# The Effect of Unemployment Benefit On The Length of Unemployment
## The Case of Hungary

By

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## Abstract

The aim of the paper is to investigate the partial effect of replacement rate on the job finding hazard. Since the last wage may be correlated with the unobserved characteristics of unemployed I use the change of the unemployment benefit In Hungary on 1st November 2005. The reason for that is that one part of the variance of the replacement rate is due to the change of the Labor Code which might be thought exogenous. My results suggest that the change of the replacement rate does not affect the job finding hazard of low wage earners. Contrary to this I find a large negative elasticity for middle earners and moderate effect for high wage earners.

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## 1. Introduction

At the beginning of the transition one of the most generous unemployment insurance systems was introduced in Hungary. After the early years of capitalism, not only the length of eligibility period but also of the amount of unemployment benefit was permanently decreased (Nagy, 2000, Köllő, 2008). Although the situation of the unemployed and inactive was always a hot topic in the political agenda and the unemployment benefit system was modified almost every year the economic research has a lot of unexplored areas. One of this topics is the question how the amount of unemployment benefit affects the length of unemployment spell. Although there is some related research (e.g. Köllő, Nagy, 1996, Galasi, Nagy, 2003), according to the best of my knowledge, there are no papers directly exploiting the partial affect of the amount of unemployment benefit on the length of unemployment spell in Hungary. That is why this paper measures the effect of the replacement rate on the length of unemployment benefit.

A crucial point in the estimation strategy is that the replacement rate depends on wages received in the period before entering unemployment and wages correlates with the unobserved abilities of the individuals (Atkinson and Micklewright 1991). So the body of the literature uses particular changes of the unemployment benefit system to get exogenous variation in the replacement rate to diminish problems resulting from the unobserved heterogeneity of unemployed individuals. That is why I use the change of unemployment insurance system due the modification of Labor Code on 1st November 2005. As shown below in more detail, individuals who began their unemployment spells after the change, face different amount of unemployment benefits then people who began their unemployment spell before November. In addition, the unemployment benefit was independent from the length of unemployment spell before the change of the Labor Code but it was replaced by a decreasing

time path thereafter. This change of the unemployment benefit system provides us with a significant amount of exogenous variance in the replacement rate without the modification of length and other eligibility rules of unemployment benefits. In addition, if we have a closer look at the macroeconomic circumstances and at the characteristics of the unemployed before and after the change of the Labor Code then we can see that there is no fear of policy endogenity and self selection issues at the change of the Labor Code. Since there was a large jump (not necessarily into the same direction) in unemployment benefits overnight at 31st October 2005, this time period gives such a unique opportunity to measure the effect of replacement rate on the length of unemployment benefit which is important not only for Hungary but for more broadly as well.

In my analysis, I use Cox proportional hazard model for the estimations. According to my results the replacement rate has no significant effect on the employment hazard of low earners. Around the income of the median earner I find a large and significantly negative elasticity but the results are very sensitive on the definition of the last wage. At high wage earners the estimated elasticity is approximately -0.5 independently from the estimation method. My most interesting result is that in Hungary females have larger reaction to replacement rate than males.

The paper is organized as follows. The second chapter introduces the change of the Labor Code in detail and the expected effects of the new law on the amount of unemployment benefits. The macroeconomic situation in Hungary is shown in section 3. I introduce the data in section 4. I show the results in section 5. Section 6 concludes.

## 2. Policy framework

According to the Hungarian operative regulation in 2005, the length of unemployment benefit eligibility was the number of working days in the last four years before the unemployment spell divided by 5. The maximum length was 270 days. The change of the unemployment benefit system did not affect the length of eligibility but the amount of unemployment benefit was changed twofold. First both the minimum and maximum unemployment benefit increased, second; the replacement rate between the unemployment benefit and the last wage decreased. Before the change of the Labor Code, the amount of minimum benefit was 90 percent of the minimum of the old age pension at the beginning of the unemployment spell (22,230 HUF in 2005) and the maximum was double the minimum unemployment benefit (44,460 HUF). The average wage in 2005 was 158,000 HUF (HCSO, 2012). After the change of the Labor Code a new two stage system was introduced. The length of the first stage was half of the unemployment eligibility but maximum 91 days. The new minimum unemployment benefit increased up the 60 percent of the operative minimum wage at the beginning of unemployment spell (34200 HUF in 2005). The maximum unemployment benefit during the first stage remained the double of the minimum (68400 HUF). Through the second stage, the unemployment benefit was 34200 HUF for every unemployed independently from previous earnings

During 2005, the definition of the reference wage before the unemployment spell did not change. Both before and after the change, the unemployment benefit was bound to one twelfth of labor income earned during the 365 days before the unemployment spell begun. Before the change of Labor Code, the replacement rate was 65 percent if neither the minimum nor the maxim level of unemployment benefit was binding. After the change of the Labor Code on 1$^{st}$ November 2005, the replacement rate decreased to 60 percent in the first stage of

the unemployment benefit[1]. This downward shift was a clear aggravation in the unemployment system.

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Figure 1: The replacement rate in different income groups in Hungary in 2005


To understand this complex change of unemployment benefit system is worth looking at the replacement rate conditional on the previous-wage as it is shown in Figure 1. In the figure you can see the pre-change replacement rate (solid line) and the replacement rates in first stage (dashed line) and in second stage (dash-dot line). For people earning less than 52,000 HUF during the year before the unemployment spell began on average, the new minimum unemployment benefit became an affective lower burden (Group I.). That is why their replacement increased in the same amount both in the first and second stage of

[1] Note that if somebody worked only a few months during the last year before the unemployment spell began, then the average labor income during the reckoned period could be much lower than the minimum wage. That is why the minimum replacement rate could increase above 1.

unemployment benefit. This group of unemployed can be seen at the left side of the left vertical line. For people who earned on average between 52,000 and 74,000 HUF a year-before was neither the minimum nor the maximum unemployment benefit bounding that is why they suffered a loss during both period of unemployment benefit (Group II.). As you can see the dashed line is above the dash-dot line which means their loss is even larger during the second stage then during the first stage. You can see this group between the two vertical lines. For people who earned more than 74,000 HUF monthly before the unemployment spell begun, the old maximum unemployment benefit was an effective upper bound (Group III.). That is why their unemployment benefit increased in the first stage compared to the old benefit system. On the other hand they suffered a loss in the second stage, since they only could get 34,200 HUF which is lower then the old maximum. That is why their payoff compared to the pre-change benefit strongly depended on the length of unemployment.

To understand the effects of the regulation, we should distinguish between two different channels. The first is the permanent change of replacement rate; the second is that the flat benefit path was substituted by a decreasing one.

Both static labor supply models (e.g. Mofitt and Nicholson, 1982) and dynamic job search models (e.g. Mortensen, 1977) suggest that replacement rate is inversely related to the job finding hazard. What is more, the widespread previous empirical results also support these theoretical findings. After the early work of Meyer (1990), most papers use survival analysis to find the partial effect of replacement rate on length of unemployment. The body of the literature uses specific changes in replacement rate due to regulation (Benmark et al. 2006, Carling et al. 2001, Lalive et al. 1996 and Meyer-Mok 2005). The results of the estimations tend to show that the job finding hazard is inversely related to the replacement rate and the probability of finding a job increases very fast before the exhaustion of the exhaustion of the unemployment benefit eligibility. Most papers find elasticity between -0.3 and -0.9. Some

authors argue that the generosity of unemployment benefit system is countercyclical in the sense that policy makers are encouraged to increase the amount of unemployment benefit in bad states of economy (*policy endogenity*). Contrary to this Landaies et al. (2011) do not find evidence of a different effect of replacement rate on length of unemployment in booms and recessions.

This means in our case that the job finding hazard of Group I decreases but it increases at Group II among individuals begun their unemployment spell after 1st November compared to the control population. For Group III, the effect is more complex since the replacement rate increased in first stage and decreased at the second stage. According to these basic theories if we neglect the effect of the shape of the time path, then we expect that job finding hazard decreases during the first stage and increases during the second stage.

Other research investigates the effect of decreasing time path of unemployment benefit on the job finding hazard. Most models concerning this topic assume some kind of moral hazard. These papers mostly consist of models which have a government (the principal) that cannot observe the job finding activity of unemployed (the agents). In these kinds of models the unemployed dislike job searching and make less effort to find a job then social optimum would be (Shavel and Weiss, 1979, Fredrickson and Bertil, 2001 and Kreiner and Whitta-Jacobsen, 2002). In this case the time-decreasing path of unemployment benefit would decrease the rent shirking behavior of unemployed.

Contrary to moral hazard models, Chetty (2008) claims that almost two-thirds of the unemployment lengthening effect of the unemployment benefit is caused by the liquidity constraint of the households. The author argues that without the unemployment benefit a large number of unemployed can not effectively smooth their consumption and have to accept a job offer as soon as possible independently from the promiscuous shirking behavior of job

seekers. In Chetty's opinion the negative welfare effect of decreasing unemployment can be easily underestimated.

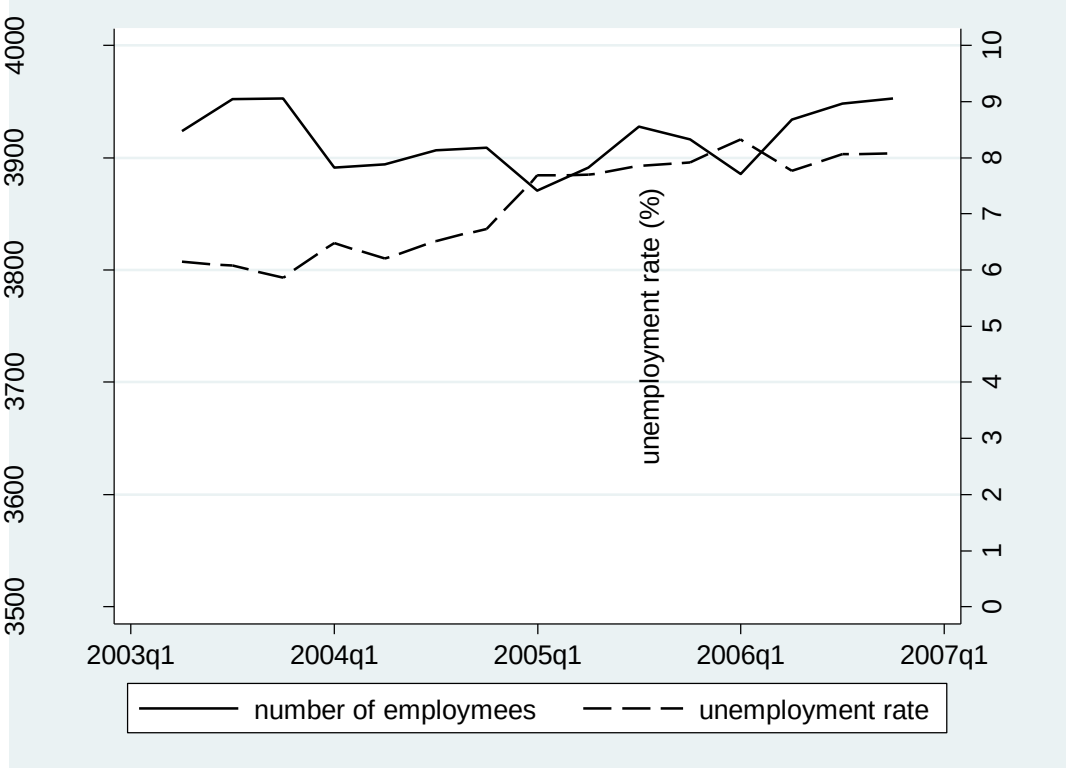
Empirical work concerning the time path of unemployment insurance was done by Hopenhayn and Nicolini (1997) and Wang and Williamson (1996). The authors compared the unemployment insurance system of the US with a time-decreasing unemployment system using calibrated macroeconomic models and find that the length of average unemployment could be decreased by the change of the benefits' time path.

The time path of unemployment benefit is an important issue in my analysis since Group III faces mainly the change of the timing of unemployment benefit and not the average amount of it. Although the economic literature stresses different mechanisms through which the time decreasing path of unemployment benefit affects job finding hazard, all of them suggest that the exit hazard from unemployment should increase in Group III.

## 3. Macroeconomic environment and policy endogenity

Since not only labor policy can change the job finding hazard but also the overall economic environment, it is crucial to analyze the state of the economic cycles around the policy change. For example, an economic recession during the change of labor policy could decrease the marginal benefit of searching effort. This phenomenon can influence the behavior of unemployed and change the estimated partial effects compared to the results without recession. The most important policy changes in Hungary in the last decade were the dramatic increase of minimum wage in 2000 and 2001 and the wage increase of public servants by 50 percent in 2002. Although we might think thank that these wage shocks had a negative employment effect, these policy decisions were much earlier than my period of study so we can assume that economy reached its new equilibrium and the adaption period was already finished. What is more, the economy did not show large turbulence around the period of my interest. As you can see in Figure 2, the unemployment rate showed a moderate increase at 2003 and 2004 which stopped at the beginning of 2005. However at the end of 2005 and the beginning of 2006 we can see a mild decrease of unemployment level which was, in my opinion, due to the change of the Labor Code.

Figure 2: The Employment level and unemployment rate in Hungary in mid-2000s




Source: Hungarian Labor Source Survey

Bennmarker et al. (2007) argues the unemployment level is not the best indicator for analyzing the macroeconomic environment during the change of unemployment benefits and recommends also the examination of the aggregate number of vacancies because it is less affected by unemployment policy. Since the Hungarian time series of registered vacancies are not reliable I show the aggregate level of employment. Although this indicator usually moves in the opposite direction than the unemployment rate it can give some useful insight on the labor market. The most important feature of aggregate employment level is that we can observe neither a clear decreasing nor an increasing trend during the period of interest. On the other hand there is an important seasonality in unemployment. That is why I think there is no fear of policy endogenity but the employment effect of seasonality should be taken into account at the estimation strategy.

## 4. Data description

My analysis is based on a special database owned by the Institute of Economics-Hungarian Academy of Sciences. My data arise from the merging of different databases containing various data about the tax payment and labor market status of individuals and transfers paid by the state to individuals. The dataset contains information about roughly 4 Million people who represent the half of the population who where between the ages of 15 and 74 in 2002. The randomization was based on day of birth. In my analysis I use the data of National Employment Service (NES) which have very precise data about the transfers paid to the unemployed and some other individual characteristics. On the other hand I supplemented the database of NES with information about working career in the last year before the unemployment spell began. These data are derived from the database of Central Administration of National Pension Insurance.

The database contains no data on the residence of employed people but only the competent employment center of the unemployment is observable. That is not a huge problem in my research since the office districts map the territory of the local labor markets. The database comes from the Statistical Database System of Settlements (T-STAR – Hungarian acronym). It is provided by the VÁTI, Hungarian Non-profit Limited Liability Company for Regional Development and Town Planning and it is cleaned by the Economic Institute of the Hungarian Academy of Science. The T-STAR contains detailed data about the demographic and economic patterns of each Hungarian settlement. From this dataset we can merge the unemployment rate and the logarithm of the average taxable income in the territory of each of the 160 employment centers. I use the data of local unemployment rate and the logarithm of average income as the proxy of the tightness of the local labor market. The weakness of this database is that it contains yearly data only.

In my analysis I used individuals who began their unemployment spell around the change of the Labor Code. I use the people who applied for unemployment benefit from 1st September until 31st October 2005 as control group and people who began their unemployment spell between 1st November 2005 and 31st December 2005 as the treatment group. As robustness check I also repeat these exercises using only a two month wide window.

I consider the unemployment spell to be continuous if the suspension was shorter than 8 days. This restriction is needed since the Hungarian regulation allows different types of breaks in the unemployment spell. According to the registration, a new unemployment spell begins after every break even if the activity during the break can not be reckoned as permanent employment in the economic point of view. The most typical intermissions in unemployment are working days with the so called Temporary Employment Booklet (become known as *blue book*). It was introduced on 1st August 2005, and its goal was to allow people working legally, who were employed occasionally by other individuals (e.g. gardening, maintaining etc.). This type of employment became widespread also in agriculture. Despite this, the work with the blue book can not been regarded as permanent work since it has to be renewed every day and people who used it was employed on the average only 20 days a year in this form (Frey, 2011).

One other restriction is that I consider the observation censored if somebody runs out of unemployment eligibility and did not find a job. The reason is that the contingent transfers, which replaces the unemployment benefit also depends on the household characteristics of the unemployed which I can not observe. The larger the transfers are somebody gets after the exhaustion of unemployment benefit, the more likely she has very poor household income conditions. Since I can not control for this effect the inclusion of these transfers would bias my estimations.

Some descriptive statistics can be seen in Table 1. The largest difference between the treated and control group is in the proportion of females. As you can see the proportion of females among people who begin their unemployment spell before 1st November is much lower compared to people who lost their job later. This is caused by the gender proposition of jobs which suffer seasonality (e.g. construction). Opposed to this we can not see large differences in the other dimensions of comparison. The unemployed people in the control group have a slightly longer eligibility but smaller average earnings before the unemployment spell. They spent approximately 8 days more between the end of the last employment spell and the beginning of the unemployment. If we look at the distribution of highest education level in the two groups we can not find large differences either. The only notable difference in this dimension is that in the control group there are a few more people with vocational school. If we look at the 2 month long window around the change of the Labor Code (columns denoted as October and November) we can not find large difference between the control and treatment group. Generally it can be said that the differences between the control and treatment group has the same signs as in the 4 month window. Although the differences between control and treatment group are usually very small in economic term, the differences are significant in a statistical sense because the number of observations are relatively large.

Table 1: Descriptive statistics (means)

| | Control | Treated | diff. | t-stat. | October | November | diff. | t-stat |
|---|---|---|---|---|---|---|---|---|
| Females | 49% | 36% | -13% | -31.6 | 0.47 | 0.414 | -5.6 | -9.6 |
| Age | 37.1 | 38 | 0.9 | 9.8 | 37.1 | 37.8 | 0.7 | 5.4 |
| | (10.7) | (10.7) | | | (10.7) | (10.7) | | |
| Length of unemployment benefit eligibility | 136.3 | 139.8 | 5.26 | 3.4 | 132.4 | 141.5 | 8.9 | 9.5 |
| | (84.3) | (72.3) | | | (83.8) | (73.6) | | |
| Average earnings last year before the unemployment spell | 80434 | 77570 | -2863 | -6.4 | 79545 | 79909 | 363 | 0.4 |
| | (54622) | (52092) | | | (54996) | (55293) | | |
| Average time between the end of the job and the beginning of unemp. spell | 58.4 | 50.3 | -8.1 | -6.3 | 57 | 58.9 | 1.9 | 1.0 |
| | (156.3) | (146.5) | | | (157.8) | (155.3) | | |
| highest education level (proportion) | | | | | | | | |
| Elementary school | 12.1% | 10.1% | -2.0% | -7.8 | 32.5% | 34.6% | 1.9% | -4.2 |
| Vocational school | 52% | 58.9% | 6.9% | 16.0 | 36.6% | 37.5% | 0.9% | 4.5 |
| High School | 21.3% | 19.0% | -2.3% | -7.0 | 22.2% | 19.7% | -2.5% | -2.7 |
| College | 14.3% | 12.1% | -2.2% | -7.8 | 8.6% | 8.2% | -0.4% | -0.5 |
| Total number of observations | 32,056 | 37,251 | | | 17,043 | 19,518 | | |

As mentioned above, the change of the Labor Code could affect the unemployed three different ways depending on previous earnings. That is why in Table 2 we can see the proportion of these groups. As you can see the middle group whose members got worse off after the change has the largest proportion and represent more than half of the unemployed both in control and treatment group. The smallest group of unemployed belongs to the winners of the new system. They represent less then one-eighth of the population. Looking at the differences between the control and the treatment group, the largest difference can be seen at the middle earners. In these groups the control group has a larger share by 6 percent. People who had the smallest and largest previous earnings are a bit underrepresented in the treatment. The differences are small but statistically significant. We can see the same pattern independently whether we look at the 4 month or the two months window. In the latter case not only the differences are smaller but the t-statistics are also closer to zero.

Table 2: Wage distribution of unemployed in 2005

| | Control | Treated | diff. | Total | October | November | diff. | Total |
|---|---|---|---|---|---|---|---|---|
| Income less then 52000 HUF | 12.1% | 10.1% | -2.0% | -7.8 | 12.1% | 10.5% | -1.6% | -4.2 |
| Income between 52000 and 74000 HUF | 52.3% | 58.9% | 6.6% | 16.0 | 53.5% | 56.2% | 2.7% | 4.6 |
| Income more then 74000 HUF | 35.6% | 31.0% | -4.6% | -11.6 | 34.4% | 33.3% | -1.1% | -1.9 |
| Total | 32,056 | 37,251 | | | 17,043 | 19,518 | | |

Since most of the unemployed got worse off after the change of the Labor Code we should check whether there are some self selection issues. According to the Hungarian regulation, the formal unemployment spell begins when somebody presents herself as unemployed at the local Employment Center. The better informed unemployed may postpone or bring forward their application for unemployment benefit which can cause an important selection bias in my estimations. On the one hand Anderson and Meyer (1997) argues that the most important factor of not taking up unemployment benefit is the belief of finding a job early on. Curei (2004) pointed out that family background and past working history may have a very important effect on the probability of take up. It is not very likely that job finding expectations and work history of applicants change due to the change of unemployment benefit system. Concerning the benefit level we should expect that the unemployed bring forward the beginning of the unemployment spell since most of them are worse off after the change. Contrary to these expectations I find that the average time between the end of a job and beginning of the unemployment spell decreased by more then a week after 1st November compared to the average length of the control group. We get the same results if we compare only people who worked in the last year and their eligibility comes from work and not other taxable income (e.g. maternity fee.).

Another possible caveat is the so called "job finding premium". (About the details see Frey, 2011) People who find a new job before the end of their eligibility expired could get half of their remaining unemployment benefit under the new code. For example if somebody was eligible for 9 months but found a job after a month of job search then in this case she

could get the unemployment benefit of 4 months in a lump sum. The opportunity cost was that if somebody asked for the job finding premium then she lost her remaining eligibility and had to collect it again from zero days. That is why only less then 2.5 percent of unemployed in my sample requisitioned the job finding premium. The proportion of this kind of person is very low and we can assume that they are significantly different from non requisitioning people so I omit them from the analysis.

A third possible caveat is the Hungarian informal economy which may bias the official statistics concerning the labor market (Elek et al. 2009). For example it is possible that some people prefer being officially unemployed and working illegally at the same time. Cremer el al. (1996) show that in this case a decreasing time path of unemployment benefit can decrease both the average length of unemployment and illegal work. In our case it is not a huge problem, since we should not think that the preferences of people toward illegal working possibilities changed significantly during the few months period I use at the estimations. Moreover, the change of unemployment benefit was very fast, the replacement changed discontinuously so we should not except the bias caused by illegal activities of unemployed significantly changes my results. Even in this case it would be interesting to estimate the effect of the new system on the legally and illegally working people differently but this would be out of the scope of the paper.

## 5. Empirical results

For the empirical analysis I use the Cox proportional hazard model (Cox, 1972) to estimate the effects of the change of the timing and the amount of unemployment benefit on the different groups based on previous earnings.

My general specification is the following

$$\ln h(t) = ln\lambda(t) + \sum_{i=1}^{3} \alpha_{1i} * \Delta rr * Group_i + \alpha_{2i} * Group_{\ i} * T + \boldsymbol{\beta} * \boldsymbol{X} + \nu$$

In this setup $\Delta rr$ denotes the change of the replacement rate due to change of the Labor Code[2]. In the baseline estimations the hazard rate is defined as the ratio of unemployment benefit and the official base of unemployment benefit (see above). $T_i$ is a dummy indicator which takes 1 if somebody begins his official unemployment spell after 1st November. $Group_i$ denotes in which category somebody belongs as introduced in Section 2. This setup is very similar to the estimation strategy of Carling et al. (2001)[3] and allows us to estimate the affect of the replacement rate separately among the three different income groups. $X$ denotes the vector of control variables. These are the gender, age age-square, education level, last wage and dummies for the last occupation. Besides this I use various proxies of labor market connection. This is the time spent between the end of last job and the beginning of the unemployment spell and the number of days when the unemployed officially worked during the year before the spell started. As mentioned above I also use some characteristics of the local labor market. These are the local unemployment rate and the logarithm of average taxable income of individuals. The estimation also contains dummies for the month of the beginning of the unemployed spell in order to control for seasonality. The

[2] Note that $\Delta \boldsymbol{rr}$ is always zero if somebody lost his job before 1st November. That is why $\Delta rr = \Delta rr * T$

[3] The difference is that the Carling et al. (2001) normalized the change of replacement rate up to 1.

weakness of month dummies is that I cannot control for both month in the treatment period since the three group dummies and the two month dummies are perfectly correlated. That is why I omit the December dummy. In this case the treatment dummies have no clear economic meaning and I do not show them.

The most basic evaluation method to measure the overall effect of the change of the unemployment benefit is using only treatment dummies. In this case it is worth including the same 4 month period in 2004 into the estimations since if we compare the job finding hazards across 2004 and 2005 then we can get rid of seasonality. Table 3 shows the regression results. The dummies show the difference in job finding hazard of unemployed who lost their job after 1st of November in 2005, compared to people who lost their job in 2004 after 1st of November.

**Table 3: The estimated effects of the change of unemployment benefit on different social groups**

| | 4 months window | | | 2 months window | | |
|---|---|---|---|---|---|---|
| VARIABLES | Together | Males | Females | Together | Males | Females |
| Group I. * Treatment | -0.121* | -0.087 | -0.133 | -0.208** | -0.232 | -0.193 |
| | (0.062) | (0.089) | (0.087) | (0.092) | (0.143) | (0.122) |
| Group II. * Treatment | 0.023 | 0.020 | 0.014 | -0.042 | -0.086 | 0.002 |
| | (0.029) | (0.037) | (0.047) | (0.042) | (0.057) | (0.064) |
| Group III. * Treatment | 0.0072 | 0.043 | -0.011 | -0.084* | -0.094 | -0.077 |
| | (0.032) | (0.041) | (0.051) | (0.044) | (0.059) | (0.068) |
| Number of spells | 98619 | 57319 | 41300 | 51771 | 29357 | 22414 |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: Results of Cox proportional hazards models. The reference is a male individual with less then finished elementary school in the control group. Personal and labor market control variables and occupation dummies are added to every regression.

The most robust results are estimated for Group I. We can see negative partial effects in every case both in the 4 months window and the 2 months window. This result is in line with our expectations since the replacement rate for this group increased due to the increase of the minimum unemployment benefit. According to the results the increase of the replacement rate in this group decreased the job finding hazard approximately by 12-21 percent. However,

if I re-estimate the equation separately for males and females we can not find any significant effects but the sign remains economically reasonable. At the higher income groups we can not find so solid results. The estimated partial effects are low and none of them are statistically significant at the 5 percent level. The sign of the estimated effects have different sign in the two months sample. For example I estimated a positive partial effect on job finding hazard for the Group III in the four months window but a negative partial effect in the two months window. One possible reason for the lack of significant effects is that measuring with a single dummy is not an efficient way of the measurement. The replacement rate changed differently on the individual level which can not been got hold of using only group level dummies. Another drawback is that these estimations also contain data from 2004 which renders the evaluation more difficult. For these reasons I think the specifications where the replacement rate is measured on individual level are more reliable.

**Table 4a: The affect of replacement rate on the length of unemployment (official definition)**

| | 4 months window | | | 2 months window | | |
|---|---|---|---|---|---|---|
| VARIABLES | Together | Males | Females | Together | Males | Females |
| Change of replacement rate * Group I. | -0.311 | -0.395 | -0.185 | -0.001 | 0.361 | -0.257 |
| | (0.289) | (0.446) | (0.378) | (0.386) | (0.640) | (0.493) |
| Change of replacement rate * Group II. | -2.986*** | -2.872*** | -2.847*** | -4.028*** | -3.830*** | -4.077*** |
| | (0.437) | (0.531) | (0.770) | (0.681) | (0.911) | (1.035) |
| Change of replacement rate * Group III. | -0.996*** | -0.946*** | -0.869*** | -1.183*** | -0.860** | -1.557*** |
| | (0.174) | (0.221) | (0.280) | (0.273) | (0.358) | (0.426) |
| Number of spells | 68154 | 40851 | 27303 | 31759 | 18068 | 13691 |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: Results of Cox proportional hazards models. The reference is a male individual with less then finished elementary school in the control group. Personal and labor market control variables and occupation dummies are added to every regression.



In Table 4a, we can see the results of the most preferred estimations. For example, the second partial effect in the first column means that if the replacement rate increases with one percentage point in the middle income group (Group II) then the job finding hazard decreases

by 2.9 percent. Since the average replacement rate is approximately 60% in this group, this means that the 1 percentage point equals 1/0.6=1.66%. The quotient of these numbers implies us approximately the elasticity of 2.9/1.66=1.7**.** Although the literature mostly finds elasticity between 0.3 and 0.9 in absolute value, this result is not unprecedented. For example Bennmarker et al. (2001) also find the elasticity to be approximately 1.6. What is more, Abring et al. (2005) estimates suggest that this elasticity to be between 2 and 5 depending on the specification. If we look at the smaller window then the estimated effect of the replacement rate is somewhat higher. A one percentage point increase of unemployment benefit decreases the reemployment hazard by approximately four percent which is consistent with the elasticity of 2.4 in absolute value.

One of the most important results is that at the higher and lover end of the income distribution the estimated partial effects are smaller than in the middle. In Group I. the estimated partial effect is not only much smaller but also statistically insignificant. The reason for this could be that low earners, who are just weakly connected to the labor market, face some labor demand constraints. For example, some economists argue that the high level of minimum wage in Hungary was an effective lower bound of wages and strongly restrains the job finding possibilities of low skilled workers at the middle of the decade (Benedek et al. 2007).

In Group III the replacement rate has a significant effect on the length of unemployment but the estimated partial effect is much smaller then at the middle income group. According to my estimates a one percentage point increase of replacement rate decreases the length of unemployment by 1 percentage. Since the average replacement rate of this group was 47 percent, this partial effect is approximately equivalent with an elasticity of 0.5. This elasticity is smaller because the unemployment benefit is relatively small compared

to the wage income of high earner individuals so the change of unemployment benefit has only a lower encouraging effect on them.

### 5.1 Robustness checks

The most difficult part of the analysis is defining the replacement rate for people who do not work permanently and do not begin the unemployment spell right after the employment ended. The problem in this case is that it is not clear what people think to be their last wage or reference income. That is why I also repeated the estimations on a subsample where people work permanently before the unemployment spell began and there was less then 45 days between the end of the employment and the beginning of the official unemployment spell. The regression result can be seen in Appendix since this kind of selection did not affect the results notably.

One other weakness of my exercise could be that people only care about the wage in the last period of employment and not a year-long time. That is why I also used another kind of wage definition. In this case, I calculated the wage income of people during the last 90 days before the last working day and divided by three to get a proxy of the monthly wage income.[4] I used a longer period and not only one month to be able to calculate reasonable wage income for people who work occasionally or was employed at different workplaces at the same time. The estimated results with the new replacement rate are shown in Table 4b. In this case I omitted the observations where the replacement rate was larger then one. The reason for the omission is that in most of the cases the change of replacement rate is less then 10 percent but if somebody worked only one or two days in this 90 day long period then the calculated replacement rate could increase even over 10 and could greatly affect the estimations. As you can see in table 4b approximately one third of the observations were dropped out compared to the previous regressions.

[4] This method simply gives the monthly wage for people who worked permanently during these months.

Table 5b: The affect of replacement rate on the length of unemployment (based on he average of the last 3 month)

| | 4 months window | | | 2 months window | | |
|---|---|---|---|---|---|---|
| VARIABLES | Together | Males | Females | Together | Males | Females |
| Change of replacement rate * Group I. | -0.202 | -1.153 | 0.158 | 0.038 | -1.436 | 0.398 |
| | (0.604) | (1.116) | (0.715) | (0.706) | (1.741) | (0.769) |
| Change of replacement rate * Group II. | 0.053 | 0.336 | -0.335 | -0.439 | -1.227 | 0.036 |
| | (0.365) | (0.540) | (0.506) | (0.579) | (0.843) | (0.769) |
| Change of replacement rate * Group III. | -0.614** | -0.387 | -0.891** | -1.137*** | -0.675 | -1.450*** |
| | (0.277) | (0.447) | (0.353) | (0.432) | (0.863) | (0.497) |
| Number of spells | 42811 | 25369 | 17442 | 20583 | 11647 | 8936 |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: Results of Cox proportional hazards models. The reference a male individual with less then finished elementary school in the control group. Personal and labor market control variables and occupation dummies are added to every regression.

The most important difference between Table 4a and 4b is in the estimated partial effect of replacement rate in Group II. Using the second definition of replacement rate, we do not find statistically significant effects for Group II and the point estimates show also much larger differences than the previous results. The reason for this can be that the calculated replacement rate strongly depends on the number of working days during the last three month before the job loss. The number of working days is inversely related to the replacement rate in these specifications but it is not clear that individuals also care as much about the number of working days as this method suggest. In other words, we do not know how individuals working only a few days a month or multiple job holders conceive of their monthly wage. One possible difference between the personal judgments and calculated monthly wage is that the unemployed take their weekly or hourly wage as reference point. If it is true then this method underestimates the personal judgment of replacement rate of part time workers and overestimate of the multiple job holders. That is why this method can only noisily measure the individuals' judgment about their monthly wage. If the difference between the calculated and subjectively observed wage is not correlated with the personal characteristics then this kind of imprecision of measurement leads to classical measurement error. The opposite of this could also be true.

It is possible that the official base of unemployment benefit is “too smooth” compared to the personal judgments of the individuals since it is the average monthly wage earned during a whole year. In this case the estimates of Table 4a can be an upper bound of the estimates. If somebody has high average earnings (belongs to Group III) then she also most likely works permanently. In this case the attenuation bias should be also smaller. That is why our point estimates are much closer to the results above.

## 6. Conclusion

The aim of the paper was to estimate the elasticity of job finding hazard of unemployed on the amount of the unemployment benefit. This is an important topic in Hungary since the situation of unemployed is a perpetual topic of the public and political agenda. In addition, there was no detailed research on this topic in Hungary and my identification strategy is based on an exogenous variation of the UE system, and thus it can diminish several problems which probably contaminated results of previous research.

For the estimation I used a particular change of the unemployment benefit system on 1st November, 2005. The change of the unemployment benefits only affected the amount of the benefit but left the length of the eligibility unchanged. What is more, only the starting date of unemployment spell determined the amount of unemployment benefit. I also argued that there was no fear of policy endogenity and self selection of unemployed. I compared unemployed who had the same attributes but they begin their unemployment benefit in opposite side of the cut off point so in this setup the amount of unemployment benefit can be regarded as exogenous. I fit Cox proportional hazard model because in these case it is not needed to make assumption on the shape of the baseline hazard.

Since the change of the unemployment benefit has different effects on individuals with different previous earning I allowed the replacement rate to have different effects on individuals with different previous earnings. According to my results the replacement rate has no significant effect on individuals with low previous income. One possible explanation for this may be that this type of unemployed faced labor demand constraints. The results for unemployed with average previous labor income are the most contradictory. Although I estimated larger partial effects than the literature usually finds the results strongly depended on the definition of the last wage. On the other hand the most robust result is that the high

wage earners' replacement elasticity of job finding hazard rose to be approximately -0.5 which suits the international results.

From an economic policy view my results has several implications. Since I do not find evidence that the increase of unemployment benefit decreases job finding hazard. That is why the unemployment benefit of low wage earners seems to be a tool of social policy rather than a disincentive of job searching effort. On the other hand the decrease of the maximum amount of unemployment benefit could increase job finding hazard in Hungary. However the government should take into account the welfare loss of unemployed if it decides to decrease the unemployment benefit.

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# Appendix

**Table A1: The affect of replacement rate on the length of unemployment (official definition), only people who spent less then 45 days between the end of employment and the beginning of the unemployment spell**

| | 4 months window | | | 2 months window | | |
|---|---|---|---|---|---|---|
| VARIABLES | Together | Males | Females | Together | Males | Females |
| Change of replacement rate X Group I. | -0.256 | -0.446 | -0.0292 | 0.467 | 0.749 | 0.181 |
| | (0.343) | (0.524) | (0.458) | (0.480) | (0.756) | (0.641) |
| Change of replacement rate X Group II. | -3.059*** | -3.005*** | -2.545*** | -4.025*** | -4.109*** | -3.559*** |
| | (0.474) | (0.564) | (0.886) | (0.765) | (0.998) | (1.213) |
| Change of replacement rate X Group III. | -0.914*** | -0.909*** | -0.594* | -1.163*** | -0.922** | -1.391*** |
| | (0.195) | (0.245) | (0.319) | (0.322) | (0.420) | (0.505) |
| Number of spells | 43065 | 26545 | 16520 | 20309 | 11915 | 8394 |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: Results of Cox proportional hazards models. The reference a male individual with less then finished elementary school in the control group. He begun his unemployment spell at the first mont of the time window.

Table A2: **The affect of replacement rate on the length of unemployment (official definition), only people who spent less then 45 days between the end of employment and the beginning of the unemployment spell and worked more then 180 days before the unemployment spell started**

| | 4 months window | | | 2 months window | | |
|---|---|---|---|---|---|---|
| VARIABLES | Together | Males | Females | Together | Males | Females |
| Change of replacement rate X Group I. | -0.0141 | 0.0214 | -0.00209 | 0.579 | 0.968 | 0.255 |
| | (0.362) | (0.548) | (0.475) | (0.505) | (0.789) | (0.685) |
| Change of replacement rate X Group II. | -3.154*** | -3.191*** | -2.395*** | -3.872*** | -3.936*** | -3.446*** |
| | (0.494) | (0.586) | (0.923) | (0.782) | (1.021) | (1.236) |
| Change of replacement rate X Group III. | -0.902*** | -0.890*** | -0.575* | -1.147*** | -0.881** | -1.433*** |
| | (0.200) | (0.251) | (0.332) | (0.332) | (0.429) | (0.529) |
| Number of spells | 37693 | 23302 | 14391 | 17615 | 10301 | 7314 |

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1
Note: Results of Cox proportional hazards models. The reference a male individual with less then finished elementary school in the control group. Personal and labor market control variables and occupation dummies are added to every regression.