Inactivity in Hungary – the impact of the pension system*

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Preliminary, do not quote!

Abstract

This paper looks at the very low activity of the elderly in Hungary during the 1990s and early 2000s. Although we do know that the social security system has substantial influence on this phenomenon, the actual mechanism is not well documented. Examining the incentive structure of the Hungarian old-age and disability pension system reveals that it provides very little to no incentive for extending active life. It is an accessible exit route from the labour market that provides a minimal but secure income flow. It seems that the average Hungarian household accommodates to this possibility and does not seek alternative income sources.

In this paper I argue that inactive retirement is a absorbing state, from which almost nobody shifts to activity over time. Using panel household survey data I look at the level and structure of income and expenditure of households where an individual shifts from non-pensioner to pensioner status. These changes reflect that pensioners on average do not seek additional income sources, but rather accommodate the income drop associated with the transition to inactivity. Finally a simple model of retirement decision is estimated. Results support the hypothesis that incentives provided jointly by the labour market and the pension system make retirement very attractive.

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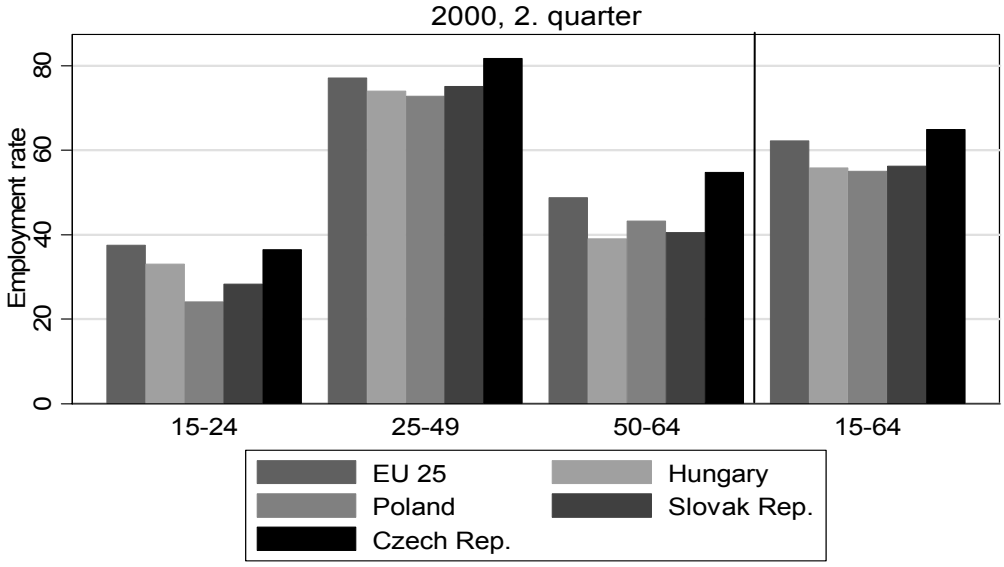
1. Introduction

Activity rate of the working-age population is low in Hungary on average if we compare it to the EU average. In 2000 – the first year comparable data exists for all countries we look at – employment rate in Hungary falls short of the EU25 average by 6 percentage points. With the exception of the Czech Republic, other new member states (NMSs) seem to experience a similar situation. Looking at activity by age groups reveals that we see the greatest difference among the eldest age group, those between 50 and 64 year of age. Clearly not the only source of the low activity rate, behaviour of the aged is an important contributor.

Figure 1: Employment rate by age groups in selected EU countries



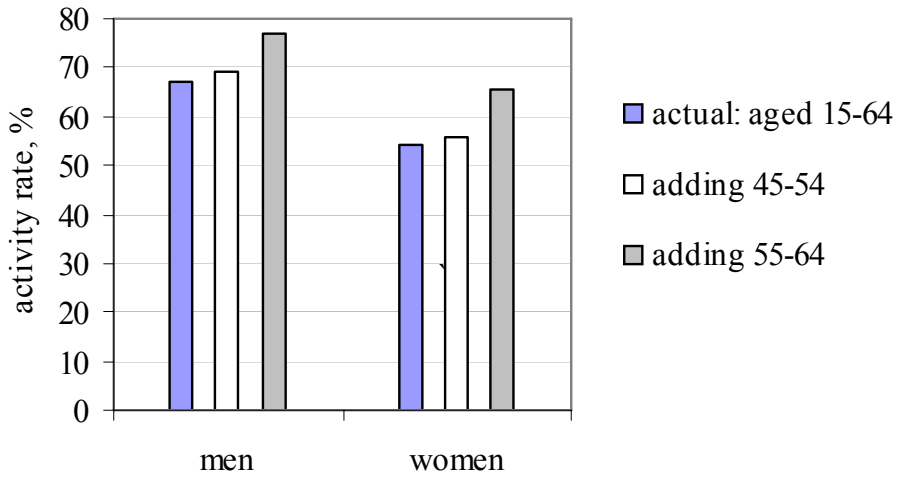
LFS series from Eurostat on-line database

A simple calculation shows that if the activity rate of the age group 45–54 was in line with that of the 40–44 age group in Hungary, the overall activity rate of the population aged 15–64 would be about two percentage points higher (abstracting from the extremely important demand-side conditions of this scenario). If a similar proportion of people aged between 55 and 64 were present in the labour market, the activity rates among men and women would be a further 7–10 percentage points higher (see Figure 2). The involvement of women aged between 55 and 64 would result in the largest increase in economic activity. On the basis of these calculations, the activity rate for the two sexes combined would be 62.4% and 71.2%, as against 60.5% in 2004.

To be able to "afford" inactivity, there must be a secure and in some ways sufficient income source for elderly people. Naturally and given its importance in most European countries, the prime suspect is the institution of retirement in the case of the elderly group. Al-

though retirement offers a well-documented exit-route from employment (see Herbertsson, 2001, for theoretical considerations and Peters et. al, 2004 for an overview of policies and their impacts in the EU), there is no empirical evidence relating to Hungary.

Figure 2: Actual (year 2004) and hypothetical activity rates



Source: Cseres-Gergely – Scharle (2006); Authors' calculations based on 2004 Labour Force Survey data.

The present paper has two aims. Firstly, to give a broad view of the interaction between the Hungarian pension system and labour market. Secondly, to generate empirical evidence on the strength of the incentives to step out of the labour force coming from the pension system. Working towards this latter goal, I explore the nowadays standard option value model of retirement in a case when the retiring population is not random, but selected along characteristics that affect future labour market chances. There are four sections in the paper. Firstly, I give a motivating overview of the interaction of the labour market and the pension system. Secondly, I outline the institutional background in Hungary that potentially affects the labour market behaviour of elderly people. Thirdly, I use household survey data to look at the level and structure of income and expenditure of households where an individual shifts from non-pensioner to pensioner status. Fourthly, I sketch a modified option value model that accommodates the data restrictions I have to face and is able to handle the potential selection of retirees. Finally empirical results are presented using the previous model and the Hungarian Household Budget Survey.

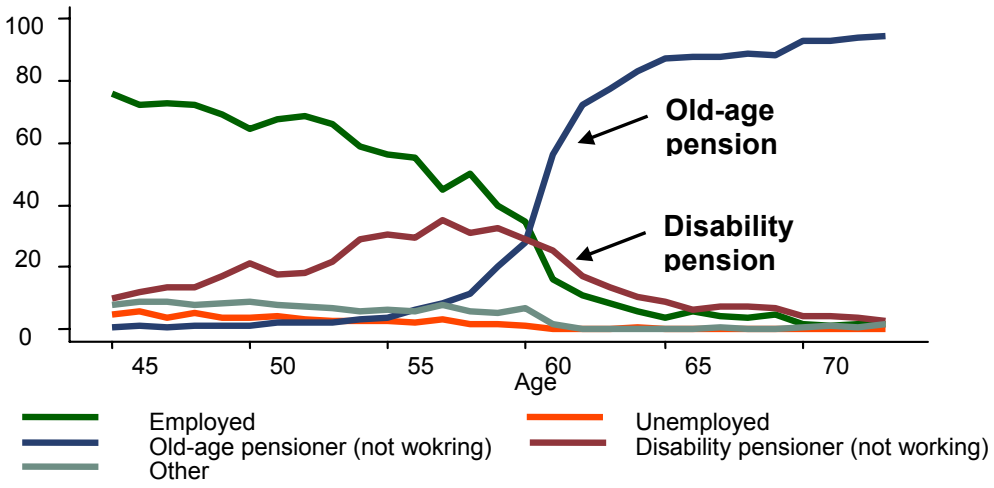
2. Interaction of the labour market and the pension system – a motivation

We know a priori that pension benefit, no matter what exact form of it are we looking at, is mostly claimed by ageing people. However, looking at the change of activity and alternatives to it over the life-cycle, we have to go beyond age groups and use individual level microdata (from the Labour Force Survey). Although we have direct access to such data in the case of Hungary (see, for example, Fazekas and Varga, 2004 or Lelkes and Scharle, 2004), without easy access and knowledge of local peculiarities, international comparison is troublesome. In Figure 3, I use Hungarian LFS data to create "age-activity profiles" for males in 2001 and supplement it with two similar graphs for the Netherlands and Great Britain, borrowed from a presentation of Blundell (2002). Both comparison economies are much more advanced than the Hungarian, but there are important similarities. The industrial structure in the United Kingdom underwent a similar transformation in 1980s to that Hungary experienced after the transformation in 1990; this resulted in a very high number of poorly qualified people left without jobs (see, for example, the report in Faggio and Nickell, 2003). The Netherlands did not suffer similar shocks, but it has a high level of social benefits.

The age-activity profiles show that although different in levels, there is a remarkable similarity in the share of employees and pension claimants over the life-course in all the three countries. We do not actually see it, but employment rate starts decreasing gradually right around the age of 45 and drops when the availability of old-age pension kicks in. Nevertheless, the decrease in activity does not happen in isolation. A similarly gradual increase in the stock of disability benefit/pension recipients suggest that those not working get transferred to this benefit programme in great proportions (there are some who are better off staying). When old-age pension is available, there is yet another transition to be observed: now the stock of disability beneficiaries melt away, to apparently feed the increase in the stock of old-age pensioners. Unemployment is not only low in this age group, but goes rapidly down approaching retirement age.

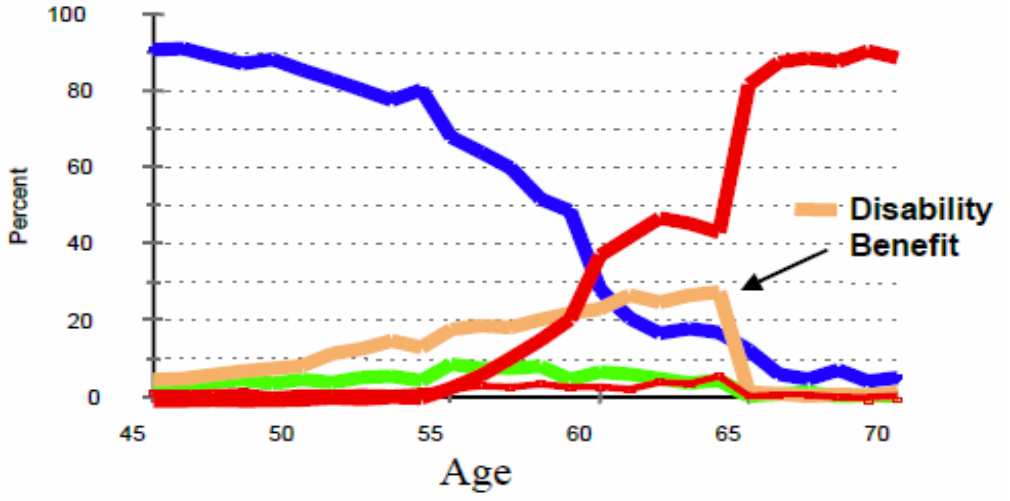
Figure 3: Age-activity profiles of males in three countries in 2001

Hungary

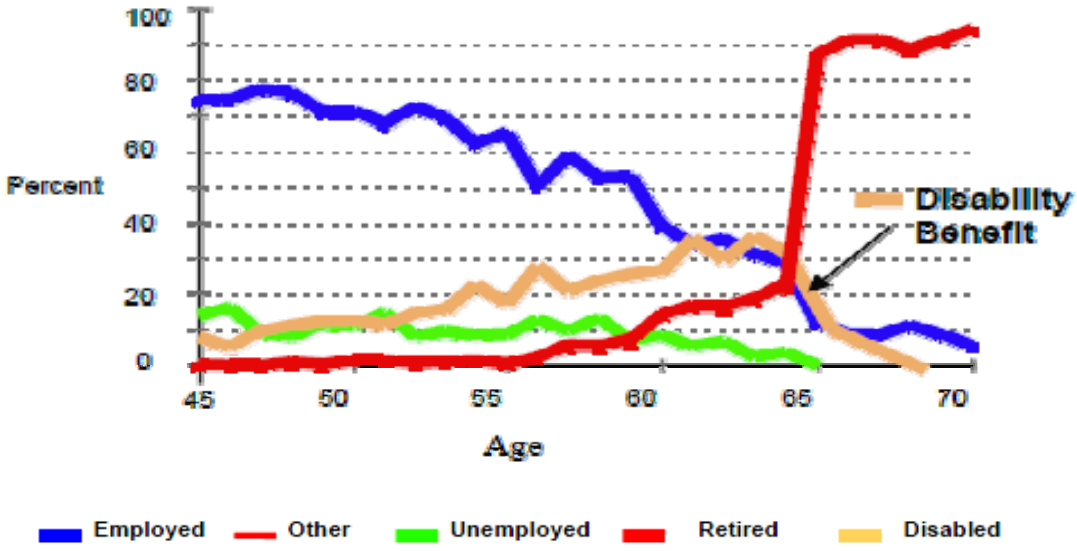


Source: Own calculations from the 2nd wave of the 2001 Hungarian LFS

Great Britain



Netherlands



Source: Presentation slides of Richard Blundell: "Pension Incentives and the Pattern of Retirement", 2002

Although these graphs do not show retirement ages and characteristics of the pension institutions, one can almost see these rules manifesting: legal retirement age is 65 in both the Netherlands and Great Britain, with a possibility for pre-retirement at the age of 60 in the latter. The same threshold is 60 years of age in Hungary, which readily explains part of the low activity rate: if it was higher, probably activity rate would be higher too. It remains to be seen however, whether increasing legal retirement age would put the non-retirees into employment or into unemployment. Actually testing this hypothesis was not attempted in Hungary, probably because the lack of experimental situation, insufficient information and small sample sizes.[‡] It is therefore only a hypothesis, and not a very well funded one, to suppose that that availability of employment possibilities would not be the main issue in the case of a marginal rise in legal retirement ages.

One has to bear in mind, however, that the institutions in a given country are most probably not set up independently from the prevailing circumstances. It is often stated that health condition of Hungarian citizens is much below that of western EU countries, a factor that can have profound effect on labour market activity. If this is so, it can well be the case that the pension system is set up the observed way exactly because if it was not, only elderly poverty increased, not employment.

Because data treating these two characteristics together is practically nonexistent in Hungary, there are no papers looking at the causal effect of health on labour market status. The simplest way to illustrate a possible health issue, one can look at life expectancy of the elderly, as a proxy for their planning horizon. Table 1 shows this measure in the case of the countries used on the comparison of Figure 1. It is apparent that although there is a fairly rapid improvement to be seen in the case of the ex-soviet bloc countries, life expectancy still lags behind that of the selected western-EU countries.

[‡] One possible information available is from the effective increase of retirement ages for women starting at 2001-2002. Although we have already seen an increased female employment in this period, it is not clear whether this was caused by the increase of the minimum wage in 2001 and 2002, the wage increase for civil servants at about the same time, the changes in pension regulations, or some other effect.

Table 1: Life expectancy at the age of 65

Year	The Nether-lands	UK	Hungary	Poland	Slovakia	Czech Rep.
1986	16.7	15.7	13.7	14.4	13.9	13.4
1990	17.1	16.3	14.0	14.6	14.4	13.8
1995	17.3	16.7	14.4	15.1	14.8	14.7
2000	17.6	17.6	15.2	15.9	15.2	15.8
2001	17.7	17.9	15.5	16.2	15.3	15.9
2002	17.8	17.9	15.5	16.4	15.4	15.9

Source: European health for all database (HFA-DB) World Health Organization Regional Office for Europe Updated: January 2006

Economic activity and pensioner status[§]

Ideally, one would like to use flow data to show the fact that the change in pensioner status is closely followed by a change of economic activity. LFS data provides the possibility of connecting at most 6 consecutive quarters to obtain a panel. It has a rotating panel structure and every household (thus every individual) is kept in the sample for 6 quarters. The resulting data however proved to be too small and noisy to clearly show a detailed pattern of such a transition or the evolution of it over time. The reason for this is that the Hungarian LFS focuses on unemployment quite heavily, employment status is checked through several questions. The same is unfortunately not true for pension receipt, as it is asked only as one option in a series of possibilities for non-work income.

Despite this, we can look at some crude measure how the two type of status are interrelated. Doing so, I shall make the distinction between the pre-1997 and post-1997 period, as the pension system underwent some reform in 1997 (more on this later).

First of all, we have to note that a majority of (old-age) pensioners retire from employment. Using with a panel in which only two consecutive quarters are linked[**], the proportion of individuals working prior retirement is 43/58 percent in the pre-1997 and post-1997 period, respectively. Even if we allow for measurement error, this number is quite low. Using the panel which contains 6 consecutive quarters gives a share of 66/77 percent. Anecdotal evidence suggests – although without real proof – that this difference is explained by the fact that

[§] This subsection and some of the next is largely based on the discussion in Cseres-Gergely – Scharle (2005)

[**] I created two panels, both using all quarters between 1992 and 2004. In the first, two consecutive quarters, in the second the maximum number of quarters (6) are matched. Finally the resulting two/six period panels are stacked. There are almost 3 million in the first version, and above 400 thousand in the second.

many employees bring the beginning of their pensioner careers forward by taking advantage of sick leave. Employers usually do not protest (and quite often make an offer by themselves), as this arrangement is a kind transfer to the employee, while costs nothing to them directly. If this is true, we should be focusing on the second type of data that provides the greatest distance between time periods.

Table 2: Distribution of recent retirees between labour market activity states after retirement and a year earlier (percents of all recent retirees)

	Not employed in t=6	Employed in t=6
Not employed in t = 1	28.5	0.8
Employed in t=6	58.4	12.2

Own calculations from a panel created from LFS data between 1992 and 2004

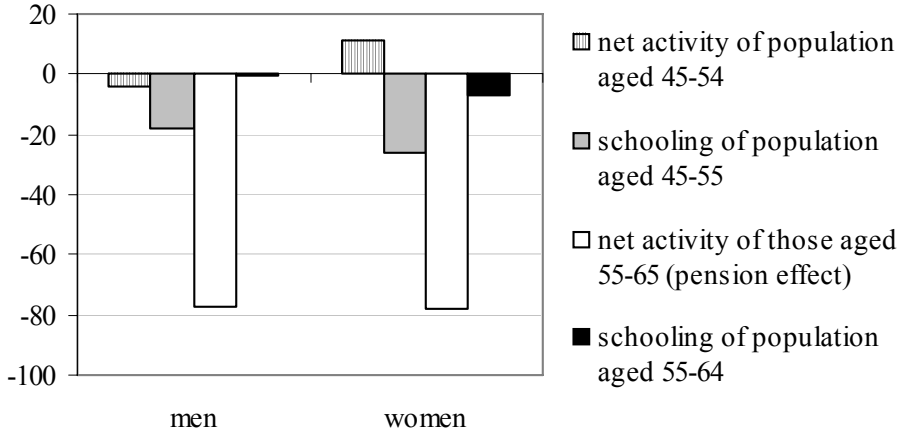
Even though a majority of retirees work before retirement, only a few keep doing so thereafter: their share is 11/15 percent out of all recently retired. Table 2 shows the two factors together. The greatest part of new pensioners was working prior retirement, but turning inactive as a pensioner. Almost one-third was not employed even before, and much less than that was and remained an employee. There is almost nobody starting to work only after retirement. Although we shall return to this matter later, It is probably not too far-fetched to say that people in Hungary do not only retire as soon as possible, but most of them also cease working as a pensioner.

It would be interesting to see if this conclusion can be supported by other evidence, in particular because of the potential problems resulting from underreporting economic activity. To check this possibility, I use household survey data on expenditure and income for individuals who become retirees. The results are presented in section 3, but we can already hint at them already now: they confirm that retirees really do retire in the broadest sense of the word as they mostly do not receive income from other sources than pension.

The role of education

The low level of activity among the elderly is partly a result of their low level of schooling. Figure 4 shows the part of the divergence from the hypothetical activity rate of the previous subsection that is explained by this, and the part that is explained by willingness to work (and the available employment opportunities).

Figure 4: Breakdown of the loss caused by the low activity of older age groups by age group, schooling attainment and net activity, 2004 (%)



Source: Authors' calculation based on 2004 Labour Force Survey data. The total loss among women and men is 11.8 percentage points and 9.7 percentage points, respectively. A percentage breakdown of these figures is presented in the above figure. The underlying assumption is that the activity of the age group under review equals that of the 40–44 year-old population, taking account of the schooling profile of the 40–44 age group and the older age group.

Clearly, the lower activity rate among older people is related primarily to the inactivity of the 55–64 age group: after eliminating the effect of lower educational attainment, this explains some 80% of the loss of activity. The lower educational level compared to the 40–44 age group contributes to inactivity among men only in the 45–54 age group, while among women the same factor influences inactivity in the 55–64 age group as well. It should be noted that among women of the pre-retirement age group, willingness to work is so much greater than in the 40–44 age group that it even compensates for their lower educational attainment.

Let us now go back to the countries of the international comparison presented in Figure 1! Table 3 shows that in the second quarter of 2002, employment of the less educated 50-64 olds is quite low in Hungary: almost half of the EU average. Only Slovakia trails Hungary in that respect among the NMSs.[††] Given that the share of population with primary or lower secon-

[††] Note that in the case of Poland, the local schooling classification is translated to the ISCED one in a way that does not make comparison possible: those with higher vocational training are classified into ISCED 0-2

dary education (below the ISCED 3 level) is around 41 percent, and the well-known fact that human capital stock plays a key role in labour demand, hence shaping employment chances, it is clear that low education has a profound effect here.[‡‡]

Table 3: Activity rates of the 50-64 year old population by schooling levels in selected NMSs and in the EU25 in quarter 2, 2002

	EU25	Czech Rep.	Hungary	Poland	Slovakia
ISCED 0-2	31	38	21	32	15
ISCED 3-4	58	54	53	46	49
ISCED 5-6	78	71	67	70	73
Together	56	53	45	48	44

Source: LFS series from Eurostat on-line database

It seems almost trivial that demand factors, such as the industrial structure of a particular country or SBTC itself have important effects on the activity of the elderly. Manifestations of differences in elderly and non-elderly employment are clearly visible, one prominent of those the Equal Opportunity Act in the US prohibiting legal retirement for the sole purpose of making room for younger employers. Because of the low level of elderly employment and the general lack of data on it however, we can not look at this issue in here, therefore sidestep it with great regret.

3. The pension system and its first-round effect on the labour market – institutions and stylised facts

In this section, I supply evidence to claim that the pension system itself has contributed to low elderly employment. In order to see why this can be so, I give a short description of the incentive structure of the pension system in Hungary. There are detailed descriptions available of the system itself (such as the one found in Burns and Cekota (2002), or recent compilation by Simonovits, 2006, focusing on the 1997 reform of the system), with which I have no

category. This makes ISCED 0-2 activity higher and ISCED 3-4 activity lower than it was otherwise. See Kertesi and Varga (2005) on the problems arising from non-standard mapping onto ISCED categories.

[‡‡] The differences might not be that stark as they seem to be. Kertesi and Varga (2004) show that the ISCED classification most probably misclassifies a significant number of lower-secondary educated people to upper-secondary. This, however, does not change the qualitative conclusion about the importance of schooling.

intention to compete. I merely highlight the most important factors that shape the incentives to claim pension and work beside that.

Old-age pension

The Hungarian old-age pension system is basically a pay as you go system with a funded pillar. The funded pillar receives up to 6-7-8 percent of gross wages from 1998, while the remaining 25-24-23 percent flows to the first, pay as you go pillar contributions of 60% of the employees. Beside the introduction of a funded pillar, the year 1997 brought about two important changes. Since 1992, pension is calculated on the basis of wage for employment back to 1988. Before 1996, the earliest legal retirement age was 55 years of age for women and 60 for men. After 1996, both of these ages have been gradually increasing to 62 years of age, in two year steps. Men reached the new legal age already in 2001, while women do so only in 2009. The legal retirement age in 2001 was 62 years for men and 58 for women.

As legal retirement ages increase after 1997, there is an important exception during the transition, covering almost every new retiree. With a sufficiently long work history, it is possible to take advantage of "transitional early retirement" (my phrase) without deduction from the pension, which is available 3 years before the legal age, at the former legal age the earliest. For this type of early retirement the conditions are exactly the same as for normal retirement (except for the work history requirement), ie., there is no penalty involved. If the employee does no have the necessary work history, early retirement is still possible, the difference being a 0.1 percent decrease in the pension for every month in the first year, 0.2 percent for every month in the second year, and so on. For example, in 2001 a woman can retire through old-age retirement if she is at least 55 year old. With the required work history (38 years of service), she can retire without a deduction in her pension. If she does not have this work history, she either has to accumulate more years and retire later (also facing the fact that the legal age is increasing) or forgo part of her pension. Supposing that she has 2 years less than required, she can retire with a 2x12x0.2= 4.8 percent penalty. Table 4 shows that accumulated work experience was sufficient in the case of most elderly, therefore the effective retirement age did not change between 1997 and 2002. The characteristic two-year cycles for female retirement are apparent, too.

Table 4: Distribution of retirees according to forms of old-age pension claimed

Males	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Retirements after the legal age	**13.4**	**6.8**	**5.0**	**4.8**	**2.0**	**0.9**
With bonus	6.7	4.5	3.2	3.0	1.0	0.5
Without bonus	6.7	2.3	1.8	1.8	1.0	0.4
Retirement at the legal age	**77.9**	**1.9**	**14.8**	**2.6**	**6.2**	**8.1**
Retirement before the legal age	**8.7**	**91.4**	**80.1**	**92.6**	**91.8**	**91.0**
Pure pre-retirement	1.1	1.1	1.2	1.6	0.9	0.8
Tr. Early retirement without deduction	7.3	85.7	75.0	84.9	86.2	85.1
T. Early retirement with deduction	0.3	4.6	3.9	6.1	4.7	5.1
Together (number, 100%)	**10,729**	**9,092**	**11,914**	**12,749**	**23,684**	**20,747**

Females	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Retirements after the legal age	**23.5**	**11.1**	**4.5**	**3.7**	**6.5**	**2.8**
With bonus	22.1	10.6	4.1	3.4	6.1	2.6
Without bonus	1.4	0.5	0.3	0.3	0.4	0.1
Retirement at the legal age	**4.3**	**0.0**	**21.9**	**1.8**	**32.8**	**1.2**
Retirement before the legal age	**72.1**	**88.9**	**73.6**	**94.5**	**60.7**	**96.0**
Pure pre-retirement	0.6	0.3	0.2	0.1	0.2	0.1
Tr. Early retirement without deduction	66.7	83.1	68.9	85.8	55.8	88.9
Tr. Early retirement with deduction	4.8	5.5	4.5	8.6	4.7	7.0
Together (number, 100%)	**16,170**	**14,922**	**21,765**	**25,325**	**11,675**	**17,912**

Table reproduced from ONYF (2004), page 17

As opposed to the penalty for insufficient work experience, there is basically no bonus for later retirement than the legal age until 2004. Although a 3.6 percent increase is available after the first year of the legal retirement age, the transitional regulations do not play a part here. The bonus is thus not extremely large and even most men would have to work for an extra 3 year after the first possible opportunity for retirement (60). Women would have to work an extra 8 years if otherwise qualified for early retirement in 1997![§§] Although one would think that this option is as good as absent, Table 4 also shows that retirement after the legal age was non-negligible before 2000, but it decreased to almost zero thereafter. We do not know the age distribution of "late retirees", there is no trivial explanation for this change. The high pro-

[§§] Although this does not concern the period studied, this situation changed dramatically after 2004. In the regime in operation since then, every year of deferral earns a 6% increase in pensions, a bonus among the highest in the EU.

portion of those retired with bonus shows nevertheless, that most of them remained in the labour market for a fairly long time. Late retirement in an environment which does not give incentives for it is an extremely interesting question to look at, as we do not expect the average person to work for the pure passion of it. Unfortunately, as we shall see later, this is one of the many questions that are very difficult to look at because of the lack of appropriate data.

Being the dominant form of old-age retirement, transitional early retirement is worth a closer look. Table 4 shows details on this form of retirement both with and without deduction (first and second columns for every year, respectively). First note that there is only a fraction of those who retire early with deduction from their pension (first column). Secondly, if there is one, the deduction is quite substantial (as so is the shortfall in the length of labour service). Although maternity and child care leave is accounted as "labour market service", it is apparent that women experience much larger deductions than men. Although we clearly do not see behind these aggregate numbers, as a general rule, it seems to be the case that people are willing to retire at the earliest age possible, some even at quite substantial expenses.

Because the entry pension formula is not linear, it is difficult to say what exact replacement rate the old-age pension provides (replacement rates are for net wages as pension is not taxable). A further complication is that the formula changed over time, leaving some cohorts better, others worse off. ICSSZEM (2005) shows both theoretical replacement rates and empirical ones for the year 2005 and beyond (although methodology for the latter is not clear). This time period is ahead of the one we are looking at here, but it is valid for the entire post-1997 period, as rules remain the same.

Theoretical rates for internationally comparable pensioner types (by the EU SPC/ISG - Indicators Sub-group of the Social Protection Committee of the EU) are in the range between 90 and 100 percent, which describes the system as very generous and having obvious disincentive effects. The study points out however that these types are not typical for the Hungarian population and therefore do not provide a good guide: the typical retirement age is much lower in Hungary than what is used in the standardisation. Coupled with the unreachable but existing bonus for extra work after the statutory age, this leads to implausible results For variants that are representative for Hungarian pensioners, a net replacement rate around 50 percent is more realistic, increasing only to a little more than 60 percent with above average earnings and long work history (see Table 3a in section 3 of the supplement to the cited study).

Table 5: Properties of retirements before the legal age ("transitional early retirement") without (1) and with (2) deduction

Males	1997		1998		1999		2000		2001		2002	
	1	2	1	2	1	2	1	2	1	2	1	2
Number	785	34	7,790	414	8,938	462	10,826	776	20,405	1,105	17,659	1,062
Average age	56.1	57.0	59.7	59.8	59.7	59.7	59.7	60.0	59.9	60.0	59.8	60.0
Diff. from legal age	4.9	4.0	1.4	1.3	2.3	2.2	2.3	2.0	2.1	2.0	2.2	2.0
Labour service	38.6	32.4	41.1	33.7	41.3	34.4	41.7	35.3	41.1	35.3	41.6	35.4
Deduction (percent)		5.7		3.7		7.0		5.8		5.6		5.6

Females	1997		1998		1999		2000		2001		2002	
	1	2	1	2	1	2	1	2	1	2	1	2
Number	10,788	774	12,401	818	14,994	977	21,728	2,174	6,518	546	15,922	1,255
Average age	55.1	55.1	55.1	55.1	55.1	55.2	55.2	55.2	55.9	56.1	56.1	56.2
Diff. from legal age	2.0	1.9	2.8	2.8	3.7	3.6	4.7	4.6	4.0	3.7	4.8	4.6
Labour service	36.3	29.5	37.1	31.3	37.2	32.3	37.4	33.4	34.3	33.0	37.8	34.3
Deduction (percent)		7.8		11.6		14.7		17.8		14.7		17.1

1: Retirement before the legal age *without* deduction

2: Retirement before the legal age *with* deduction

Tables reproduced from ONYF (2004), page 23. Rows showing average pensions and deductions in Forints are omitted.

Once claimed, old age pension can not be "handed back", the claimant will be labelled as a pensioner whatever she or he does. This fact is not very important if we look at pensions only, but has some legal consequences and possible effect on labour market chances. Pensioners are a special sort of people as far as the "act of work", the tax and the social security contribution regulations are concerned. Most importantly, people who have reached the legal age (even if they are not pensioners) can be fired immediately, without the explanation normally required

in such cases. On the other hand, pension is not taxable in the period we look at[***], only increases the tax base, pushing income into higher brackets.

Old-age type pensions

Regular old-age pension does not provide retirement opportunity before the age of 60 for men, and 55 for women.[†††] In the case of the unemployed within 3 years of the legal retirement age, the institution of pre-retirement was available before 1998. It could be claimed by those having been unemployed for 180 days and having "no prospects to find a job" (a rather soft criterion). In case of eligibility, pension is calculated the same way as regular old-age pension. Gainful activity yielding an income more than 50 percent of the minimum wage is not allowed. Pre-retirement was re-christened to unemployment benefit before retirement in 1998, and recently again, with the actual rules being essentially intact. The change in 1998 however resulted in a change in administration, hence this scheme is not handled by the same authority as real old-age pensions and is not part of pension statistics.

Disability pension

Old-age and old-age type pensions always have an age requirement, and are therefore available from the age of 52 (women) or 57 (men). In the introduction we have seen that activity of the elderly starts do decrease much earlier than that, around the age of 45. A large proportion of those parting from the labour market receive disability benefit thereafter. Table 4 has shown that the number of old-age retirements are well below 50 thousand in a given year. Given the fact that a 60 year old cohort has around 100 thousand individuals, retirement through channels different from old-age retirement are clearly very important. Although the link is not rock solid, Lelkes and Scharle (2004) provide indirect evidence that disability pension can actually function as an exit route from the labour market. According to their results, if disabled people receive pension benefits, they are much less likely to seek employment,

[***] Even this was abolished in 2002. Since then, pension income is completely tax exempt, as if it did not exist at all.

[†††] There are, of course, exceptions. One important one is the case of dangerous or health deteriorating occupations, where employees accumulate eligibility for even earlier retirement through service. Table 2 mentions these cases under the label "pure pre-retirement", which has actually nothing to do with the transitional pre-retirement explained in this paragraph. It is also clear that its role is limited with a share around 0.1-1 percent of all retirements. Another exception concerns miners, artist and some other special occupations through various regulations spawned by the industrial restructuring of the early 1990s.

even if we compare individuals with the same health status. We do not know the extent to which it is actually used so, but with around 55 thousand applications every year, 20 thousand of which are accepted, it is a powerful channel through which people leave the labour market. The people affected are not as numerous as those transferring to old-age pension, but they are younger, so taking into account their impact on the labour market, this smaller number can be actually more important.

Disability pension can be claimed by any individual losing at least 67 percent of her/his "work capacity" and whose condition is not expected to improve within a year. Before 1998, eligibility was checked at application and lasted for a lifetime. Because many health conditions leading to eligibility can be actually cured now and because a suspicion of misuse, there was an attempt in 1997-1998 to reform the system. Formerly permanent eligibility was abolished and health status of the recipients is set to be reviewed periodically and the earnings limit was strengthened somewhat. Gainful activity is permitted until the earnings from work reach the level before the health condition appeared.

The disability pension is calculated in relation to the last earnings and work experience. A person with at least 25 year work experience receives disability pension at the same level as if it was set as a regular old-age pension. This means that if a person with secondary education successfully applies for disability pension, she or he can obtain a fixed income at the level of the old-age pension at the age of 43 (if worked continuously from the age of 18 on). Those having lost their work capacity fully receive more than the respective old-age pension. Those getting old enough to become eligible for regular old-age pension keep their pension level, but are transferred to old-age pension, which means mainly that the restrictions concerning work are lifted.

Unemployment benefits: a competing system?

It is worth mentioning that along with a quite accessible pension system, unemployment benefits is not very easy to obtain and became tougher over time. Unemployment Insurance (UI) was available for a maximum of 360 days until 1999, 270 day thereafter. UI is liable to tax and social security contribution payment. Work is permitted only up to yielding 50 percent of the minimum wage until 1999, but none thereafter (short-term work is permitted). Gross replacement rate was 70 percent until 1997, 65 percent thereafter but is constrained to the range between the minimum wage (minimum old-age pension from 1997) and twice of that. Unemployment benefit is therefore not that difficult to obtain and yields a decent replacement rate, but is not a very secure source of income.

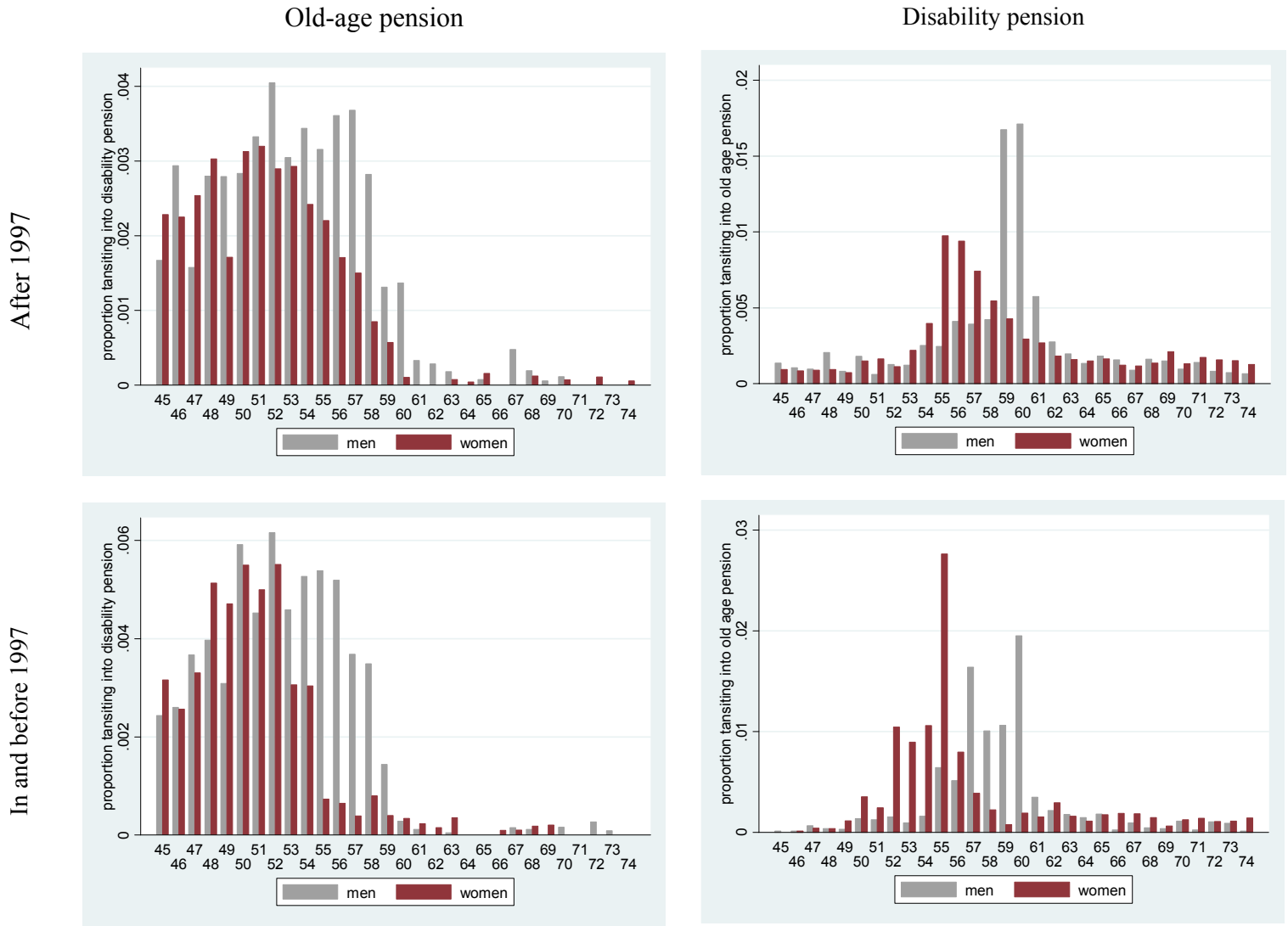
Stylised facts on retirement from flow data

The institutional statistics we used so far did not show details about retirement ages, provided no information on disability benefits and started only from 1997. To get more insight, we have to look at LFS panel data again. The key variables are age, sex, employment status, and an indicator for old age and disability pension receipt.

Based on these data, Figure 5 shows the distribution of retirement ages in two regimes, the pre-1997 and post-1997 period. Even if data is averaged over several years, because of measurement error, mostly the shape of the distributions can be compared. It is easy to observe that actual retirement ages peak right at the statutory retirement age of the first period, with a few retirements before and some after that and with a slight shift to the right after 1997. This is exactly what we have seen from the administrative data: the legal retirement age until 1997 and the transitional early retirement age thereafter for a number of years. Overall, the distributions seem to be similar to the one suggested by the life-cycle activity profiles of Figure 2. The relatively high proportion of late transitions is not easy to explain – they are most likely the result of measurement error of various sources.

Disability pensioners' transitions seem to tell a matching story, again supporting the conjecture coming from the cross-sectional data. Inflow to disability pension starts to be in full swing from 45 years age on, peaking at about 5 years before the statutory age for old-age pensions.

Figure 5: Empirical retirement age distributions in Hungary for old-age and disability pensioners after and before the pension reform of 1997 (calculations from LFS microdata)



Source: Own calculations form the LFS. Two quarters are merged to form a panel from 1992Q1 to 2004Q3. Data are weighted and averaged over two periods, from 1992 to 1997 and 1998 to 2004.

4. Change in income and expenditure based on raw data

If retirement also means inactivity, it will almost certainly result in a loss of income. The degree of that loss depends on the amount of the original income and of the pension awarded. If the drop is significant at both the individual and household levels, some adaptation is to be expected. At the individual level, it is perhaps possible to exploit some new sources of income (second job, casual work, overtime, or, in the case of somebody not being previously in employment, taking up a job), and by careful budgeting, savings can be made at the household level too.

The simplest way of assessing the impact of the status change is to compare levels and structure of income and expenditure in the "before" and "after" period. In the 3 wave HHBS panels (described in the "Data" subsection in Section 4), the comparison is made using data from the first and the third waves. Although we have no choice but to use this method, it has the added benefit of dispensing with most transitional changes that are potentially not representative for the statuses. We can expect that having a full year spent in either of the states eliminates transitory shocks that would influence behaviour.

I have prepared the calculation in several variants: for men and women, and broken down by the status of the examined person as unemployed or employed in the first period. In order to look at potential intra-household interactions but eliminate uncontrolled impacts, I have selected households where at least two partners live together, but the number of members and the activity of the partner constant. This choice minimises the potentially disturbing changes, but it precludes the possibility of extensive adaptation, such as taking up employment. As the correlation between the change in activity of partners is approximately 5 per cent, the adaptation excluded is probably not important. Although the method is clear-cut, it has the disadvantage that the sample size is just enough to calculate the cell values we are interested in – accordingly, the results must be interpreted carefully.

Below I highlight figures describing changes in the case of men switching from employment to pensioner status.[11] In a previous version of this paper, I have calculated these tables

[11] In order to eliminate the difference in size of households, I have calculated the total income and expenditure per consumption unit, rather than the total income and expenditure in the part of the raw data tables indicating household income. Therefore it is possible that when the labour income of the examined person and his partner is added up, the amount is greater than the total labour income of the household.

for other important types of individuals: for employed or unemployed women and unemployed men. The effects are naturally different numerically, but qualitatively very similar. Because of the lower initial level, the drop in income and change in consumption is even smaller.

Table 6. The size and actual change of individual and partner income (thousand 2001 HUF), if an employed male living with a partner becomes inactive as of period t=2 of the panel, and the activity of his partner remains unchanged (N=49)

	Value in t=1	Value in t=3	Change (%)	Share in t=1 (%)	Share in t=3 (%)
Own income					
Gross salaries	766	0	-100	80	0
Other labour income	89	14	-84	9	3
Pension	93	480	415	10	93
Taxes	262	0	-100	27	0
Total personal income (gross)	963	513	-47	100	100
Total personal income (net)	702	513	-27	73	100
Partner's income					
Gross salaries	468	480	3	75	76
Other labour income	40	29	-28	6	5
Pension	94	107	14	15	17
Taxes	154	152	-1	25	24
Total personal income (gross)	622	629	1	100	100
Total personal income (net)	469	477	2	75	76

Note: Simple averages, with constant economic activity of the partner. Income elements representing a small proportion are not included, thus the total is not necessarily 100%. Source: own calculations from the relevant periods of the HBS pooled panel (see data description in Section 2).

Table 6 highlights the self-evident fact that the labour income of a person declines upon retirement, and the pension becomes the main source of personal income. It is worth noting that the sizable, 47 per cent drop in gross income is not accompanied by any increase in other personal income; other labour income also declines instead. On the other hand, net incomes decrease considerably less, by 27 per cent. This represents a 73 percent replacement rate, which is higher than the one reported in ICSSZEM (2005). The situation is even simpler regarding the income of the partner: there is no sign of adaptation, ie. change in income from the existing source (in either direction) or the entry of another one.

Some income elements are present at the household, rather than the individual, level. Examples include some social benefit payments, the gains from the household's agricultural production, and transfers from other households. Table 7 shows changes in those income sources, as well as of the per capita personal incomes at the level of the household. The latter informa-

tion is important because, even though it partly coincides in its content with the figures in Table 6, we can argue that it is the size of per capita income, rather than of personal income, that substantially affects individual welfare, and thus the decision to carry on working or to retire. The results of the Table are in line with what we have already seen. Apart from a minimal increase in gain from agricultural production, none of the income sources increase. It is worth noting that non-professional ("own production") agricultural production declines at the same time.

We see no sign that the reported income of either the retiring person or the partner has changed to compensate for the loss necessarily suffered. It is questionable, however, whether we should accept the income figures as genuine. There is the possibility that, if the compensation is not through legal employment, the income thus earned will not be reflected in the survey. The survey interviewer has an appearance of an legal person, from whom such sensitive information is better concealed. There is actually plenty of room to do so: incomes are asked only once in the yearly interview, and must be recorded in diary only once too.[12]

Table 7. The size and actual change in the household's income, if an employed male living with a partner becomes inactive as of period t=2 of the panel, and the activity of his partner remains unchanged (N=49)

	Value in t=1	Value in t=3	Change (%)	Share in t=1 (%)	Share in t=3 (%)
Household income					
Gross salary	655	267	-59	65	34
Gain from agricultural production	32	35	9	3	4
Other labour income	66	24	-64	7	3
Own production	93	76	-18	9	10
Pension	99	309	213	10	40
Transfer related to child	25	18	-26	2	2
Transfer to other household	25	28	12	3	4
Taxes	209	79	-62	21	10
Total income (gross)	1008	779	-23	100	100
Total income (net)	773	672	-13	77	86

Notes: Simple averages, with constant economic activity of the partner.
Income elements representing a small proportion are not included, thus the total is not necessarily 100%.
Source: own calculations from the relevant periods of the HBS pooled panel (see data description in Section 2).

[12] This effect is most notable in the case of "entrepreneurs", who usually report very low levels of income, especially compared to their expenditures.

Consumption expenditure, on the other hand, is possibly much less prone to such manipulation. The 'total' is derived from innumerable small expenditure items, which are very difficult, if not impossible, to manipulate. Naturally, we can infer a change in income from a change in the size of expenditure only if savings develop in accordance with some rule of thumb: for instance, as a fixed percentage of income. Table 6 shows the change in the level and structure of consumption expenditure in a structure similar to that above, for the same household group. After claiming pension, expenditure level goes down just as income did. Assuming that consumers save a constant percentage of their incomes, we might think of this as a causal relationship. If we also assume savings to be zero, there is a one-to-one correspondence between the two changes. Our data indicates that the amount of money spent on consumer durables declines on average, which also points to a decline in the actual disposable income, even though the decline is slight.

Not only the size, but also the structure of expenditure may reveal the existence of gainful activity, and thus of unreported income. Expenditure on clothing, transport and meals out generally accompanies being in work. In the absence of employment, or as more time is spent in the home, certain other items are consumed in greater quantities: the most important example is expenditure on upkeep of the home (heating, lighting). Almost each related item in Table 8 (except for transport[13]) supports a decline in labour and an increase in time spent at home.

The same phenomenon can be interpreted from another aspect: we can examine the change in the amount spent on clothing and on small-value durable articles using the idea of Browning and Crossley (2004). Accordingly, in the case of a significant drop in income, the most important way of adapting consumption is to cut back on purchases of replacement articles. The change in expenditure ratios indicates that disposable income has declined, even if only slightly.

[13] Further investigation reveals that the share of transport in expenditure does decline, but only after both partners have retired.

Table 8. The size and actual change in household expenditure, if an employed male living with a partner becomes inactive as of period t=2 of the panel, and the activity of his partner remains unchanged (N=49)

	Value in t=1	Value in t=3	Change (%)	Share in t=1 (%)	Share in t=3 (%)
Food	254	220	-13	38	38
Alcoholic beverages and tobacco	55	44	-19	8	7
Self-produced consumption	93	76	-18	14	13
Clothing	53	27	-49	8	5
Housing upkeep	109	113	3	16	19
Transport	70	63	-9	10	11
Other	135	120	-11	20	20
Total expenditure	675	587	-13	100	100
Durables	37	34	-8		

Notes: Simple averages, with constant economic activity of the partner.
Source: own calculations from the relevant periods of the HBS pooled panel (see data description in Section 2).

More accurate measurement of the changes in income and expenditure

The problem with the above approach is that, even though we are going to capture the actual loss suffered, it remains a question how much of that loss is attributable to retirement? It is possible that the change measured would have happened irrespective of the change in the individual's career, due to economic processes: the decision maker in the outlined model also compares his pension with expected future income, rather than with his present salary.

To answer that question, we should consult the literature on economic policies. In this approach, the retirement is the change ('treatment'), the effects of which we want to measure. Let us now consider the difference in the income of those who retired and those who did not retire between the first and second periods and denote those differences D_R and D_W, respectively. Assuming that every person (pensioner or not) is the same in his observable and related non-observable characteristics, and the world has changed only in terms of its observable characteristics; D_R would measure the effect perfectly. However, if we allow the world to have changed, then the change in the income of those who did not become inactive (D_W-s) can be regarded as the 'trend' of income change of otherwise identical individuals and must be deducted from the first change.[14] Thus the difference net of the 'trend' can be regarded as a much better approximation of the effects of pensioner status. In practice, the comparison is performed with a regression technique, and we try to achieve the 'everybody is identical' assumption by employing appropriate control variables.

[14] In the program evaluation literature, this is called the 'Difference in differences' method.

For the sake of brevity, I do not present results here, as those can be found in a previous version of this paper (see Cseres-Gergely, 2005). It is enough to say that the general conclusion we can draw is similar to the one coming from raw data. The change in income is not extreme great and there is evidence of an attempt to make up for it either on the individual or on the household level.

5. Modelling the motivations for retirement

Evidence presented so far shows that the disability and old age pension system provides an attractive exit route from the labour market: most people seem to exercise this "option" as soon as it becomes available. It would be comfortable to state that this is the result of insufficient demand for elderly labour, a claim which seems to be supported by anecdotal evidence very well and also partly by empirical results on labour demand (such as the one in Kertesi and Köllő, 2001). At the same time, the relative generosity of the pension system and the fact that a nonzero fraction of pensioners work makes it suspicious that such a statement is too bold. It might be very well the case that under stricter regulation, more elderly people would choose to retire later. In the present situation their behaviour can be understood as revealed preference for security without participation in the labour market. But we have seen that in fact, there is no trade off involved in this decision! Being a pensioner has no drawbacks in terms of employability over and above the effect of age, which is inevitable. Retirement at or after the legal age is therefore no puzzle at all. What *is* a puzzle however is retirement *after* this age and retirement *before* the transitional early retirement age. Because of the very few occurrences in a general purpose survey, we skip the analysis of the former phenomenon.

A real and accessible question therefore lies in retirement before the legal ages effective in 1997: this means early retirement before 1997 and retirement before transitional early retirement after that. The two possibilities open before the legal age require careful consideration. Disability pension is not obtainable without proof of disability, which can be regarded as a cost to this form of pension. As an addition to this, the obtained pension is less than most old-age pensions (although can be more with very poor labour market experience), and work is not permitted, only up to a limit. Early retirement into old-age pension on the other hand, is not possible without a quite severe reduction in the pension. If there is a choice at all, people should be weighting benefits of retirement to its costs quite consciously in both decisions.

A theoretical framework

To study the pre-retirement decision, I shall use the general framework of the option-value model of Stock and Wise (1988), a standard workhorse of retirement-research. Before setting out the operational model, let us look at the original one briefly! The model is one of intertemporal choice: an agent has to choose between two mutually exclusive states. In state W, income is risky and it comes from employment, while in state R, income is fixed and it comes from retirement benefit. The agent lives until time T and has to decide upon when to move from W to R. This decision can be translated into a series of possible decisions in every time period *t* to retire or not. Earlier retirement means that the secure, but potentially lower income stream starts earlier, forgoing accrual if available when retiring later. The fact that R is an absorbing state and no work is possible in R is a key to the analysis. As we have seen, this assumption does not only make the theoretical model tractable, but is also empirically relevant. Because of this, the option to switch in the *r*th period has the value $V_t(r)$ in the *t*th period:

$$V_t(r) = \sum_{s=t}^{r-1} \beta^{s-t} U_W(Y_s) + \sum_{t=r}^{S} \beta^{s-t} U_r(P_s(i)),$$

where β is a discount factor describing time preference and is constant for everyone, i is the interest rate, U_w is the per period utility function applicable during work, U_r is the per period utility function applicable in pensioner status, Y_s is the income offered by work, P_s is the income offered by pension. V is the lifetime utility function. In every period, a decision has to be made whether it is worth retiring in t, or postponing it to the later time of r. For this, the expected realisable positive gain must be examined for every r, which can be simply formulated as [15]

$$G(r)=\mathrm{E}_t[V_t(r)] - E_t[V_t(t)].$$

The decision is based on whether $G(r)$ is the greatest in the current period t among all possible periods. If it is, retirement is optimal in t. The empirical strategy is to specify a discrete choice equation including the variable characterising the expected income flows. According to the authors, who examined the impact of the structure of US occupational pensions on re-

[15] The decision rule contains the expected value of utilities instead of the utility of the expected value of incomes. In general, this is not an accurate wording, but the authors find that this compromise is worth making to simplify the discussion.

tirement, both salaries and pensions have a strong, but different, correlation with age. Though in a somewhat different form, this correlation is also applicable in Hungary: salaries increase with age, but at some point this increase comes to a halt, and then goes into reverse. Though the pension is a function of the total life earnings and the time of service, in the period under study, it can be forecast with sufficient certainty from the final salary (see later).

The insight of the model is that although the decision is fundamentally a dynamic programming problem, where choice is based on the expected value of the option yielding the maximal payoff, one obtains a considerably simpler structure while retaining a most accurate approximation to the underlying true model if the choice is assumed to be based on the maximum of the expected values of the different choices (rather than maximising the expectation of the lifetime income stream as a function of the choice.).

Estimation can proceed on two avenues. In earlier times, people used simple probit and logit models to estimate the model, while more recently simulation-based techniques are more prevalent. It is shown however in Lumisdale, Stock and Wise (1990) that the savings in clarity and computational costs do not necessarily mean that results become much less precise. In either case, the option value approach requires the researcher to quantify the key elements to a high degree of precision, most importantly social security wealth, attainable pension and accrual. Nevertheless, realisation of this benefit is conditional on being able to calculate precisely the option value of retirement, and the social security wealth, among others. One can do this if the pension formula is simple (as it is in Germany) or if there is a great amount of data available (as it is often the case in the US or in Scandinavian countries).

Estimation and the problem of selectivity

The above theoretical model is quite successful in predicting retirement in certain cases. It neglects however an important element of the decision making process, namely labour market prospects. If there is important omitted heterogeneity in this respect, the estimated incentive effects can be biased.

Parameters of the option value model are to be estimated in a simulation framework, which can incorporate all the complications of the underlying dynamic programming exercise. Lumisdale-Stock-Wise () shows however, that with proper parameterisation, a simple probit regression replicates the results. Because it is also more suitable to expose the problem of selectivity, I treat them as equivalent and work with the simpler version.

The functional form of the probit option value model is quite simple. The outcome is an indicator whether an individual retires in a given year, the regressors are the option value, social security wealth, and other control variables, such as health, family background and so on. The "trick" therefore lies not in the estimation itself, but in the construction of the option value and the social security wealth. The former depends on expected income in the available states. The latter is a function of past information on one hand, but also of future information on the other, as it incorporates the value of future retirement options, which in turn depend on earnings streams between the present and the future retirement date. Supposing that pension benefit is defined and the pension system is sound, the uncertainty manifests in the earnings stream, should the individual decide to work rather than retire immediately.

There are several ways to deal with the problem of uncertainty. Stock and Wise (1988) forecast wage growth as a function of age, tenure, past values of wage growth and interactions of these variables. The thus predicted wage enters the estimation through the option value and social security wealth formula in a highly nonlinear way. Unobserved individual effects are supposed to enter the system in a way that is separable from wages.

If the wage prediction for a certain group of persons is systematically different from that for the rest, and this difference is correlated with the propensity to retire, the proposed estimation strategy is flawed. Suppose for example that a worker's knowledge became obsolete for some reason, but could nevertheless stay with the firm for some reason so far. Suddenly a downturn of the economy comes, and everybody is sacked who is paid above his or her marginal product. The person in question is probably unable to sustain the previously established wage level or growth. It might well be the case that a person does not wait to be sacked, but anticipates the event and acts beforehand. When it comes to estimation, we observe this person to retire, even though the option of staying on the job seems to be attractive.

The model of Stock and Wise (1988) is general, but when it comes to estimation, they are using firm level data. The empirical applicaton is carefully engineered such that the above mentioned problem is kept at a minimum. One has to be careful however when applying the model to different setups. Börsch-Schupan – Kohnz – Schnabel for example use survey data on individuals with very heterogeneous occupational background. It is not clear that the established methodology is sound in that case, too. The problem might be even more serious in historic episodes such as the pos-socialist economic restructuring. Because the case of Hungary we are looking at now is such, an alternative procedure is described in the following sections.

Data

The data the option value model, or any complete model of the retirement decision, requires is not available in Hungary. Administrative records of course hold the necessary information for computing pension when individuals have actually applied for it. However, these are not accessible for research at the moment and can not be linked to contextual information either. As there is no specialised survey running that would cover the elderly (such as SHARE in the EU or the HRS in the US), one can only resort to general purpose ones. The Household Budget Survey (HHBS) of the Hungarian Central Statistics Office (HCSO) is a suitable candidate for this task.

This study relies greatly on the Rotating Panel of the Institute of Economics, Hungarian Academy of Sciences, based on the Hungarian Household Budget Survey (HHBS) of the Hungarian Central Statistics Office. The survey has been running since 1993 in a relatively constant fashion. The primary sampling unit is the flat, and every person in the flat is surveyed. There is variation over time in the sample size: a cross section consists of 8 to 10 thousand households, which translates to 22-26 thousand individuals. There is detailed information about the demographic and key market labour characteristics of the entire household, and the incomes of the various individuals, including the income/consumption arising from own production.

Expenditure data are based on a diary kept by the household member most familiar with financial matters for one month, indicating the volume (if applicable) and price of the goods purchased or produced. A year-end survey is also made of the consumption of durable goods, and the final expenditure figure is derived by combining the two figures. Incomes are assessed in a similar manner – monthly, then once a year. The annual assessment of income is not conducted at year end, though, but before the deadline for tax filing, when all sources of income, rather than only one part, are considered.

The HHBS is principally a cross-section, but in order to keep the sample "fresh", the HCSO implements a rotating design through 3 years. Although the HCSO usually does not assemble the panel elements into a real panel dataset, there is enough information to do so. György Molnár, senior research fellow of the Institute of Economics, Hungarian Academy of Sciences has pioneered the HHBS panel, dubbing it the Rotation Panel (RP, documented in Kapitány-Molnár, 2001). The specific rotating structure means that if a household enters the sample in wave 1, it remains there until wave 3, and leaves it thereafter. In practice, this

means that in the periods of 1993–1995, 1996–1998 and 1999–2001 the data of the various households and, unless the composition of the households has changed, also of their members can be connected into three separate but identically structured panel databases.

This type of linkage is unfortunately hampered by heavy attrition in the last year, which results in very few observed transitions into pensioner status. Linking only two years thus gives disproportionately more observations, hence transitions. The resulting short panels are every combinations of adjacent years from 1993 to 2001, except for the 1995-1996 one. There is a price to be paid for this treatment, however. Because the HHBS does not record income spells just monthly or yearly totals, there is no way to find out from yearly data, whether a person retiring has low labour income because he or she was working only a few months, or because the wage was low.[16] As monthly data is affected less by this kind of problem, it is that what is used in the analysis. Even though it is probably more contaminated by transitional income shocks, these are most certainly smaller than the distortion brought about by the inability to account for the length of income spells within a year. An initial version of this paper used 3 year panels and yearly data to estimate the models. It turned to be unfit for that purpose, but exactly because of the noise inherent to monthly data, the Tables 6-8 of income and expenditure changes still use the 3 year panel.

Because the number of transitions is not too large even in the seven 2 wave panels, I have analysed them together ("stacked"), rather than separately. This may be regarded as an extension of the pooled cross-section analysis method. However, as in the case of the pooled cross-sections in general, it is necessary to address the effect of the 'forgotten' historical time. I do this by inflating the cash variables to a common point in time (2002) and, for regression analyses, by including the various control variables and indicators to control for the passage of historical time.

The resulting database consists of a total of 79,156 observations, including children and elderly. Looking at only the population between 45 and 65 years of age leaves us with 34,509 observations, which shrinks to 6,184 as soon as we keep only those having a spouse with complete set of information and with a positive net income, not being pensioners and unemployment benefit recipients. The two latter restrictions are crucial, as it is only earnings data

[16] After 1998, there is in fact information on the total length of the period(s) when a given income type was received. But even here, we do not know how many spells were involved, only the sum of earnings and the total length of all periods.

which we can use for the estimation of expected pensioner income. Out of the 6,184 persons in the risk group, we observe 502 transitions to pensioner status. Due to the uneven pattern of missing data, it is 5,264 observations with 383 transitions that we can analyse in the econometric model.

As we have seen earlier in the discussion of the pension system and administrative data, it is the "really" early retirees, who sacrifice a substantial amount of income by not working, which suggests that we have to pay particular attention to them. Out of the 383 transitions there are only 15, which took place after the statutory retirement age. Drawing the divider line 1 year before the statutory retirement age yields 258 "before" and 125 "after" transitions.

Ideally, we would also like to differentiate disability and old-age pensioners – we have already seen that the two retirement routes have potentially different characteristics. This is however not possible after 1997, and even if it was, the resulting sample size would be very small in either case. Because of this, I do not differentiate pensioner types and define a pensioner based on the criterion "receiving pension income in a given period".

An operational model

The specific situation at hand propts for an extension of the original option value model. Firstly, we have to deal with selectivity, mentioned in previous sections. Moreover, with only two time periods and lacking retrospective data, there is insufficient information to exactly calculate pensions or social security wealth at any point in time.

In the modified model, agents face the same decision problem as before – choosing between the mutually exclusive Retired and Nonretired (employed) states –, but now the decision is based on only the next period expected income in the two states. Let us denote the income of individual i in state 1 as y_{1i}, the observable variables driving variation of it as X_{1i}, and the unobservables as u_{1i}. Note that the relevant labour income to compare pension income to, is the one expected in the next period. This is unknown not only to us, but also to the agent, mainly because employment is uncertain. One might also try to rationalise the other supposition, namely that the employee does not know pension income, but it is more hones to say that here the researcher has less information than the individual making the decision.

The equation our interest focuses on is the one deciding upon retirement. From another point of view, this decides upon which equation will describe the income flow of the individual in the future. This can be captured by a simple binary index-model, in which the decision is driven by observables we denote with Z_i and an unobservable factor denoted by u_i. These

observables include income in the two states, y_{i1} and y_{i2}, along with other factors driving the decision, such as the value of non-work time, employment opportunities and the like. Note that the model is that of a switching regression, such as the union- non-union wage model of Lee (1978) or Maddala (1983). The fact that X_{1i} and X_{2i} are not the same does not change much and can be thought of as an a priori restriction. The model can be summarized formally as follows:

$$y_{1i} = X_{1i}\beta_1 + u_{1i}$$

$$y_{2i} = X_{2i}\beta_2 + u_{2i}$$

$$I_i = \begin{array}{ll} 0 & \text{if} \quad Z_i\gamma \geq u_i \\ 1 & \text{if} \quad Z_i\gamma < u_i \end{array}$$

(Z_i includes y_{0i} and y_{1i})

$$u_1, u_2, u_3 \mid X_1, X_2, Z \sim N_3(0, \Sigma)$$

$$\Sigma = \begin{bmatrix} \sigma_1^2 & & \\ \bullet & \sigma_2^2 & \\ \sigma_{1u} & \sigma_{2u} & 1 \end{bmatrix}$$

The unobservable factors are assumed to be joint normal. Observe that in their variance-covariance matrix Σ, one entry is missing and can not be calculated. This is because the two states are mutually exclusive, so we can actually observe every single individual in only one of them. Because we suppose that people actually chose to be in one or the other state (ie it is not only fate or labour market pressure that makes them pensioners), it might well be the case that the two groups are systematically different in characteristics that determine their income in one or the other state. This can include genuinely unobservable components, or information that is missing only for us, observers. A classic example for the first is ability in the equation for expected future labour income, which can make wages higher for some people given the same observed characteristics. In the case of the pension equation, poor or good work history despite a good/poor wage observed in period 1 is a prime suspect for driving pensions up/down conditional on observables.

If such important unobserved characteristics are at work in sorting people between the states and are correlated with observables, ie. σ_{1u} and σ_{2u} are not zero, we get inconsistent estimates if we estimate the equations using OLS. One way out of the problem is to estimate

the resulting system jointly with maximum likelihood, explicitly allowing for a correlation between unobservables: supposition of normality allows us to do that. Full information maximum likelihood estimation has however the same numerical stability problems we encounter in the classic case pioneered by Heckman (1978) and more, given the slightly more complicated nature of the problem.

To simplify estimation, we can exploit the fact that the two states we consider are mutually exclusive and σ_{12} is nonexistent. Because of this, the problem reduces to the estimation of two equations with selectivity, sharing the same selectivity equation. Note that because the reduced form probits correcting for selectivity are specified the same way, the actual estimates will be numerically identical, except for a negative sign in front of one set of results. As a first step, the equations in turn can be estimated as two-step Heckman models for improved stability. As a second step, expected incomes are predicted from these equations and at the third step, these can then entered into the selection probit to estimate its structural form.

Parameterisation and estimation results

The following table summarises the variables included in each equation of the empirical model. Note that both income equations are estimated in a Heckman two-step framework, hence are accompanied by a reduced-form probit. The variables included there are given by the appropriate combination of the RHS variables presented here.

	Income in t=2 if did not claim pension	Income in t=2 if claimed pension	Structural probit
Non-pensioner net income in t=2 (log)	-	-	X
Pensioner net income in t=2 (log)	-	-	X
Net income in t=1 (log)	X	X	
Net income in t=1 (log) X female		X	
I: female	X	X	
Age			X
Potential experience	X	X	
Potential experience squared	X		
I: education=elementary and vocational secondary	X		
I: education=secondary	X		
I: education=college and more	X		
sI: type of employment (at a company, at a		X	

cooperative, self employed, etc)			
sI: Industry of the employer ("TEAOR")		X	
sI: occupation ("FEOR", 2 digit)		X	
sI: status in employment (manager, subordinate, blue collar, white collar, etc.)		X	
Local activity rate (NUTS3)	X		
I: region=North-Transdanubia (+)	X		X
I: region=West-Transdanubia (++)	X		X
I: region=South-Transdanubia (0)	X		X
I: region=Northern-Hungary (--)	X		X
I: egion=Norther-Great Plain (-)	X		X
I: region=Southern-Great Plain (-)	X		X
I: type of settlement=county town	X		
I: type of municipality=town	X		
I: type of municipality=village	X		
I: year-dummies	X	X	X
Share of own production in total household expenditure			X
I: partner is pensioner			X
I: was on sick-leave in t=1			X

Note: "sI" stands for "set of Indicators", which tend to be numerous so they are not listed one by one

Income at work is parameterised as a standard Mincerian wage equation with wage dynamics that accounts for potential wage rigidities. Along with previous period income, experience and schooling are included, plus local activity rate (effect of local labour markets) and dummies for females and different panel periods. Lambda is the inverse mills ratio controlling for selectivity.

Because lagged income is included, conditional effect of variables can be interpreted as governing (about half of the) growth of wages. Although potential experience has no significant effect, increasing education exhibits the well known positive effect on wages. Ideally the equation should be estimated for men and women separately, as women are known not only to earn lower wages than men, but with different impact of the relevant drivers. The small number of observations does not permit this, but the negative parameter on the dummy for women captures this effect well. The positive impact of the local activity rate represents the effect of a wage curve: local labour markets with higher activity rate (lower inactivity rates, thus lower

pressure) yield higher wages. Some of the regional and time dummies are significant too, introducing a downward correction for worst performing regions and years immediately after the transition. Fit of the labour income equation is good, producing a 76 percent correlation between observed and predicted income for the population that is working through period 2.

Lambda, the control variable in the labour income equation has a statistically significant positive sign, indicating that the persons remaining in employment from period 1 to period 2 are indeed a selected population. The sign of the parameter indicates that the implied correlation between the unobservables in the labour income and the selection equation is positive. If we think of this unobservable variable as "ability" affecting labour market success, this means that more able people earn *more* and also consider retirement *less* than the less able ones. If this is an omitted variable concerning (good) labour market experience, we can conclude it affects both wages and the probability of not retiring. This is the result we expect based on the simple model.

Table 9: Selectivity-corrected estimates of expected working income (Heckman two-step estimates with selection probit)

Outcome: Working income in t= 2 (net, log)			
	parameter	std.error	
Income in t=1 (net, log)	0,665	0,012	**
Potential experience	0,020	0,014	
Potential experience squared	-0,000	0,000	*
Schooling: vocational	-0.013	0.039	
Schooling: secondary	0.077	0.041	*
Schooling: college	0,165	0,142	**
Female	-0,083	0,011	**
Local activity rate	0,204	0,093	*
Lambda	*0,118*	*0,048*	**
Constant	3.30	0.262	**
+panel dummies			
Corr(y,yhat)	0,76		
N	5.262		
Censored:	383		

The reduced form probit: Outcome: NOT claiming pension in t=2			
	Parameter	std.error	
Income from own production (%)	-0,055	0,316	
Partner retired	-0,159	0,067	**
Sick days	-0,446	0,070	**
Age	-0.130	0.026	***
Female	0.131	1.429	
Potential experience	0.240	0.087	**
Potential experience squared	-0.003	0.001	**
Income in t=1 (net, log)	0.313	0.101	***

Local activity rate	0,404	0,614
Constant	4.465	
+schooling, employment type, employment status, occupation, industry, regional, settlement type and panel dummies		

Turning to the reduced form selection equation, we see that it gives results that are by and large in line with our expectations. The presence of a retired spouse (as an important determinants of the value of non-work time), sick days in period 1 (a proxy for health issues) and age decreases the likelihood of continued work. Local activity rate and the share of own-production compared to total expenditure however exhibit no significant effect. This is a somewhat surprising, but quite robust result. Results do not suggest regional differences in propensity of a continued career. The individuals in years witnessing the first increase in statutory retirement age have an increased propensity to retire later.

The effects of economic incentives are consistent with what the simple framework suggests. Higher net income in period 1 increases the likelihood of retirement. If there is persistence in wages, a high wage in t=1 suggests high wage in t=2, which makes it worth to continue an active career. Age has a negative, experience a positive effect. Out of the job-related set of indicators, only some industry dummies are significant by themselves.

Table 10: Selectivity-corrected estimates of expected pensioner income (Heckman two-step estimates with selection probit)

Outcome: pensioner income in t=2 (net, log)			
	parameter	std.error	
Income in t=1 (net, log)	0,359	0,055	**
(Income in t=1) * (female)	-0,009	0,055	+
Potential experience	-0.005	0.010	
Lambda	0.023	0.094	
Constant	6.961	0.922	**
+ employment type, employment status, occupation, industry, panel dummies			
Corr(y,yhat)	0,77		
N	5262		
censored	4879		

Note: results for the selection equation are identical to those presented in Table 9, but with a negative sign.

The next equation predicts pensioner income as a function of the log of period 1 net income and other variables affecting pension. Because the pension formula includes last period

income in both the pre- and post-1997 regime, and income tends to be persistent, income in the last period is a highly relevant variable – it has indeed a statistically significant effect on pensioner income. It does not, however, reflect past labour market experience. This is proxied by the interaction of last (period 1) net earnings and a female dummy, plus a set of job-related indicators: employment status, employment type, job type and industry of employer. The interaction is meant to capture that on average, women accumulate less labour market experience than men do and therefore either retire later or – as we have seen in the administrative statistics – with greater deductions from their pensions. The job-related indicators reflect the observation that employees in different jobs and industries had very different chances to switch to a new, more profitable job during the transformation. Although the interacted variable is significant only at 10 percent level, and only some of the job-related indicators are significant at any level, together they contribute significantly to the identification of the pension equation. Note also that this equation is essentially estimated on the 383 individuals claiming pension. Considering this and the imperfect proxies used, the explanatory power of the pension equation is quite good: the correlation between the predicted and actual pensions is 77 percent.

The selection equation was specified the same way as in the case of the labour income equation. The results are broadly the same, with the exception that lambda, the variable controlling selection is insignificant. This might be due to the fact that there is only a few observations that are informative about income in pensioner state.

Table 11: Structural probit estimate of retirement

Outcome: claiming pension in t=2			
	dP/dX	std. error.	
Predicted pensioner income (net, log)	0.025	0.013	*
Predicted working income (net, log)	-0.060	0,013	**
Income from own production (%)	0,003	0,025	
Partner retired	0,025	0,007	**
Sick days	0,049	0,009	**
Age	0.011	0.000	**
Local activity rate	-0,035	0,056	
+regional and panel dummies			
Pseudo-R2=0.11			

Table 11 presents the structural probit estimates of the marginal effects of the regressors on the probability of retirement. These were calculated by predicting both labour and pensioner

income for both those who transferred to retirement and for those who did not and including them into the probit equation for retirement.

For the variables excluded from income equations, the results are similar to what we have already seen in the reduced form probit. Concerning the expected period 2 incomes, we have the expected results. A higher labour income decreases the propensity of retirement, while a higher expected pension, fixing labour income, increases it.

As a robustness check, the above estimates were repeated on a number of different populations and with different specifications. Instead of the 45-65 year olds, I also used the above 45, below retirement age group, those above 45, but 1 and 2 years before early retirement age, all the above with no restriction on the lower end. I also experimented with including the job-type set of indicators also in the wage equation, where some could comment, they also belong. Although the results were not identical, they were very similar and always gave the same qualitative answer, suggesting that the obtained results are quite robust.

What can we make of these results if we take them at their face value? We have looked at retirement decisions in Hungary where there really is a decision to be made: retirement before early retirement. Economic incentives seem to have a significant effect on these decisions: those with higher expected pension retire earlier and so do those with lower expected labour income. Based on theoretical results and empirical evidence from other countries, this result is in line what the relevant literature documents in other countries.

In Hungary, the interpretation can be different from what is appropriate in the case of, say, US occupational pension schemes. There, it seems to be clear that firms engineer wage and pension schedules to create an incentive structure for the employees to leave the firms at a specific age, as they want to refresh their workforce. This is a deliberate action that has certain benefits to the company and some to the employee as well. In Hungary, however, and in fact in many European countries, the aim of the pension system is not to remove working individuals from employment, even though this is the end result. This is especially interesting

6. Conclusions

Activity of the working age population is quite low in Hungary, similarly to other new EU member states, with the exception of the Czech Republic. In this paper I presented arguments to support the claim that low activity can be attributed to the workings of the pension system to a great extent. Firstly, retirement age is lower that that in a typical EU country, with aver-

age retirement age at 55 for women and 60 for men. Although labour activity is permitted for retirees, there is practically no pension bonus attached to extended activity in the pension system. A change in the legal framework regulating employment is connected to age, not pensioner status, which gives no incentive do defer retirement. Because of this, there is nothing to lose with claiming pension. People thus do so as soon as possible, only few works after retirement. Although there are different reasons for this in every case, such an experience is in line with what we see in many EU countries. Although adjusting for the difference in legal retirement ages immediately "removes" part of the difference in activity, it remains to be seen whether such a correction would work out in real life. The recent increase in effective retirement age for women might give some insights to the possibilities.

We have seen that although this is not a necessity, retirement goes hand in hand with inactivity. Retirees do not seem to develop additional income sources, but rather adjust to the lower income level that retirement brings about. Calculations that follow international standard yield a very high replacement rate, possibly higher than 100 percent. Another calculation, better suited for Hungarian peculiarities obtain a much lower value, between the range of 50 and 70 percent. Empirical net replacement rates calculated from the Hungarian Household Budget Survey (HHBS) for married people are just a little above 70 percent.

Another factor contributing to low activity is early retirement, partly independent from low legal retirement ages. Those taking early retirement have to face a more difficult decision than those retiring at normal ages. Using disability retirement or early old-age retirement as an exit route, available pension is considerably smaller. This might make one wonder whether claiming such a pension is really a decision, or merely the workings of a severe constraint on employment possibilities. Using panel data to model the decision process revealed that expected income in the two available states, non-pensioner and pensioner, have a significant effect on retirement decision. Moreover, significance of the correction term suggests that the system is selective: people with below average wage prospects have a higher chance to retire early than others. Given the legal framework, employment chances and rigor of the unemployment benefit system, this creates particularly strong incentives to retire and not work afterwards.

Although the results are reassuring, there is ample room for improvement. Firstly, exact calculation of expected pension is not possible using the data sources at hand. Access to administrative data is restricted, mainly because of data protection reasons. If this changes and actual retirement records become available, further research can use much higher quality data. Secondly, there is very little information on labour market behaviour of retirees. We know

that only a few of them works. It would be instructive, however, to see why and in what circumstances decide so the ones who do work.

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