0.01	0.02	0.04	0.03	0.02
Academics	0.05	0.09	0.06	0.03	0.05	0.05
Wealth (/1000000)	−0.03	−0.02	−0.03	−0.03	0.11	0.04
UI replacement rate	0.79	0.79	0.81	0.79	0.71	0.74

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