IN FOCUS
LABOUR – THE SUPPLY SIDE

Editor:
Péter Galasi
Authors:
Péter Galasi
Gyula Nagy

1. INTRODUCTION

Péter Galasi

Defining and estimating the labour supply is an important area of labour economics. Neo-classical economics defines supply as the amount of a given good being offered for sale. The supply function describes the selling intention. The simplest form of these models has only a single factor: the unit price of the good. Supply, then is the amount of a good being offered as a function of sales price (unit price). This definition also works for the labour supply. The good for sale is labour, and the supply is the amount of labour being offered for sale as a function of sales price – in this case: wages. What is not self-evident is how we measure the quantity of work being offered.

There are essentially two ways of measuring the amount of labour that is for sale. One approach defines the labour supply as the sum of the individuals willing to work under given labour market conditions, or in other words, the total number of people who want to work. Here, we measure the labour supply in capita. In this case, the labour supply is empirically quantified as the sum of persons actually working (employed) plus the people who would like jobs but are not working at the time of the observation (unemployed). This approach leads to a study of various participation (employment) and unemployment rates. In this instance the analysis focuses on calculating the appropriate rates, on investigating their time trends, and on studying the factors influencing the chances for individual labour force participation (activity, employment) and unemployment. This approach has been used in Section 2 of this chapter, where the author investigates labour force participation, employment, and unemployment trends for males and females along with the factors that influenced them in the 1990s.

Another approach to quantifying the labour supply sets supply as the amount of working time people want to spend on the job over a given period of time (day, week, month, year). In this case, we measure labour supply in working hours. The principal task here is to study the fluctuation of working hours over time – that is, the supply-side adjustment. One distinct trend in analyses defining the labour supply as working time is the study of factors – principally price signals – that influence the supply. Starting off in the early 1960s, these models initially focused primarily on the effects of wages and of non-wage incomes on the paid labour supply measured in working hours.[1] Later investigations included analyses of the costs effects[2] related to taking a job on the supply of paid labour,[3] and of the effects of wages and non-wage incomes on the supply of unpaid labour.

Initial results were limited to individual labour supply estimates, but later analyses also investigated the ways how individuals within the same household adjusted their labour supply. In this context, individuals setting their own labour supply consider not only their own earnings, but also the incomes of the other working members of the household.[4] Subsection 3.1 reports on the results of this type of estimates, presenting the results of calculations for the supply of both paid and unpaid labour.

Researchers later extended the simple labour-supply models in many directions. In Subsection 3.2 we look at the value of paid and unpaid labour using labour supply models. In these models, first we have taken monthly paid and unpaid working hours as given, and then we have ordered specific values (hourly wages) to the unpaid working hours using equivalent wages. This enabled us to define the value of the mostly invisible unpaid labour supply. In Subsection 3.3, we present simple labour supply models that try to capture the "effective" labour supply, which includes both the labour supply of persons actually employed, and of those people who are currently not working, but who probably would work in the event of an economic upturn or of a prolonged economic prosperity.

2. THE LABOUR SUPPLY AS LABOUR FORCE PARTICIPATION

Gyula Nagy

In the course of the deep transformational recession in Hungary, about one-quarter of jobs were lost in the early 1990s. Although a significant portion of the previously employed population simply quitted from the labour force (became inactive), the result was still massive unemployment. Despite the slow economic recovery beginning in 1994, the number of employed continued to drop, and a slow expansion only began in 1998. On the other hand, the unemployment rate has been steadily declining since mid-1993, and is currently low by European comparison.

1 The early results are summarised in *Killingsworth* (1983). For an overview of later research, see e.g. *Killingsworth–Heckman* (1986) and *Pencavel* (1986).

2 E.g. *Cogan* (1980).

3 See *Gronau* (1986).

4 E.g. *Solberg–Wong* (1992), *Apps–Rees* (1988, 1997).

Males and females were affected differently by the dramatic decline in labour demand. For example, the decline in female labour force participation and employment was more substantial than for males, but actual unemployment has always been higher among males. In explaining male and female labour market peculiarities through the 1990s we rely primarily on the Labour Force Surveys (LFS) of the Central Statistical Office (CSO). The information they offer is manifold and is in line with international statistical standards. But as data collection only started in 1992, for the pre-1992 period we had to rely on Labour Force Balance Sheets. These contain different concepts from those of the LFS, they describe relatively few labour market characteristics, and the data is only available for larger aggregates. Overall, this section focuses on changes in male and female labour market participation and employment triggered by the economic transformation, on the factors influencing female labour force participation rates, and on the gender-based differences in the proportion of self-employment and part-time work.

2.1 Labour force participation and employment

Participation rates in the eighties and nineties

Table 1 illustrates corresponding trends between 1980 and 1997 for several European countries. Since there can be significant differences in the ratio of school attending between the countries, and since differing retirement ages influence the labour force participation of older cohorts, *Table 1* does not contain the data for the 15–24 and the 55 and over age groups.

Apparently, in 1980 the female labour force participation rates in the Eastern European countries – including Hungary – were significantly higher than in Western Europe.[5] Later, throughout the 1980-s it was increasing continuously in both country groups, but the female labour force participation rate was still higher in Eastern Europe in 1990. In the 1990-s these trends reversed. From 1990 to 1997 female labour force participation rates continued to grow in Western Europe, while they fell in the East. The decline was significant in Hungary, in the Czech Republic and in Slovakia (11–13 percentage points in the 25–54 year old cohort). By 1997, only three of the 14 Western European countries had lower rates of female labour force participation than Hungary, and the Hungarian rate was also the lowest among the five East European countries.

There was no significant difference in the labour force participation rate of 25–54 year old Hungarian males compared to Western Europe in either 1980 or 1990, a period when there was a slow decline in male labour force participation rates in both East and West. The decline continued in both country groups following 1990, but we observe the most substantial decline

5 When defining the labour force, we consider the number of employed and unemployed people. The labour force participation rate is the proportion of the labour force relative to the whole population. The same definition can be applied within specific demographic groups as well.

in Hungary. Thus, by 1997, Hungary had the lowest labour force participation rate for 25–54 year old males among all the countries in *Table 1.*

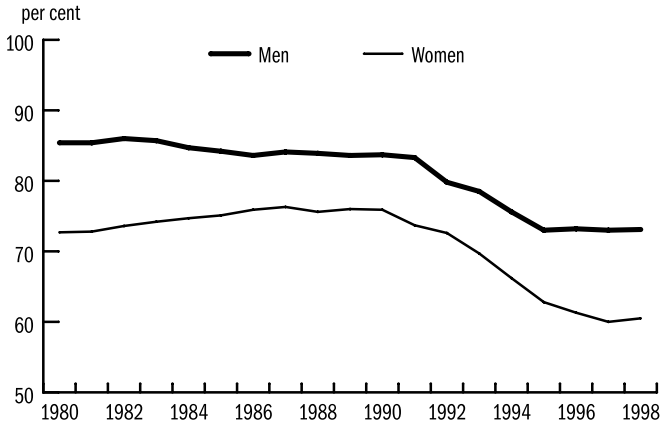
Table 1: Labour force participation rates of those aged 25–54 in selected European countries, 1980–1997 (per cent)

Country	Women			Men		
	1980	1990	1997	1980	1990	1997
Western Europe						
Austria	60.1	64.0	71.0	95.8	94.3	89.9
Belgium	46.9	60.8	69.7	94.6	92.2	92.1
Denmark	80.4	87.7	81.7	95.3	94.5	92.5
Great Britain	61.2	72.9	75.0	97.0	94.8	91.6
Finland	82.7	86.0	85.5	92.2	92.8	91.0
France	63.8	72.9	77.3	96.5	95.4	94.8
The Netherlands	36.7	58.5	68.7	93.1	93.4	88.1
Ireland	28.9	45.5	58.4	95.4	91.9	90.5
Norway	68.9	79.2	83.3	93.0	92.3	92.6
Italy	42.5	53.8	55.1	95.6	94.0	89.1
Portugal	54.1	69.5	75.0	94.4	94.3	92.4
Spain	30.6	46.9	58.1	95.0	94.3	92.6
Switzerland	52.1	64.5	76.7	97.7	97.4	97.0
Sweden	82.9	90.8	84.4	95.4	94.7	89.1
Central-Eastern Europe						
Czech Republic	90.9	93.3	82.0	97.4	96.9	95.2
Poland	78.8	79.0	76.5	94.3	93.0	89.4
Hungary	77.0	79.1	67.2	95.1	93.3	85.0
Slovakia	84.3	92.6	80.0	96.9	96.8	92.0
Slovenia	81.0	83.9	82.9	95.0	94.2	89.8

Source: ILO's Key Indicators of the Labour Market.

As mentioned before, longer time series on employment and labour force participation are available only in the Labour Force Balance Sheets (LFBS). These contain aggregated data for January 1 each year. They are based mainly on data supplied by companies and other employers, so they qualify the employees of data-providing companies and institutions as employed, while they qualify those registered at the regional employment centres as unemployed. *Figure 1* is based on these balance sheets and contains information on the labour force participation rates for the cohorts between the ages of 15 and retirement age (55 for females and 60 for males), between 1980 and 1998. Although for many years, Hungarian statistical practice included people receiving childcare support (childcare fees and childcare assistance) into the labour force, we treat these groups in *Figure 1* as being outside the labour force, so that our data should be in line with international convention and also with the practice followed by the CSO since 1998.

Figure 1: Labour force participation rates of women aged 15–54 and men aged 15–59, 1980–1998



Note: Women on maternity and child care leave are not included in the labour force.
Source: Central Statistical Office's labour force statistics.

According to LFBS data, the labour force participation rate for males dropped by 1.7 percentage points between 1980 and 1990, while for females it rose by 3.2 percentage points. Thus, during this decade the gap between the two genders narrowed from 12.8 percentage points to 7.9 percentage points. Then in the 1990s, there was a significant drop in the labour force participation rates for both genders. The decline for males – about 11 percentage points overall – ended in 1995, while the female labour force participation rate declined continuously until 1997, leading to a 16 percentage point overall decrease. Since the shock of the economic transformation had a more serious effect on the labour market position of females in terms of labour force participation rates, the labour force participation gap widened. In 1998, with female labour force participation at 60.5 per cent and male labour force participation at 73.1 per cent, the gap in the labour force participation rate is 13 percentage points, a similar figure to those recorded in the early 1980s.

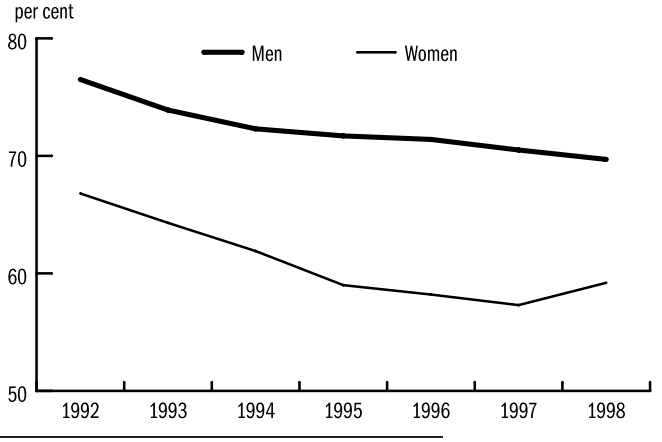
Factors Influencing Participation

We will now consider how labour force participation is related to various characteristics of males and females, more specifically to age, education levels, and to household- and region-specific characteristics. We have reliable data from 1992 when the CSO began regular LFS surveys. These surveys are conducted on a quarterly basis, and contain labour market data for the members of tens of thousands of households.

The LFS differs substantially from earlier collections of labour-related data, including the LFBS, in both its methodology and its terminology.

First of all, the source of the LFS data is not the reports of companies and other employers, but surveys on random samples of the population. This yields direct information on people working for small units or unregistered employers (for instance, in households) that were generally missing from the institutional statistics.[6] In addition, the data are not aggregated but are available on individual level, and this makes it possible to group them in many ways and conduct investigations of interactions. Further, while the Labour Force Balance Sheets treat persons who have work contracts as employed and people registered at the regional employment centres as unemployed, the LFS is in line with International Labour Organisation (ILO) standards. In the LFS a person is qualified as employed if s/he worked, or was absent from his/her job in the week of the survey, while a person is qualified as unemployed if s/he is not employed, is actively looking for work, and is ready to take a job if offered.

Figure 2: Labour force participation rates of women aged 15–54 and men aged 15–59, 1992–1998



Note: Annual averages of quarterly rates.
Source: Central Statistical Office's LFS.

Due to the methodological and conceptual differences, we come to different employment and unemployment rates when using the LFBS and LFS for the same period. *Figure 2* shows the labour force participation rates between 1992 and 1998 calculated from the labour force survey. A comparison with *Figure 1* – illustrating rates calculated from the LFBS – shows that for the majority of the years the labour force survey yields a somewhat lower rate of labour force participation.[7] We also see that in the labour force survey the male labour force participation rate continues to decline after 1995.

6 In many cases, the data on these groups in previous statistics are only estimates.

7 Possible reasons for the differences – related to the differences in concepts and methodology already mentioned – include the January 1 focus of the Labour Force Balance Sheets, while the Labour Force Survey data contain the average data for the whole of the given year. This means that the latter reflect conditions at a later time. Another reason for the lower level of labour force participation in the LFS was that the number of unemployed calculated according to ILO standards (actively looking for work and ready to take a job) has been lower than the number of registered unemployed ever since 1993, and the gap between the two has widened continuously.

Labour force surveys were introduced in 1992, but the decline in the number of jobs and labour force participation, leading to mass unemployment began much earlier, following the political regime change. We have to consider the amount of information that has been lost because we don't have detailed data for the pre-1992 period.

To answer this question, we have divided *Table 2*, which is based on LFBS data between 1989–1997 into two phases. One of them covers 1989–1992, when we had no LFS data, and the other is for 1992–1997, when these data are available. We see that the female labour force participation rate dropped by 16 percentage points between 1989 and 1997, and that 12.7 percentage points, or almost 80 per cent of the overall drop occurred after 1992. For males, the overall drop was 10.6 percentage points, out of which 6.8 or about two-thirds occurred after 1992. In other words, the majority of the decline in the labour force participation rate took place during a time period that we were able to investigate with the LFS data.

Table 2: Changes in labour force participation of women aged 15–54 and men aged 15–59, 1989–1997 from labour force balance sheets (per cent)

	Women	Men
1989 to 1997	-16.0	-10.6
1989 to 1992	-3.3	-3.8
1992 to 1997	-12.7	-6.8

Note: Women on maternity and child care leave are not included in the labour force.

Using the LFS, we will now investigate the effects of age, education, and certain household and regional specific characteristics on the labour force participation rate. We have focused on two questions: 1) is there a difference between males and females in the effects of the different characteristics, and 2) has there been a change in the effects of these characteristics over the period – 1992–1998 – under investigation?

Age

There can be significant differences between the labour force participation rates of various age groups, because the decision to take a job is strongly dependent on the life cycle. Significant proportions of young people choose to go to school to improve their future employment opportunities and wage prospects. Older groups have the opportunity to retire and as the ability to work often deteriorates with age, we can expect a decline in the labour force participation rate. The birth of children clearly has a significant influence on the participation of young women. Another difference in the

participation decisions of the various age groups may be triggered by differing attitudes towards leisure.

Table 3 presents gender labour force participation rates between 1992 and 1997 by age groups. We find typical differences between the labour force participation rates of males and females based on age. The male labour force participation rate reaches its maximum at a relatively young age: there is no significant difference between the labour force participation of the 25–29 year old and the 30–39 year old males. For females, however, labour force participation is much lower when they are in their twenties than in their thirties, clearly because of child birth. Another difference is that while there is a significant decline in male labour force participation rates above the age of 40, for females, although there was a slight decline in 1992, by 1997 the labour force participation rate of the age group 40–54 was slightly higher than that of the 30–39 year group.

Among both genders, the drop in labour force participation rates between 1992 and 1997 was the sharpest among the 20–24 year olds, although there was also a significant decline among teenagers. Among the older groups, the biggest decline among females was in the young adult (25–29) and middle aged (30–39) cohorts, while among males the most significant drops were among the older groups (40–54 and 55–59). Above retirement age, male labour force participation rates dropped much more substantially than the female ones.

Table 3/B illustrates the gender-based differences in labour force participation rate by age groups, and changes in these differences. The gap between male and female labour force participation for the entire population below retirement age widened by 3.4 percentage points between 1992 and 1997. The change was far from homogenous for the different age groups: the gap expanded more substantially for the 25–39 year olds (nearly 7 percentage points), and less substantially for teens and 40–54 year olds (1.8 and 1.3 percentage points), and remained essentially unchanged for 20–24 year olds.

We also investigated labour force participation probabilities with a multivariable logit estimate. We used the 30–39 year olds as our reference group for the age estimates. In other words, the coefficients show probabilities compared to this age group. Negative values indicate a lower probability than that of the reference group, while positive values suggest a higher probability.

For females, the coefficients for the younger age groups yield essentially the same results as the labour force participation rates reported in *Table 3*. The labour force participation of teenagers and those in their twenties is much smaller than that of the 30–39 year olds. For the over 40 year olds, however, the results were different. While the regression suggests that the

probability of labour force participation over the age of 40 is significantly lower, raw labour force participation rates show no such difference. In 1992 – as we see in *Table 3* – the labour force participation rate of females aged 40–54 in fact was 2.4 percentage points lower than that of the 30–39 year olds, though the regression estimates suggest a far bigger difference than that. Based on the coefficients, the probability of labour force participation on the part of 40–49 year olds exceeded that of the 30–39 year olds by over 5 per cent, and that of the 50–54 year olds was about 30 per cent higher. The difference was even more substantial in 1997. Here the labour force participation rate for 40–54 year olds was somewhat higher than for 30–39 year olds, while the estimation suggested an almost 8 per cent lower probability of labour force participation for the 40–49 year olds and a 37 per cent lower probability for the 50–54 year olds. The key to explaining this apparent contradiction is that over the age of 40, a far lower ratio of females have small children than do younger ones. (In 1997, for instance, 58 per cent of females aged 30–39 had children under the age of six, while the corresponding figure for 40–49 year olds was 26 per cent, and for 50–54 year olds it was 3 per cent.)[8] As we will demonstrate later in details, the younger children a woman has, the lower is the probability that she will choose to belong to the labour force. After filtering out the positive effects on the labour force participation of the lower number of children, above the age of 40 the probability of female labour force participation declines with the age.

8 The proportions are for the second quarter. The average number of children under the age of six for 30–39 year olds was 0.74, while for 40–49 year olds it was 0.31, and for 50–54 year olds it was 0.04.

Table 3/A: Changes in labour force participation rates by gender and age-group, 1992–1997 (per cent)

Age group	Labour force participation rate 1992	Labour force participation rate 1997	Change (percentage point)	Labour force participation rate 1992	Labour force participation rate 1997	Change (percentage point)
	men			women		
15–19	24.4	16.5	–7.9	21.5	11.8	–9.6
20–24	81.0	69.5	–11.6	60.6	49.2	–11.4
25–29	92.7	90.4	–2.2	62.1	52.9	–9.2
30–39	93.4	89.3	–4.1	79.9	69.3	–10.5
40–54	86.3	80.5	–5.8	77.3	70.2	–7.1
55–59	52.0	44.2	–7.9	19.3	16.2	–3.1
60–74	13.5	5.8	–7.7	7.9	3.0	–4.8
15–54/59	76.9	70.8	–6.1	66.7	57.3	–9.4
15–74	66.7	60.4	–6.3	51.0	42.8	–8.2

Table 3/B: Differences in gender labour force participation rates by age group, 1992 and 1997 (per cent)

Age group	Difference (women – men)		Change in difference (increase: +, decline: –)
	1992	1997	
15–19	–2.9	–4.7	1.8
20–24	–20.4	–20.2	–0.2
25–29	–30.6	–37.5	6.9
30–39	–13.5	–20.0	6.5
40–54	–9.0	–10.3	1.3
55–59	–32.7	–28.0	–4.7
60–74	–5.7	–2.8	–2.9
15–54 (–59)	–10.1	–13.5	3.4
15–74	–15.7	–17.6	1.9

Source. CSO (1999).

We also need to mention that the (negative) coefficients for the older age groups were larger for females than for males in every single year (i.e., smaller in absolute value). This means that above the age of 40, male labour force participation declines more substantially with age than does female labour force participation. It would appear that more males suffer a deterioration in health – the most probable explanation for a decline in labour force participation prior to retirement – than females. On the other hand, the effect of age on the labour force participation of females in the investigated time period increased in the youngest and the oldest groups. Following 1994, the absolute values of the coefficients for both teens and over 40s were higher than earlier.

The multi-variable estimates for males yielded about the same interactions between age and labour force participation as the raw labour force participation rates. Teen activity was quite low, and activity among the 20–24 year olds was significantly lower than that of the 30–39 year old reference group. In three of the seven years investigated, the coefficients of the 25–30 year olds were not significant – in other words, the probability of labour force participation by this age group was not different from that of the 30–39 year olds. In the other four years (1994–1995 and 1997–1998), however, we found significantly positive coefficients. In those years the probability of labour force participation for males aged 25–29 with the same other characteristics as the 30–39 year olds was 5–12 per cent higher than the reference group. At the same time, the labour force participation rates of the age groups show a maximum of 1 per cent difference. The reason for the difference is most likely the composition effect. The proportion of single males among the 25–29 year old group is much higher than among the 30–39 year olds,[9] and this variable influences negatively the probability of labour force participation.[10]

9 The definition of single is a male without a spouse or live-in partner. In Q1 1997, 33 per cent of the 25–29 year olds were single, while the same figure for the 30–39 year olds was 20 per cent.

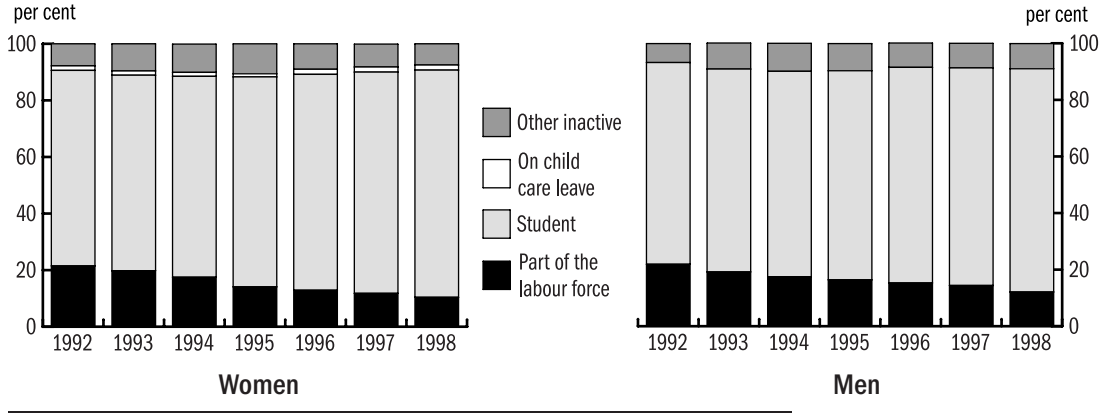
10 The "pure" differences in probability based on age received from the multi-variable estimates differ from the differences in raw labour force participation rates not only in these cases. We have only emphasised those cases where the deviations from the multi-variable estimates were significant.

Besides the labour force, we have distinguished three groups among those who are not in the labour force: full-time students, recipients of childcare support, and other inactive. On that basis we take a closer look at changes in labour force participation between 1992 and 1998. *Figure 3* shows changes in the labour force participation rates and in the proportion of the three groups being outside the labour force separately for males and females, among the 15–19 year olds.[11]

The decline in labour force participation for both genders in this age group is clearly closely related to the rise in the proportion of full-time students. Among females, the 11 percentage point drop in labour force participation occurred in conformity with a similar increase in the proportion of full-time students. Among teen males, labour force participation dropped by 9.8 percentage points while the proportion of students increased by 7.6 percentage points. In other words, among the females there was no increase in the proportion of those economically inactives who are not full-time students, while among the males that proportion went up by only 2.2 percentage points. That is, almost all of the decline in the teenager labour force participation was the result of the huge increase in the secondary school (and the much smaller increase in college or university) attendance.

11 The labour force participation rates for males shown in *Figure 3* do not correspond to the data in *Table 3*. The reason is that the CSO data used as the source for *Table 3* includes mandatory military service as a participation category, while military conscripts are not included in the data used to compile *Figure 3*.

Figure 3: Labour force participation of 15–19 years old, 1992–1998

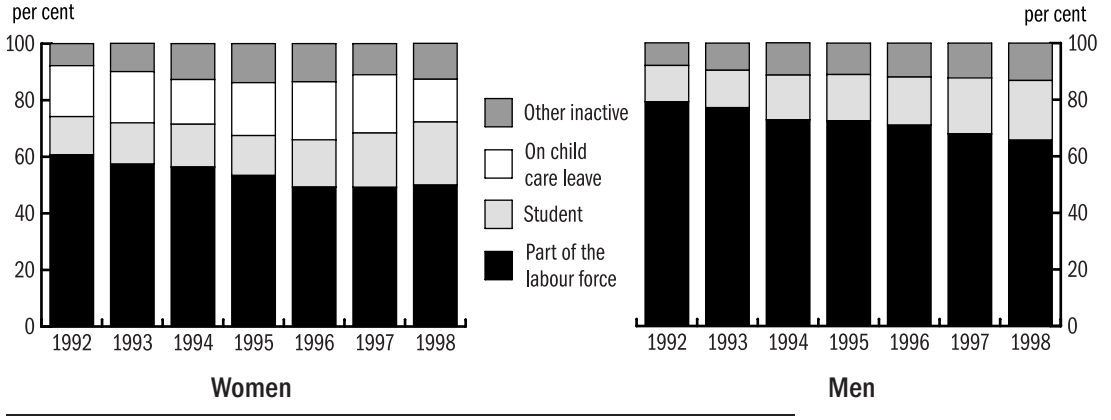


Source: CSO LFS.

Among the 20–24 year olds, there is a similar though somewhat weaker interaction between labour force participation trends and school attendance *(Figure 4)*. Female labour force participation in this age group dropped by 10.7 percentage points between 1992 and 1998, while the proportion of full-time students increased by 8.8 percentage points. Male labour force participation dropped by 13.6 percentage points, while school attendance increased by 8.3 percentage points. Meanwhile, there was an initial rise of

over 2 percentage points in the proportion of 20–24 year old females receiving childcare assistance or fees, which dropped significantly by 1998, obviously triggered by budgetary restrictions which also hit the amount of benefits offered.

Figure 4: Labour force participation of 20–24 years old, 1992-1998



Source: CSO's Labour Force Survey.

College and university attendance of the 25–29 year olds also increased substantially. LFS data on 1992 reported that in this age group 1.3 per cent of males and 0.4 per cent of females were full-time students. By 1998 the figures had gone up to 2.9 and 2.1 per cents.

The data makes it obvious that the expansion of education played an important role in the decline in the labour force participation among younger age groups in the 1990s. The altered labour market conditions provided an incentive to young people to obtain secondary and higher education, to improve their job prospectives and wages. Higher levels of education significantly reduce the risk of unemployment – which we will discuss later –, and education-based wage differences also increased significantly in the transition period.[12] As we have seen, school attendance increased to a somewhat greater extent among females than among males.

Although attending school or college is something that young people do, the influence of the increase in the number of the full-time students cannot be ignored when looking at trends in the labour force participation rates of the overall population. Between 1992 and 1998, the labour force participation of the 15–54 year old females dropped by 8.4 percentage points, while the proportion of full-time students increased by 2.6 percentage points within the entire age group. Among the 15–59 year old males there was a 7.8 percentage point decline in labour force participation accompanied by a 2.1 percentage point increase in the proportion of full-time students.

12 Compared to blue-collar workers with a primary education, the wages of white collar workers with a secondary education increased by 15 per cent, the wages of college graduates in subordinate jobs increased by 30 per cent, and the wages of college-graduate managers increased by 40 per cent between 1986 and 1995. (*Kertesi–Köllő,* 1997).

In other words, among both genders, about one-quarter of the decline in labour force participation between 1992 and 1998 was associated with an increase in school or college attendance.

Education

The participation data *(Table 4)* clearly shows that the labour force participation of both males and females increased substantially with the rise in education levels. (In *Table 4* we calculated the labour force participation rates using data of the 25 and above age groups, since under 25 there is a relatively large proportion still at school or in higher education.) The obvious economic explanation for the phenomenon is that the more highly educated persons devote more time and money to their education, and the longer the time they spend in the labour force, the more return they can expect for that input in the form of higher wages.

Table 4: Labour force participation by schooling (highest degree) of the population older than 24 years of age and younger than the age of pension in 1992 and 1998 (per cent)

Schooling	Men		Women	
	1992	1998	1992	1998
Less than primary school	51.8	33.9	45.6	20.0
Primary school (8 years of schooling)	75.6	62.1	69.2	56.2
Vocational school	90.7	84.1	78.2	67.7
General secondary school	89.7	82.9	82.8	74.9
Vocational secondary school	92.3	86.9	84.0	77.3
Higher education	94.8	91.9	85.4	85.7

According to the coefficients obtained in the multi-variable estimates, taking people having primary school education as a control group, people with less than a primary school education show a significantly lower probability of taking a job (their coefficient is negative). The relative difference between the probability of labour force participation is particularly large when comparing females with and without a primary school education. In every single year, the coefficient of females without a primary school education was lower (larger in absolute value) than the coefficient for males. We can also conclude that between the early and late 1990s, the relative difference increased for both genders, though the increase was larger for females.

Different types of secondary education had different effects on the labour force participation of males and females. Among males, a general secondary school education only slightly increased the probability of labour force participation (by 4–6 per cent), while vocational secondary school and vocational school education increased probability more significantly (by 22–25 per cent for the former and by 25–34 per cent for the latter).

However, by 1997–1998 the effects of vocational schools on increasing labour force participation had declined. A general high school education increased the probability of female labour force participation more than it did for males (by 14–20 per cent), but similarly to males, this increase was lower than for vocational secondary school education. From 1992 to 1996 there was no significant difference between the effects of education in vocational schools and vocational high schools on the labour force participation. Both of them increased the probability of labour force participation by 30–38 per cent relative to a primary school education level. Then, in 1997–1998, the effects of a vocational school education dropped somewhat (to about 25 per cent).

As expected, higher education increased labour force participation the most substantially. University and college graduates have a 40–50 per cent higher probability of looking for work than similar groups having only a primary school education. Here there is no significant difference between males and females.

Household characteristics

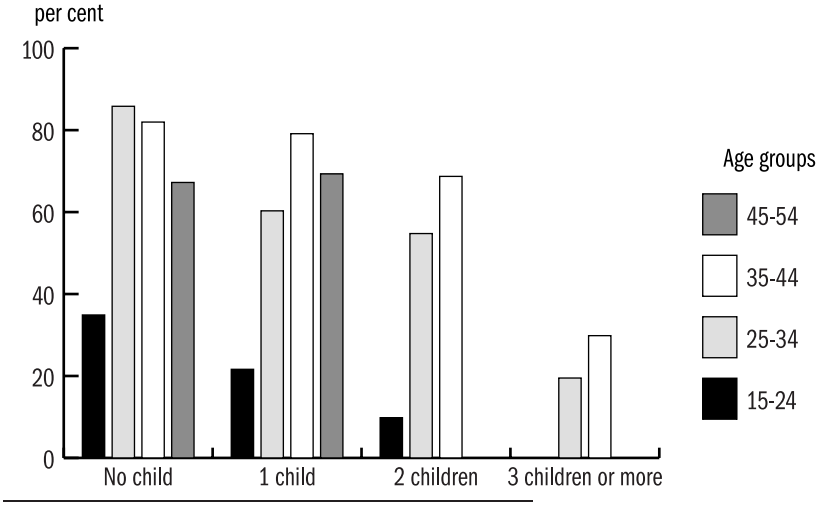
In this section we explore the effects on labour force participation of two household characteristics – children, and cohabitation with a spouse or partner.

The presence of children requiring care and support increases the household's demand for income, and thus the parents' willingness to work. But it also increases the value of the housework – caring for children is very time-consuming –, which in turn reduces the labour supply. Considering the traditional division of gender roles and the higher wages attainable by males, we expect that the higher willingness to work can be observed for males, while the females take on household demands and stay off the labour force.

Figure 5 uses 1998 data to show the differences in the labour force participation of different female age groups together with the number of small (under 14 year old) children. Within the same age group, female labour force participation generally declines with the increase in the number of children, but this interaction is not always valid, or is not always strong. For instance, the labour force participation of 45–54 year old females with one small child is even slightly higher than for females of the same age group without small children (69 vs. 67 per cent). Among the 35–44 year olds, there is hardly any difference between the labour force participation of the two groups (79 per cent of females with one child as opposed to 82 per cent of childless females), and the difference in the labour force participation of 25–34 year olds with one as opposed to two children was also small (60 vs. 55 per cent). A clearly visible and sharp difference becomes

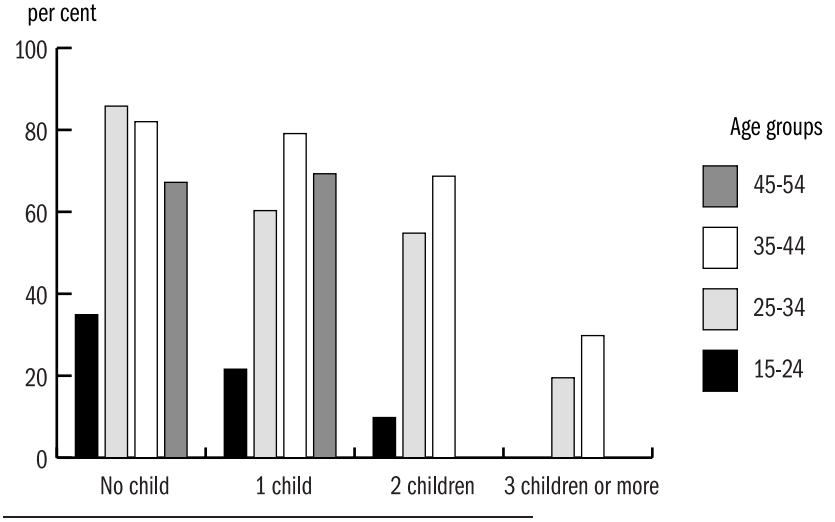
apparent between females with two as opposed to three or more children. Having three or more children radically reduces the labour force participation of both the 25–34 and the 35–44 female age groups.

Figure 5: Female labour force participation rates by age-group and the number of children in 1998



Source: CSO LFS.

Figure 6: Female labour force participation by age group and the age of the youngest child in 1998



Source: CSO LFS.

Figure 6 shows that female labour force participation is influenced at least as much by the age of children in the household as by their number. Fe-

males with a child under five show far lower labour force participation rates in every single age group, than do childless females or females with older children. The difference between the labour force participation of childless females and females with small children is lowest among the youngest groups (15–24), clearly because in this age group a large proportion of the childless females are still at school. Among the 25–34 year olds, the labour force participation of females with both 6–10 year old children and 11–14 year old children is lower than that of childless females. 35–44 year old females with children that are at least 6–10 years old continue to show a lower rate of labour force participation than childless females, but those whose smallest child is at least 11–14 seek work to a greater extent than childless females. Over 45, there are too few females with small children in the sample to estimate their labour force participation, although in this age group children who are 6 or more do not restrain them from looking for work.

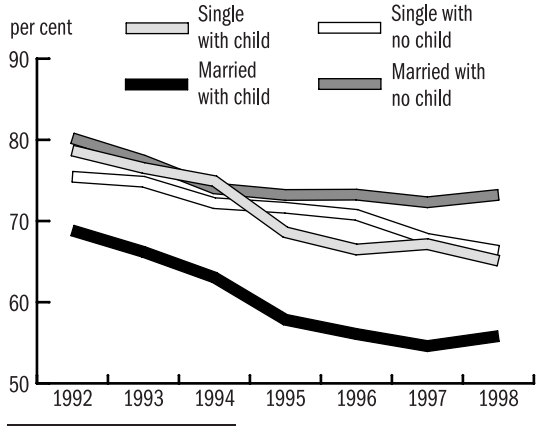
The next question is how the labour supply is influenced if someone is single as opposed to living with a spouse or partner. Living together with a spouse or partner can have differing effects on male and female labour force participation rates – depending on whether or not they have children. The probability of labour force participation can be increased if the spouse needs to be supported and it can decline if the spouse is working. The effect of marriage (or live-in partnership) on increasing labour force participation is probably stronger for males, while the effects of decreasing it should be stronger for females. When females have children, we expect their labour force participation to be lower when living with a spouse than when being single (when they cannot rely on the income of a spouse).

In *Figure 7* we describe labour force participation rates for 1992–1998 for four groups of females, distinguished by children and marital status. The labour force participation of single females raising a child was significantly higher – by about 10 percentage points – throughout the entire period than that of females raising a child as part of a couple. Among the childless groups the correlation is the opposite: singles were somewhat less active (2–7 percentage points) than when living with a partner.

With the results of the multi-variable models we get a clearer image of how the number of children, age of children, and family status operate independently of other variables – such as education level and age – in affecting the labour force participation of males and females. In the model for females, we included the number of children separately for four age groups – 0–2 years old, 3–5 years old, 6–10 years old, and 11–14 years old – to allow us to distinguish between the influence of younger and older children on labour force participation. In the model for males, since we found no difference in the level of labour force participation that could be related to

age of children, we used a single variable to represent the number of children. As we had assumed, and have seen in *Figure 7*, family status has a different effect on the probability of labour force participation, depending on whether or not a person has a child. We designed interaction variables to demonstrate this. Their value was the product of 1 and the number of children (of different ages) for singles, and the product of 0 and the number of children (of different ages) for couples, giving us a value of 0 for couples, and a value equal to the number of children for singles. This means that the coefficient for the number of children plus the coefficient of the interaction variable for marriage and number of children yields the effects of the number of children on the labour force participation for singles. We also introduced a variable with a value of 1 for childless singles, and of 0 otherwise, the coefficient of which yields the probability of the labour force participation of childless singles relative to childless couples.

Figure 7: Labour force participation rates of 20–54 year old women by marital status and child care leave, 1992–1998



Note: Married includes those living with partners.
Source: CSO LFS, Q2.

In all years under investigation the labour force participation of females with children aged 10 or less was significantly lower than that of childless females. The value of the coefficients declined together with the rise in the child's age, indicating that females with older children are more prone to enter the labour force than females with younger children. As expected, children aged 0–2 had an exceptionally strong negative effect on labour force participation, while children aged 3–5 also had a significant effect. Each additional child of this age reduces the probability of labour force participation by about 25–30 per cent. Each additional child aged 6–10 had a far less powerful influence, with the probability of labour force par-

ticipation reduced by 6–12 per cent. Where there were 11–14 year olds, in most of the years studied, there was no reduction whatsoever in female economic labour force participation: 1995 was the only year with a significant coefficient. Among males the relationship was the opposite: the higher is the number of children, the more probable it is that a male looks for a paid work. In five of the seven years, the effects of the number of children were statistically significant. At the same time, the relationship was not too robust: an additional child increased the probability of male labour force participation by only 2–5 per cent.

Among *females*, it was observed that a single parent was more ready to look for work than a parent who was part of a couple with the same number of children – clearly because of being forced to earn an income. The significant positive coefficients of the number of children/single interaction variables showed that between 1992 and 1996, single females raising a child under 6 showed a higher probability of labour force participation than married women with the same number of children. However, in 1997 and 1998, we no longer found a significant difference between the two groups. The effect of 6–10 year old children on reducing labour force participation between 1992 and 1995 was lower among singles than among married females. Among males, the situation was also different here. The sign of the coefficients of the interactive variables was negative and their absolute value – when they were significant – was larger than the child number variable coefficients without the interaction. This meant that probability of labour force participation for single males declined rather than increased with a rise in the number of children.

In all of the years studied, there was a lower probability of childless singles seeking paid work than childless couples – which shows that the single and childless variables were significant coefficients. A factor probably contributing to this is that childless couples compared to childless singles have a higher demand for income because a larger proportion of them have moved away from the parental household. The correlation is valid for both males and females, although the effect is weaker for females than for males – only about half as much.

Looking at labour force participation trends by gender, we have seen that in the period of economic transition, female labour force participation dropped to a greater extent than male, so the labour force participation gap between the two genders widened in the 1990s. There might be supply causes in the background of this, along with the decline in demand for labour.

One factor that made a minor contribution to expanding the gender labour force participation gap was that the number of females below retirement age attending full-time school increased to a significantly greater ex-

tent than the number of males. It is very likely, however, that there was an even more significant supply-side factor behind this: with declining real wages it became less worthwhile for females to work for pay. Female wages were significantly below the males' wages, although the gap became less significant in the 1990s,[13] while at the same time, their household work is considered to be more valuable than the males' household work.

As we have seen, raising children is an important factor that influences female labour force participation. While among males, having children somewhat increases the probability of taking a job, irrespectively from the age of the child, labour force participation on the part of females with pre-school children or children in the lower grades of school (6–10 year olds) is significantly lower than that of childless females or females with older children that otherwise have the same characteristics. The smaller the child, the more powerful the labour force participation-reducing effect. Childless singles – males and females alike – are less likely to belong to the labour force than couples living together. However, single females with children are more prone to look for work than females with the same characteristics and the same age children, who live in couples.

2.2 Employment trends and types in the 1990s

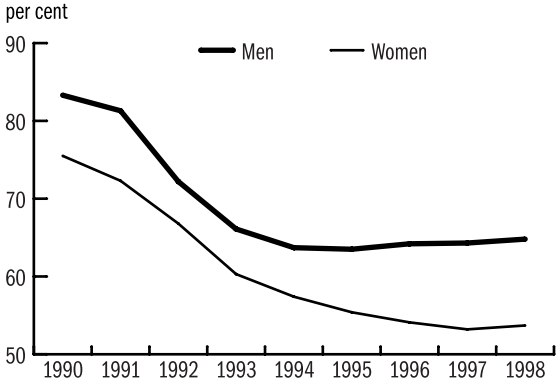
In the 1990s, employment among females dropped to a greater extent than among males, just as did labour force participation. Using LFBS data, *Figure 8* shows employment rates for the under-retirement-age population between 1990 and 1998. At the beginning of the period, employment rates for both genders dropped rapidly, and then from 1993–1994 female employment continued to decline though at a slower rate, while male employment showed hardly any change at all. In the final analysis, in early 1998, the employment level of males under retirement age was 18.5 per cent lower than in early 1990, while the female employment rate decreased by 21.8 per cent over the same time period.

We do not have detailed employment data before 1992, when the LFS began, just as we had no data for labour force participation rates. We will now briefly look at certain employment types such as part-time work, and the difference between genders in the various types of employment.

Table 5 shows the part-time workers whose usual number of working hours is below 40 hours per week, unless it is below 40 hours because some kind of legal preference mandates a time-off. (There is no data on part-time employment available for 1993 and 1994.)

13 See: *Galasi* (2000).

Figure 8: Employment of those below pension age by gender, 1990–1998



Note: State as of 1st of January of the given year.
Source: CSO LFBS.

Table 5: Part-time employment among the below pension age population by gender, 1992–1998 (per cent)

	1992	1995	1996	1997	1998
Men					
Number of the employed (1992=100)	100.0	93.4	93.9	94.7	95.3
Number of part-time employed (1992=100)	100.0	35.7	37.9	37.6	47.1
Proportion of part-time employed out of all employed	3.5	1.3	1.4	1.4	1.7
Proportion of voluntary part-time employed among all part-time employed		59.8	60.6	61.7	63.3
Women					
Number of the employed (1992=100)	100.0	89.2	88.1	87.7	91.2
Number of part-time employed (1992=100)	100.0	49.0	50.5	55.5	58.0
Proportion of part-time employed out of all employed	6.3	3.5	3.6	4.0	4.0
Proportion of voluntary part-time employed among all part-time employed		59.2	61.5	63.4	64.0

Source: CSO LFS.

In *Table 5* the top line on the upper block (male data) and on the lower block (female data) gives information on the time trend of the number of people employed over time, and the second line gives information on the number of people employed part-time. We see that from 1992 to 1995, part-time employment went down to a far greater extent than overall employment. The number of males working part-time dropped to just over one-third of what it had been and the number of females was down by half, while the overall number of below retirement age males employed went down by only

6.6 per cent and the overall number of females decreased by 10.8 per cent. After 1995, part-time employment began to rise again, but in 1998 fewer than one-half of the males and two-thirds of the females who had worked part-time in 1992, now had part-time work. We do not know the precise reason for this decline. It may be that the labour shortage disappeared and the relatively high side-costs of employment reduced employer interest in employing people part-time. Supply side issues also have to be considered. With declining real wages, fewer employees found it worth their while to work part-time, since the specific costs of holding a job are higher and actual hourly earnings are lower for part-time workers.

We need to stress that when compared to other countries, the proportion of part-time employment in Hungary is very low. In the European Union, in 1990 the average proportion of females working part-time was 27 per cent while in 1998 it was 28 per cent (*OECD,* 1999). Compared to that, the 6 per cent that was recorded in Hungary in 1992 was itself extremely low. The results of the comparison are not changed substantively by the fact that in the European Union all those working less than 30 hours/week are regarded as part-time workers, even if they were working fewer than 30 hours because of a legal preference mandating time off. Using the same calculations, in 1998 only 5 per cent of females in Hungary worked part-time, just a single percentage point higher than the data in *Table 5.*

When looking at part-time workers, it is common practice to distinguish between people working part-time by choice and people who are working part-time because they were unable to find a full-time job. The bottom line of the blocks on males and females in *Table 5* illustrates the proportion of persons working part-time by choice. In 1998 it was barely two-thirds of either gender, and has increased somewhat – by 4–5 percentage points – since 1995 (the year from which part-time workers can be identified in the labour force surveys).

There are sharp differences between the two genders regarding the manner in which people work. *Table 6* shows that the proportion of employees is higher among females, while males are more often self-employed or members of cooperatives. (We have qualified individual entrepreneurs and owners of partnerships or other businesses who work in them as self-employed.)

Table 6: Number of employed by type of employment and gender, 1992–1998 (per cent)

	1992	1993	1994	1995	1996	1997	1998
Men							
Employee	76.4	77.9	78.3	77.9	77.3	78.3	79.7
Coop member	7.2	4.6	3.6	2.9	2.8	2.4	1.9
Self-employed	15.8	16.3	16.8	17.8	18.3	17.7	16.8
Casual worker, family help	0.7	1.2	1.3	1.4	1.6	1.6	1.6
Women							
Employee	84.2	86.6	87.1	87.2	87.4	87.8	88.5
Coop member	3.8	2.5	2.0	1.6	1.5	1.3	1.0
Self-employed	10.5	9.4	9.3	9.6	9.3	9.0	9.1
Casual worker, family help	1.5	1.6	1.6	1.6	1.8	1.9	1.3

Source: CSO LFS.

2.3 Unemployment

The unemployment rate – the proportion of unemployed people in the entire labour force[14] – is higher among females than males in the vast majority of developed countries. In 1998, the average female unemployment rate was 11.5 per cent in the European Union, while male unemployment rate was only 8.7 per cent. At the same time, in the OECD countries the average female unemployment rate was 7.4 per cent, while the male rate was 6.3 per cent (*OECD,* 1999). There are relatively few countries where male unemployment is higher. In 1998, these countries included Ireland, Sweden, and the United Kingdom in Europe, and Australia, Canada, and New Zealand of the non-European OECD countries.

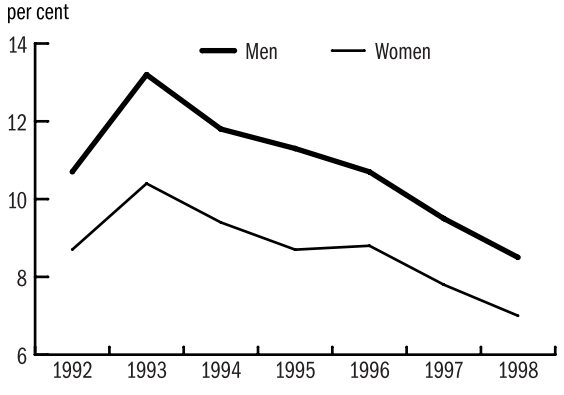
In Hungary, as we can see in *Figure 9,* the unemployment rate for females has permanently been lower than for males, ever since the appearance of mass unemployment.

In this subsection, the first thing we investigate is whether female unemployment is lower in Hungary than male unemployment because females have more favourable personal, household- and region-specific characteristics – the factors that influence the risk of unemployment. Then, we will expand the analysis to include the sectoral or industry-specific characteristics of the employees, trying to determine the extent to which differences between males and females in this respect contribute to their different unemployment rates. Then, we will look at the duration of unemployment, and differences between the two genders with respect to when they become unemployed and when they become re-employed. Finally, we will attempt to clarify the extent to which the image of unemployment would be changed if the official definition of unemployment were broader. In other words, what would happen if, for instance, the group that has lost all hope

14 Under international statistical standards, a person qualifies as unemployed if *a)* s/he does no paid work at all, *b)* is actively looking for work, and *c)* would be able to take a job within a short time, if offered. As indicated, we have used this definition of unemployment in this study.

of ever finding a job, or the people who would like to work but do not actively look for a job, were qualified as unemployed.

Figure 9: Unemployment rates by gender, 1992–1998



Source: CSO LFS.

Factors influencing unemployment

The difference between the unemployment rates of two groups of employees – males and females in our case – could occur because they have different characteristics in the factors influencing the probability of finding jobs. If differences of this nature are behind the different unemployment rates, we would be unable to say that simply belonging to one group or the other had a direct influence on unemployment. If, for instance, the sole reason for higher unemployment among males were found to be that they were less educated than females (if there were no difference between the unemployment rates of males and females with the same level of education), we would have to say that there was no difference between the genders regarding the probability of unemployment. We would conclude that the higher unemployment rate among males was the consequence of different education levels. So, the question is whether the lower unemployment rate among females in Hungary stems from differences such as this or not.

To answer this question, we took the Q2 sections of the LFS and prepared multi-variable estimates for various personal, household- and region-specific characteristics – age, education level, family status, number of children, place of residence (Budapest or elsewhere), and the regional unemployment rate – to find their effects on the probability of being unemployed. Just as when estimating the probability of labour force participation, here we also used logit regressions. But this time we set up for each year a common regression function for males and females, and used gender as an explanatory variable.[15]

15 We used a joint model, because we assumed that most of the variables – personal and regional characteristics – influence similarly the male and female probability of unemployment. However, when it came to marriage and number of children, where we assumed differences of this nature, we estimated different coefficients for the two genders with interaction variables.

According to the estimated coefficients, the probability of unemployment is strongly dependent on age. Using the multi-variable estimates, teens were found to have a positive coefficient, meaning a higher probability of unemployment than the 20–24 year olds used as the reference group. Among older groups the negative coefficients rose steadily in absolute value, indicating a declining probability of unemployment with the increase in age. The relationship between the age and the unemployment rate was similar for both genders. Perhaps it is worth pointing out the difference that unemployment among 25–29 year old females did not decline as much as it did for males relative to the 20–24 year old reference group, while among males the differences in rates between the 25–29 year olds and the 30–40 year olds were relatively small.

The higher unemployment rate among younger groups was principally because on the one hand, employers prefer to hire people with experience and practice, who require less of an effort to train, while on the other hand, there is a lower probability that they will dismiss their more experienced workers. In addition, young people are more mobile on the labour market and quit jobs more often than older people. At the same time, we might think that employers are less willing to hire older workers whose remaining active careers are too short to make it worth spending the money to train them. Based on that assumption, we should expect a higher rate of unemployment among persons close to retirement age than among the middle-aged. However, we found no such correlation between age groups and unemployment rates, and our multi-variable estimations did not reflect this either. The unemployment of the oldest group is not lower than that of the middle-aged one. The possible reason is that many people in the elder group with low chances of finding a job tend to quit the labour force, for instance, by applying for a disability pension.

There are major differences in the unemployment rates of people with different education levels. There is a far lower unemployment rate for people with higher levels of education than for people with lower ones. The reference group contained people with eight years of primary school education, and relative to them, the unemployment probability rate for people with less than eight years of education was higher (the coefficients were positive), while the probability for people with more education was lower. The higher is the level of education, the lower is the probability of unemployment (the higher is the absolute value of the negative coefficients). Among people with a secondary education, the probability of unemployment among those with the baccalaureate (secondary leaving certificate) was somewhat lower than it was for those completing vocational schools, while graduates of vocational high schools had a somewhat lower probability than graduates of general high schools. There were no significant

differences between males and females regarding the effect of education level on the probability of unemployment. The education-level based differences in unemployment suggest that employers consider education level a gauge of ability, and prefer to employ and train people with higher education levels in jobs offering long-term employment.

When investigating family-household characteristics, we assumed that they have different effects on the unemployment risk of the two genders. We might expect employers to consider marriage and children among males to be signs of reliability and a commitment to stability on the labour market, while among females they are likely to believe them to be less reliable because of obligations in the household and towards children. The results of the estimations did not fully meet these expectations but it did appear that the effects of marriage and children were not identical for males and females.

In the quarters investigated, when the effects of all other characteristics were filtered out, married males showed a 5–8 per cent lower probability of being unemployed than single ones.[16] For females, the effects of marriage show the same direction though it is less strong. Married females are only 2–5 per cent less likely to be unemployed than singles.[17] As expected, children increase the probability of unemployment among females. One additional child increases unemployment probability by 2–3.5 per cent.[18] In 1992 and 1993, the number of children did not affect male unemployment, but from 1994 there was a significant though weak correlation: one additional child increased the probability of being unemployed by 1–2 per cent. It is possible that this correlation is spurious and is the effect of characteristics that are not controlled for in the models – for instance, the combined effect of the powerful employment discrimination against Gypsies (*Kertesi,* 1994) and the typically higher level of children in Gypsy families.

Finally, the most important variable in our investigation – gender – had strongly significant coefficients in every year investigated, indicating that lower female unemployment was not being triggered by the effects of the other variables in the estimates. Between 1992 and 1998, females in Hungary with identical characteristics as males showed a lower probability of unemployment.

Sectoral/industry effects

Another factor that may have contributed to the gender difference in unemployment is that different proportions of males and females work in different industries/sectors. If the risk of unemployment is different between the sectors – which can be particularly true during periods of rapid economic restructuring –, and if the males and females tend to work more in sectors

16 When reporting the results of the unemployment models, we calculate the marginal effects at 10 per cent probability.

17 The female coefficient was calculated as the sum of the coefficients of the married and married x female variables.

18 Here the coefficients are the sum of the coefficients of the number of children and number-of-children x female variables.

where the unemployment risks are different, this will clearly influence the levels of their unemployment.

When looking for explanations for differences in the unemployment rates between two groups – males and females in this case –, there are certain limits on how we can treat the industries where they work. First of all, unemployed people who hadn't worked earlier or who have been out of work for a long time cannot be included into any sector. Secondly, the effects of unemployment triggered by the chances of losing a job in a particular industry can be more or less balanced out if there is significant intra-sectoral mobility. In other words, a substantial proportion of people losing their jobs in one sector might find re-employment in another one.

Columns two and four of *Table 7* show sectoral unemployment rates based on the numbers of people working in the sector and the number of unemployed who leave it. Columns three and five show proportions of females in the different sectors for 1992 and 1998.

Table 7: Unemployment rates and the proportion of women by industry, 1992 and 1998 (per cent)

Industry	1992		1998	
	Unemployment rate	Proportion of women	Unemployment rate	Proportion of women
Agriculture and forestry	11.1	29.1	7.5	22.7
Mining	8.6	12.8	9.9	16.7
Food, food-processing	10.9	43.4	10.3	37.5
Textile, cloth, leather	11.0	75.3	6.8	78.5
Wood processing, paper and printing	9.6	40.8	7.7	35.0
Chemical	7.8	41.0	4.0	40.4
Construction materials	17.8	39.2	9.6	33.5
Iron and steel processing	14.9	28.9	7.5	16.8
Machinery	13.6	30.3	6.6	30.0
Other manufacturing	10.5	36.5	9.5	26.4
Electricity, gas, water supply	6.4	28.2	4.6	24.3
Construction	18.5	14.6	10.6	7.8
Wholesale and retail trade	8.5	57.8	6.9	53.0
Hotels and restaurants	12.9	57.2	8.6	52.1
Transport, telecommunication	5.8	29.1	4.2	28.2
Financial services	2.2	76.1	4.4	67.1
Public administration	5.4	42.4	6.4	48.5
Education	2.4	75.6	2.4	76.2
Health care	4.3	75.3	4.0	75.9
Other services	8.2	49.2	5.6	46.5
Total	9.2	45.6	6.4	44.5

Note: Persons below pension age.
Source: CSO LFS.

We observe significant differences between the sectors regarding both unemployment rates and the proportion of females in each. We can see indeed that the proportion of females is high in several industries where unemployment rates are low – such as education, healthcare, and financial services –, and that males dominate several sectors where unemployment is higher than average – such as mining, construction, other manufacturing industries, and in 1992, the machinery industry.

To quantify industry/sectoral effects, we decomposed the difference between the unemployment rates of the two genders into two parts using standardisation. One was the difference in industry-unemployment rates by gender, and the other was the differing distribution of males and females by sector.[19] During the calculations we used data on people who were employed, and people who had lost their jobs within two years prior to the survey.

Table 8, which contains the results of the decomposition, shows that the lower unemployment rates among females really are because they tend to work more in industries with lower risks of unemployment. The majority (59–68 per cent) of the gender-based difference in unemployment rates between 1992 and 1996 was the result of this factor and only a minority was because of a gender-specific difference in unemployment rates. By the end of this period, the differences due to the different gender composition became insignificant, but they still accounted for one-third of the total difference in 1997, and nearly one-fourth in 1998.

Table 8: Decomposition of gender differences in unemployment rates (per cent)

	1992	1993	1994	1995	1996	1997	1998
Male unemployment rate	9.7	11.0	8.7	7.4	6.8	5.6	5.0
Female unemployment rate	7.1	7.4	6.2	5.3	5.1	4.0	3.6
Differences in rates (percentage point)	2.7	3.6	2.5	2.1	1.7	1.5	1.4
Effects							
Differences due to male-female differences in industry unemployment rates	1.1	1.4	0.8	0.8	0.7	1.0	1.0
Differences due to male-female differences in industry composition	1.6	2.2	1.7	1.2	1.0	0.5	0.3
Proportion of industry composition effect	59	62	68	59	59	33	24

Source: CSO LFS.

2.4 Summary

Following the political regime change, in the first years of economic transformation and the accompanying recession in Hungary, about one quarter of jobs were lost, and mass unemployment emerged. The decline in employment continued until 1997, and only began to rise somewhat af-

19 Sectoral ratios were calculated on the basis of the overall distribution of the labour force, that is the combined figures for employed and unemployed.

ter that time. Unemployment was highest in 1993 and went down steadily throughout the second half of the decade. Currently it is relatively low, compared to other countries of Europe.

In the 1980s, female labour force participation in Hungary – as elsewhere in Eastern Europe – was higher than in Western Europe. In the 1990s, however, the labour force participation rates of Hungarian females dropped significantly, while it grew in the West. By 1997, female labour force participation in Hungary was lower than in most Western European countries. At the beginning of the economic transition, male labour force participation was not significantly different from most Western European countries. In the 1990s, however, male labour force participation in Hungary dropped to a far greater extent than in Western Europe. As a result, by the end of the decade the male labour force participation rate qualified as low by international comparison.

From 1992 to 1997, the sharpest decline in labour force participation for both males and females was in the 20–24 age group, but it also dropped significantly among teens. Among older groups, female labour force participation declined most significantly in the young adult (25–29) and the middle-aged (30–39) cohorts. For males the drop was sharpest among the older groups (40–54 and 55–59). Above retirement age, male labour force participation dropped far more significantly than female. Since, on the whole, female labour force participation dropped to a greater extent than male during the period of economic transition, the gender-based labour force participation gap increased.

The expansion of education played a dominant role in the decline in labour force participation among the younger age groups in the 1990s. Altered labour market conditions urge increasing proportions of young people to get secondary and higher education, to improve later employment prospectives and wages.

Expanding education has also affected the labour force participation of the entire population of economically active age. A good one-fourth of the drop in the overall labour force participation rate among those of economically active age in 1992–1998, male and female alike, was related to growing school attendance.

A minor contributor to widening the gap between male and female labour force participation was that the proportion of economically active aged females attending full-time schools increased more significantly than the similar proportion of males. But it is likely that behind this phenomenon there is a more significant supply-side factor: with declining real wages, it became less worthwhile for females to take jobs for pay. Female wages are significantly below male wages – although the difference did decline

through the 1990s –, while their work in the household is qualified as more valuable than that of males.

As education levels rise, labour force participation rates for both males and females increase significantly. The relative difference in the probability of labour force participation between persons completing and not completing primary school grew in the 1990s, and the gap was larger for females than for males. Various types of secondary education also had different influences on male and female labour force participation rates. Among males, graduation from general high school had only a slight influence on increasing the probability of belonging to the labour force, while graduation from a vocational high school or a vocational school had a stronger influence. Among females, graduation from a general high school increased the probability of labour force participation to a greater extent than among males, but to less of an extent than did vocational secondary education. People with university or college degrees are about 40–50 per cent more likely to be looking for jobs than people with primary school education, when all other characteristics are identical. In this respect there is no noticeable difference between males and females.

Having children is a factor that significantly influences female labour force participation. Among males, the presence of children slightly increases the probability that they will be working, essentially independently of the age of the children. However, the labour force participation of females with pre-school or young school children (6–10 year olds) is significantly lower than that of females with other identical characteristics who are childless or have older children. The younger is the child, the stronger is the labour force participation-reduction effect. Childless singles – male and female alike – are less likely to be in the labour force than married people or people with a live-in partner. At the same time, single females with children are more ready to work than females with the same number of children of the same age who have live-in partners.

The decline in female employment in the 1990s was also greater among females than males, similarly to the drop in labour force participation rates. In early 1998, the employment rate for males of economically active age was 18.5 per cent lower than in early 1990, while for females it was 21.8 per cent lower. From 1992 to 1995, there was a far greater drop in part-time employment than in overall employment. The number of males working part-time was down by nearly two-thirds, while for females it dropped by one-half, while overall employment among males of economically active age declined by only 6.6 per cent and among females by 10.8 per cent. Following 1995, the number of people employed part-time began to increase, but in 1998 still less than half of the males and fewer than two-thirds of the females who had been working part-time in 1992 were employed part-

time. The proportion of part-time employment in Hungary is very low by international comparison. In the European Union, the proportion of females working part-time in the 1990s was 27–28 per cent, while in Hungary it was only 4–6 per cent.

In the vast majority of the developed countries, female unemployment is higher than male unemployment. In Hungary, by contrast, the female unemployment rate – the proportion of unemployed in the total labour force – has been lower than male unemployment ever since mass unemployment emerged. Our investigations have demonstrated that the lower unemployment rate of Hungarian females is not because of more favourable characteristics than males in factors that influence the probability of employment – such as education. In other words, females are less likely to be unemployed than males with identical characteristics. At the same time, we found that one reason behind the lower unemployment rates for females is that a larger proportion of females than males work in industries where the risk of unemployment is relatively low, and therefore females have a lower probability of losing their jobs than males. But, it is also true that if a female loses a job, she will have a harder time finding a new one. Despite the lower probability of finding a job, long-term unemployment among females is not higher than it is among males. The reason is that females have a higher probability of leaving the unemployment-pool by ceasing to look for a job, or in other words, by quitting the labour force.

3. THE LABOUR SUPPLY AS WORKING TIME

3.1 Labour supply estimates – paid/unpaid work and income

Péter Galasi

One possible course in investigating supply is to study the relationship between the time an individual intends to work and her/his wage and non-wage income. The simplest model with which this is done, the simple static single-period labour supply model, maximises the utility of the individual derived from consumption and leisure. S/he allocates her/his disposable time between leisure and working time to attain the highest possible utility, given her/his wage and non-wage income. Formally: our individual wants to maximise her/his utility (U) from consumption (X) and leisure (L), while satisfying both her/his budget and time constraints. Formally:

$$\max U = U(X, L),\ U_X > 0 \text{ and } U_L > 0, \tag{1}$$

$$T = H + L \text{ (time constraint)}, \tag{2}$$

$$X = WH + Y \text{ (budget constraint)}, \tag{3}$$

where U_X and U_L are the marginal utility of consumption and leisure, T is the consumer's disposable time (hours), H is the amount of time s/he intends to work, W is the individual's wage, and Y is non-wage income. The individual's labour supply function, derived from the model, is:

$$H = H\,(W,\ Y). \tag{4}$$

Even without going into proofs, we can see that the rise in wage can increase or decrease the labour supply, while a rising non-wage income will definitely reduce it. The empirical problem is therefore writing (4) in such a form that can be estimated, and then estimating it with some statistical method.

The estimation is not simple for various reasons. We shall mention only two of them here. First of all: we can only observe the number of working hours people intend to work (supply) among those who are in fact working, while we have no reason to assume that the labour supply of non-working people is zero. Secondly: the same is true for the wages (wage offers) of individuals who are not working. Since they are not working, their observed wages are zero, but if they were to take a job they would certainly get a wage offer higher than zero.

These complications regarding the estimation can be handled in several ways. One of these is the following – three-equation – process.

1. $$P(\text{participation})_i \xleftarrow[Probit]{} (\mathrm{Z_i}),\ (i = 1, 2, \ldots\ldots,n).$$

The dependent variable is: is the person working for pay? The right hand-side variables generally include age, education level, and a variable indicating the state of the local job market. The sample includes those 16–65 year old people who are not full-time students.

2. $$\log W_i \xleftarrow[\text{OLS (White)}]{} (\lambda_{it},\ \mathrm{K_i}),\ (i = 1, 2, \ldots\ldots,n).$$

The dependent variable is: the natural log of the net hourly wage. The right hand-side variables: λ is the variable that corrects for selection bias (calculated from Equation 1.), and K is a matrix of variables containing individual characteristics. The sample: all individuals working for pay. The estimation method: OLS with White's heteroscedasticity consistent variance-covariance estimates.

3. $$\log W_i \xleftarrow[\text{OLS (White)}]{} (\lambda_{it},\ \hat{W}_i,\ Y_i,\ \mathrm{X_i}),\ (i = 1, 2, \ldots\ldots,n).$$

The dependent variable: the natural log of the working time. The right hand-side variables: λ is the variable that corrects for selection bias (calculated from Equation 1.), $\hat{W}$ is net hourly wage corrected to account for the selection bias (calculated from Equation 2.), Y is non-wage income, and X is a matrix of the other explanatory variables. The sample: all individuals

working for pay. The estimation method: OLS with White's heteroscedasticity consistent variance-covariance estimates.

Equation 3. is a standard static labour supply estimation. It is based on the assumption that the sample correctly describes the behaviour of the typical/average Hungarian worker. It produces significant parameter estimates or a relatively good fit if we can filter out the heterogeneity of the individuals. In many cases, however, we can not do this, which leads to very poor fit and many insignificant parameter estimates, as a result of the significant unobserved heterogeneity.

The estimations are generally more successful if we slightly modify the basic model and take into account that besides working for pay, individuals can do unpaid work as well. A possible extension is the following. The individual can allocate her/his time among four types of activities: paid work (H_f), household work (H_h), small-scale farm work (H_k), and leisure (L). In that case, the individual will have the following labour supply functions:

$$H_f = H_f(W, Y)$$
$$H_i = H_i(W, Y) \; (i = h, k) \tag{5}$$

While in the simplest versions of the model the task is to estimate a single labour supply equation [see (4)], here we will have three equations (the equations for time spent at paid work, at household work, and at small scale farming). More generally: we need to estimate the same number of supply equations as the number of the working activities we distinguish between. In the equation for the labour supply for pay, the sign for wage and non-work income is the same as in (4) (a rise in the wage can reduce or increase supply, while the a in the non-wage income will reduce supply). In the household work and farm-work equations the sign of wage is negative according to the theoretical model (if wages increase, then the household work and farm-work supply will decline), because the individual will be tempted to spend less time on unpaid work if the remuneration for paid work increases. An increase in the non-wage income can reduce the supply of household and farm-work or leave it unaffected. The latter occurs when the possibility to increase consumption as a result of the increase in the non-wage income does not force the individual to reduce the time spent on all three types of working activities.

We estimated the (5) labour supply functions in (5) using data from the first three waves (1992, 1993, and 1994) of the TÁRKI's (a Hungarian Social Research Institute) household panel, using the three-equation method described above. The coefficient of the wage in the labour supply equation for paid work was insignificant. In other words, a rise in wages (net hourly earnings) neither reduced nor increased the individual's labour supply for paid work. The estimated parameters of the non-wage income were sig-

nificantly negative in two of the three equations. That is – in line with the model predictions –, a rise in the non-wage income reduced the amount of time an individual chose to spend at paid work. In the 1992 equation on household work, a one per cent increase in wages reduced this type of labour supply by about 0.03 per cent, which corresponds to the relationship described by the theoretical model. For the other two years, our parameter estimates were insignificant. In all three years, the coefficient for non-wage income was significant. A one per cent increase of it reduced the time spent at household work by 0.02–0.03 per cent, which again coincided with the implications of the theoretical model. In the equation on the labour supply for farm-work, we obtained significantly negative parameter estimates on the wage for only one time period. However, the effects of non-wage income on farm-work were significantly positive for two time periods, which contradicts our theoretical model.

The empirical performance of the model, when extended to also consider unpaid work, was not bad, but the effects of the various types of incomes on the labour supply were weak, and in some cases even the direction of the labour supply adjustment is not in line with the predictions of the theoretical model.

We can further extend our model if we take into account that individuals can do more than one type of paid work for different wages, and that taking a job is costly. Let us assume again that individuals do two types of unpaid work (household and farm work), but also that they can have three types of paid work (full-time job during normal working hours and overtime, and additional part-time/supplementary job), and that employees have a time-cost (the time spent commuting to the job). In this case (5) is altered as follows:

$$(6) \qquad \begin{aligned} H_j &= H_j(W_f, W_t, W_m, Y, H_u) \quad (j = f, t, m) \\ H_i &= H_i(W_f, W_t, W_m, Y, H_u) \quad (i = h, k), \end{aligned}$$

where the lower indices of *f, t,* and *m* are the three types of paid work (full-time job during regular working hours, overtime for the full-time employer, and part-time job), and H_u is commuting time. In this case we have five labour supply equations to estimate instead of three in the previous model, and each of them contains three hourly wage variables plus the time input variable for commuting. The theoretical effect of hourly wages and non-wage income on the supply of various paid and non-paid work types is the same as in (5), while the rise in the time-cost can either reduce or increase the supply of any activity.

We estimated the labour supply equations in (6) for the first wave (1992) of the TÁRKI Household Panel with the same three-equation procedure that was also used during the previous estimation. The estimated param-

eter of the non-wage income variable was insignificant in all labour supply equations. As for the time-costs of commuting to work (H_u), its estimated coefficient was negative and significant (except for part-time and supplementary work, and farm work), meaning that an increase in commuting time reduces the supply of both full-time labour during regular hours and of household labour. The effect of hourly wages on the labour supply (in cases where the estimated coefficients were significant) was also clear: a rise of the wages always reduced the labour supply. Looking at full-time jobs during regular working hours, a rise in the hourly wages of the other two types of paid activities reduces the labour supply for full-time jobs. None of the hourly wage variables were significant in the overtime at full-time job or in the part-time and supplementary job equations. According to the estimates, a rise in the hourly wages for full-time job during regular working hours and for part-time job reduced the supply of household labour. This is also true for farm work, where we received a significantly negative coefficient for the wage for full-time job during regular working hours.

3.2 The value of paid and unpaid work

Péter Galasi – Gyula Nagy

In addition to their paid work individuals typically do a great deal of unpaid work that creates various goods and services. However, when investigating the goods and services created by a nation, we often ignore the unpaid work. As a consequence, we not only underestimate the total value of the goods produced, but we also tend to underestimate the productive activity of certain groups of people and overestimate that of others – since the two types of work are not divided evenly or randomly among the various groups of people. Data from the TÁRKI 2000 Monitor Survey allows us to estimate the value of paid and unpaid work and investigate the value of the productive activity of various population groups. First we describe the theoretical model that served as a basis for our estimations, and then we will present the estimates themselves.

The method of estimation

Our approach is based on the micro-level observations, and relies on the labour supply model designed by *Becker* (1965) and extended by *Gronau* (1977). In the model individuals maximise their utility as a function of consumption and leisure. The goods consumed can be obtained in two different ways. Either the person does paid work for a given hourly wage, or produces goods and services through unpaid household work. The individual compares the value of the two activities, expressed in consumption opportunities, and divides her/his time between paid and unpaid work ac-

cordingly. S/he spends as much time at unpaid work so that the consumption opportunity created by one hour of unpaid work should exceed the value of consumption opportunity created by one hour of paid work (with working time measured in hours). Therefore, if the person does a given number of hours of unpaid work, then – in the spirit of the model – every single hour of this time is worth at least as much in consumption opportunities as an hour of paid work. The value of one unit of paid work is equal to the hourly wage for that work, since that is the amount of consumption opportunity the individual may obtain with one hour of paid work. Thus, the total value of paid work is the product of the time spent at paid work and the hourly wage, while the product of the time spent at unpaid work and the hourly wage represents the minimal value of unpaid work. If we assume that the value of one hour of unpaid work is exactly the hourly wage, we can defend this assumption by arguing that spending one hour at unpaid work, the individual loses the equivalent income from paid work during that same hour, for which s/he would have been paid had s/he spent it at paid work. In this sense, the hourly wage is the opportunity cost of unpaid work, or the cost of forgone income that was not earned.

Therefore, when calculating the total value of the work, we have to determine the value of one hour of work, and the numbers of hours spent at paid and unpaid work. But determining the value of one hour of work is not quite obvious. Theoretically, it is equal to the hourly wage an individual can earn if s/he chooses to exchange her/his time spent at leisure or unpaid work for paid work. This – in the context of labour economics – is the individual's wage offer, the wage that some employer is willing to pay for one hour of paid work. But, wage offers cannot be observed, or only in a biased way. We do not know what kind of wage offers have those people who do not undertake paid work. Their observed hourly earnings are zero, though it is unlikely that none of the employers would be willing to pay them anything for their work. While we know the actual hourly wages of those people who work for pay, in most cases these do not describe well all the wage offers. It may well be the case that when we are unable to observe a specific wage offer, the reason of this is that it is so low that potential employees do not accept it, so it will in fact never be observed. If that is indeed the case, then we are overestimating the wage offers if we take into account only the actual hourly wages of those people who work for pay.

We can handle this problem if we follow *Heckman's* (1979) procedure to filter out the selection bias that stem from observing only the actual wage offers, and calculate a corrected hourly wage from the observed hourly wages. Moreover, we can also render wage offers to those individuals who are currently not working for pay.

We used the income and working time data of the Monitor Survey to calculate the net hourly earnings of those respondents who worked for pay, and then we estimated the corrected hourly wages of them. Heckman proved that the extent to which observed net earnings are overestimated is related to their probability of being observed. If, therefore, we know the probability that an individual will work for pay, we can estimate her/his corrected hourly wage from the actual wage. Technically, this means that first we use a probit model to estimate the probability that the individuals will be working for pay, and then, based on these probabilities, we calculate the value of the correction variable.[20] We then estimate a wage equation where we include this correction variable as an explanatory variable. The result is a corrected wage, which can be calculated not only for those people who are actually working for pay, but also for those who are not working for pay at the time of the observation. For this, we have to assume that the wage offers of non-working individuals with given explanatory variables and correction variable are the same as the wage offers of those individuals who are currently working for pay with similar explanatory variables and correction variable. With this process we therefore receive 1.) the corrected wages for people working for pay, and also for people who are not, and 2.) the minimum value of a unit of unpaid work (one hour of unpaid work), measured in hourly earnings.[21] The product of the corrected hourly wages and paid and unpaid working time gives us the total value of the paid and unpaid work.[22]

The results about the corrected hourly wages are in line with our expectations. We obtained a significantly negative parameter estimate for the coefficient of the correction variable in the wage equation. The significance of this coefficient suggests that the selection bias described above is indeed significant, and the negative sign shows that without the wage correction, we would have overestimated the value of one hour of work. We can see from *Table 9*[23] that the corrected wage leads to an hourly wage that is about 30 per cent lower than the one observed wages of those people currently working for pay. Similarly to our earlier results (*Galasi,* 2000), the correction results a much higher decline in the wages of males, and less of a decline for females. For the former, the corrected wage decreased by 32 per cent, while for the latter it was only 26 per cent lower. Therefore, the earnings advantage of males measured in corrected wages is lower (11 per cent) than their observed hourly wage advantage (21 per cent).

It is clear from *Table 9* that there is a significant difference between the corrected hourly wages of people who are actually working for pay and the overall average of the corrected hourly wages which includes the wages of those people doing unpaid work. The latter is about 17 per cent lower than the former. This shows that individuals currently not working for pay can

20 The value of the correction variable (m) for the j-th observation is:

$$mj = \frac{\phi(Z_j\beta)}{\Phi(Z_j\beta)}$$

where Z is the matrix of the explanatory variables in the model, β is the vector of the estimated parameters, Φ is the cumulative distribution function of a standard normally distributed random variable, while ϕ is the density function of a standard normally distributed random variable.

21 See *Galasi–Nagy* (2001) for details on the estimation process.

22 We need to point out that this process differs on a number of points from the process used by *Sik–Szép* (2000) in their recently published study. When calculating the opportunity costs of unpaid work, the authors only took into account the incomes from full-time jobs and did not use the wage corrections. In addition, they only calculated the value of unpaid work for those households in which the individuals worked for pay as well.

23 The calculations are for the population aged 19–70. A significant proportion of young people under the age of 19 is still at school, and they also do a very tiny amount of unpaid work. Among people over 70, for all practical purposes we did not find any individual working for pay, and it is very unlikely that people in this age group would want to return to the labour market.

expect a lower wage offer on average than those people currently working for pay, should they want to take a job as well. This confirms our assumption that the unobserved wage offers tend to be lower.

Table 9: Net (after tax) wage rates

	Men	Women	Wage rate ratio[c]	Together
Observed wage rate of workers (HUF)	405	334	121	370
Corrected wage rate of workers (HUF)	274	248	111	261
N[a] 733	697		1,430	
Average corrected wage rate (HUF)[b]	233	203	115	217
N[b] 1,510	1,701		3,212	

[a] Those doing paid work.
[b] Those doing and not doing paid work together.
[c] (male wage rate/female wage rate)×100.

Results

We investigated the average values of the corrected hourly wages of paid and unpaid working time, and of the values of paid and unpaid work by different age groups, education levels, and settlement types. Since the labour market positions and household characteristics of males and females differ, we have conducted separate calculations for the two genders.

Persons working for pay spend on average slightly more than 160 hours a month at this type of work. Males on average work 15 per cent more than females, and about 5 per cent more males than females do work for pay. Slightly less than half of the amount of time spent at paid work is used for unpaid work. The average working time for males here is significantly less than for females. On average, it is less than 40 per cent of the unpaid working time by females. In addition, more females than males do unpaid work (males make up only 89 per cent of the number of females) *(Table 10)*. In other words, a somewhat higher number of males work for pay for a slightly longer time period, while significantly more females than males do unpaid work for significantly longer time.

Table 10: Paid and unpaid working time

	Men	Women	Working time ratio[a]	Together
Paid work				
Monthly hours of work	178	155	115	167
N	732	697		1,430
Unpaid work				
Monthly hours of work	43	115	38	81
N	1,510	1,701		3,212

[a] (male working time/female working time)×100.

We can see in *Table 11* that the monthly average value of paid work for the individuals in the sample was about HUF 43,000, which is more than two and a half times higher than the monthly average value of unpaid work. The time spent at unpaid work – as we have seen – is about half of the time spent at paid work. However, the difference between the two average values is significantly larger than this because the corrected hourly wages of people doing unpaid work is relatively low. In paid work, males produce nearly five and a half times the value they produce in unpaid work, and females produce over one and a half times more. The value of paid male work is higher than that of female work – this result is a direct consequence of longer working hours and higher hourly wages –, while the value of their unpaid work is significantly lower, being only 41 per cent of the similar average value for females.

Table 11: The value of paid and unpaid work (HUF)

	Men	Women	Male-female ratio[b]	Together
Value of paid work	48,365	38,079	127	43,260
Value of unpaid work	8,973	21,805	41	15,771
Paid to unpaid value ratio[a]	539	175		274

[a] (value of paid work/value of unpaid work)×100.
[b] (male value/female value)×100.

We can get a good image of the life-time trends of the time spent at work, hourly wages, and value produced at work by looking at the different age groups. *Table 12* contains this data.

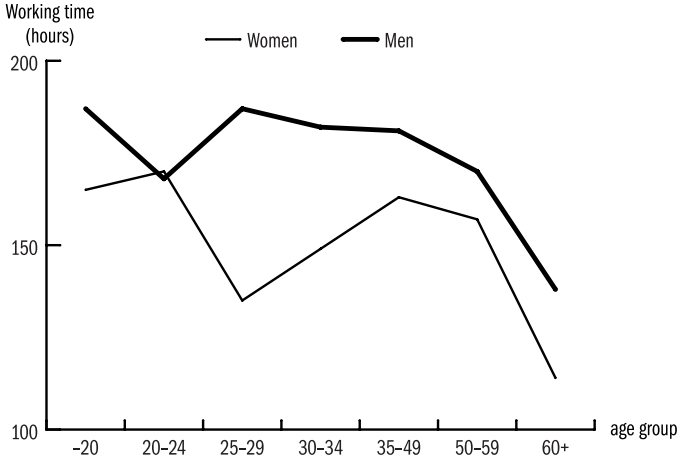
For both genders, corrected hourly earnings show a similar trend. First they rise with the increase in age, then they drop, but their final values are still higher than the initial ones. In all age groups, hourly wages for males are higher than for females *(Figure 10)*. Paid working time is also higher for males in all groups except the 20–24 year olds, where both genders spend on average the same amount of time per month at paid work. Differences in life-time profiles reflected well the different roles of the two genders in the division of household work. Male values increase at ages 20–24 and 25–29, then slowly begin to decline, dropping rapidly towards the end. Among females, paid working time is lowest at the age of 25–29 – clearly because of having children –, then it increases, and only begins to decline, similarly to males, in the oldest age group *(Figure 11)*. Among males, the duration of unpaid work increases throughout their entire life-time – though it fluctuates and the rise is relatively slow – while for females it increases rapidly at the age of 25–29, and then continues to rise slowly. The biggest difference is in the values of the 25–29 age group – similarly to paid work and for similar reasons, but in the opposite direction *(Figure 12)*.

Table 12: Working time and value by gender and age group

	Corrected wage rate (HUF)	Hours of paid work[a]	Hours of unpaid work[a]	Value of paid work (HUF)[b]	Value of unpaid work (HUF)[b]
Women					
–20	108	165	34	19,394	3,629
20–24	180	170	63	36,460	10,411
25–29	228	135	113	32,790	23,736
30–34	237	149	122	37,929	26,853
35–49	240	163	119	42,423	26,553
50–59	189	157	126	36,249	21,552
60+	149	114	131	31,597	18,480
Total	203	155	115	38,079	21,805
Men					
–20	131	187	18	31,634	2,557
20–24	198	168	29	34,064	5,412
25–29	238	187	21	48,496	5,039
30–34	264	182	33	51,715	7,892
35–49	263	181	49	52,052	11,785
50–59	222	170	45	46,588	8,810
60+	195	138	75	33,531	12,730
Total	233	178	43	48,365	8,973

[a] Monthly hours of work.
[b] Monthly value.

Figure 10: Corrected wage rates by gender and age group



The value of paid work among males essentially follows the same course as the net hourly earnings. With the increase in age it first rises at a declining rate, and then declines at an accelerating rate. Among females, however, it is more similar to the life-time pattern of paid work. Here, we also see a decline at the age of 25–29. We also need to note that at the age of 20–24,

and also in the oldest age group the values of the two genders are essentially identical. Between these two age groups, male values are higher *(Figure 13)*. As far as the values of unpaid work are concerned, here the roles of the two genders are exchanged. The female life-time pattern is very similar to the males' paid work life-time pattern. However, we observed there slowly increasing values for the males, though with fluctuations. We can also observe here that there is no significant difference between the two genders in the youngest age group, and that among older groups (over the age of 35) the advantage of females decline *(Figure 14)*.

Figure 11: Average monthly paid working time by gender and age group

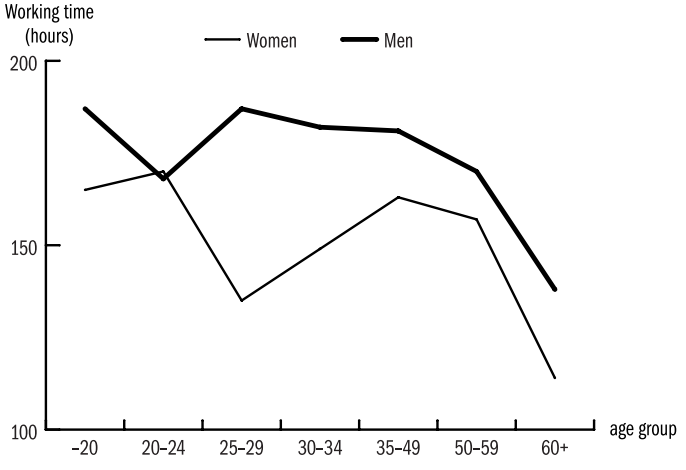


Figure 12: Average monthly unpaid working time by gender and age group

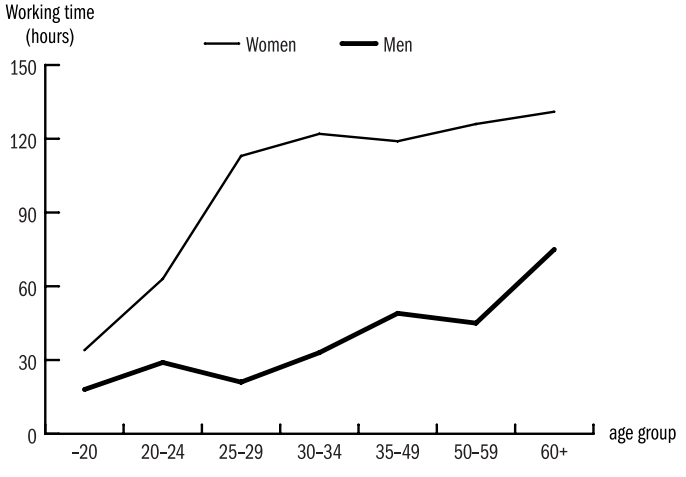


Figure 13: Average monthly value of paid work by gender and age group

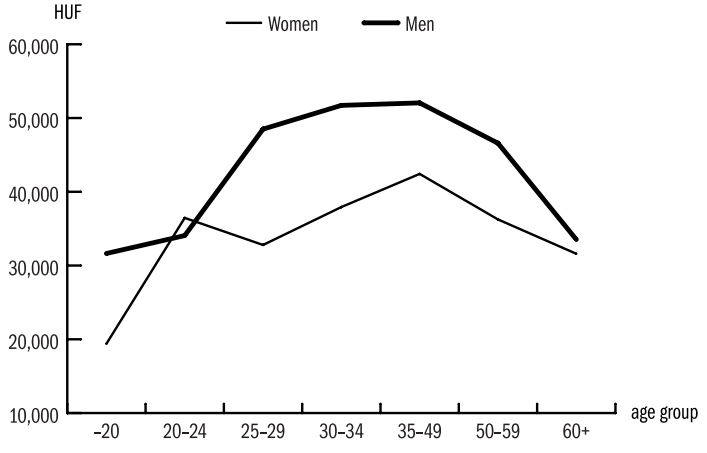
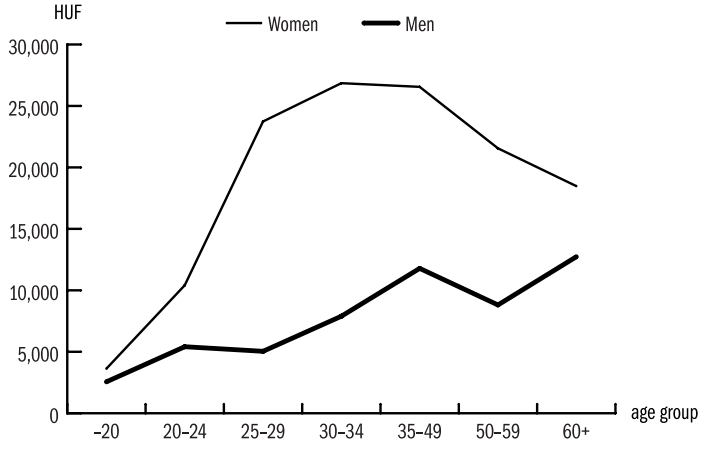


Figure 14: Average monthly value of unpaid work by gender and age group



If education level reflects more or less accurately the of differences in human capital, then higher education should be associated with higher hourly wages. We can observe this in *Table 13*, where we also can see that graduation from the secondary vocational high school is worth more than graduation from a general secondary high school. At the same time, except for the group with the lowest education level where male wages are only 5 per cent higher than female ones, males have been earning 12–17 per cent more than females with the same education level. Moreover, the number of paid working hours is relatively independent from education level. It does not show significant differences for the two genders either. Therefore, with the exception of the group with fewer than eight years of primary school edu-

cation, the male/female working time ratio is more or less constant, and males work more for pay in every single education group. There is no typical pattern regarding unpaid working time either. As the education level rises, the number of hours of unpaid work declines for both genders, though for females the fluctuation is higher. It is not surprising that among the groups with higher education, the value of paid work for both genders is higher, the differences between the two genders are more or less constant, and finally, male values are higher for every education level. The value of unpaid work increases for both genders with the education level in the three lowest education groups, and then drops for people having secondary education. We observe the highest values for people with college or university degree. Fluctuation is stronger among females and female values were higher for all education levels – similarly to our earlier findings.

Table 13: Working time and work value by gender and schooling

	Corrected wage rate (HUF)	Hours of paid work[a]	Hours of unpaid work[a]	Value of paid work (HUF)[b]	Value of unpaid work (HUF)[b]
Women					
Less than primary	80	111	137	9,812	10,746
Primary	131	154	137	23,845	17,724
Vocational	202	158	129	33,685	25,924
General secondary school	219	155	90	37,091	19,582
Vocational secondary school	238	164	100	41,708	23,764
Higher education	349	145	87	51,918	29,820
Total	203	155	115	38,079	21,805
Men					
Less than primary	84	184	81	21,960	6,983
Primary	150	179	57	30,470	8,298
Vocational	228	178	42	43,606	9,364
General secondary school	256	180	31	50,044	8,138
Vocational secondary school	269	177	33	49,095	8,492
Higher education	391	180	29	72,115	10,899
Total	233	178	43	48,365	8,973

[a] Monthly hours.
[b] Monthly value.

Table 14 shows the distribution of working time and the value of work by type of settlement. Net hourly wages show similar trends for both genders. They are lowest in villages, higher in towns, still higher in county seats, and highest in Budapest *(Figure 15)*. Both females and males spend a longer time at paid work in Budapest and the county seats than in other towns and villages *(Figure 16)*. If we investigate the time spent at unpaid work, the order is reversed. Individuals spend the most time at unpaid work in the villages and the least in Budapest. In all settlement categories, females

spend significantly more time at unpaid work than males *(Figure 17)*. The value of paid work shows exactly the same trend as that of hourly wages. Moving from the highest towards the lowest, the order is: Budapest, county seats, other towns, and villages. In addition, in all settlement types the values for males are higher than for females *(Figure 18)*. Among males, the value of unpaid work is essentially the same in Budapest and the county seats, which is also true for smaller towns and villages. But, the values for town and village residents are higher. Among females, there are no significant differences in the values for Budapest, other towns, and villages, but the values for residents of county seats are somewhat lower. In all settlement categories, the value of female unpaid work is at least the double of that of male unpaid work *(Figure 19)*.

Table 14: Working time and value by gender and type of settlement

	Corrected wage rate (HUF)	Hours of paid work[a]	Hours of unpaid work[a]	Value of paid work (HUF)[b]	Value of unpaid work (HUF)[b]
Women					
Village	163	154	146	32,113	23,264
Town	190	146	121	33,582	22,002
County town	202	157	90	36,234	18,076
Budapest	287	163	83	51,117	23,170
Total	203	155	115	38,079	21,805
Men					
Village	194	175	57	40,819	10,380
Town	223	176	50	44,279	10,659
County town	233	183	30	48,633	6,463
Budapest	328	182	21	65,199	6,559
Total	233	178	43	48,365	8,973

[a] Monthly hours.
[b] Monthly value.

Figure 15: Average corrected wage rate by gender and settlement

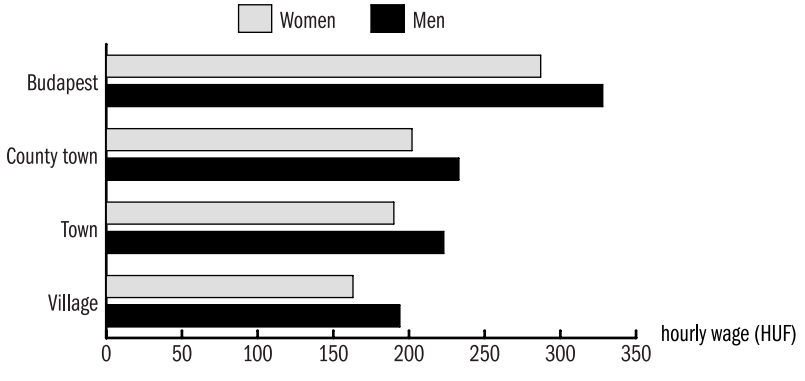


Figure 16: Monthly average working time by gender and settlement

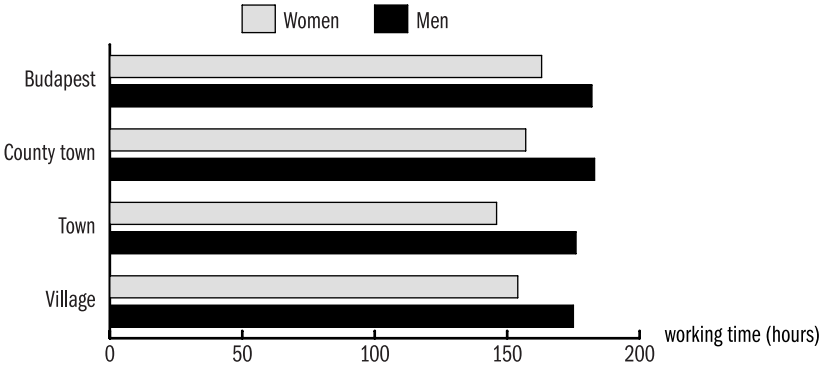


Figure 17: Monthly average unpaid hours of work by gender and settlement

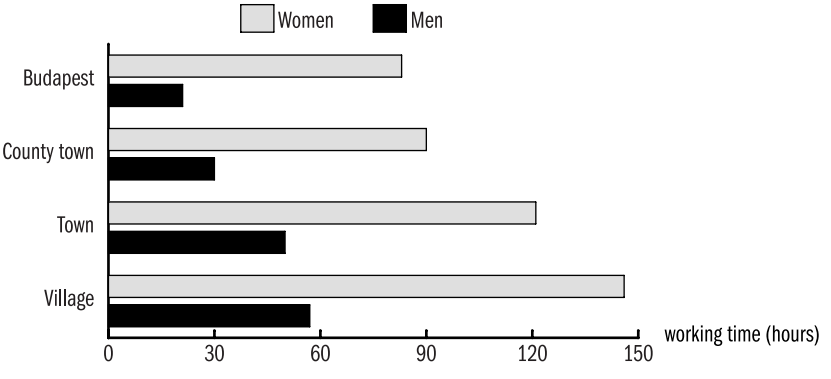


Figure 18: Monthly value of paid work by settlement

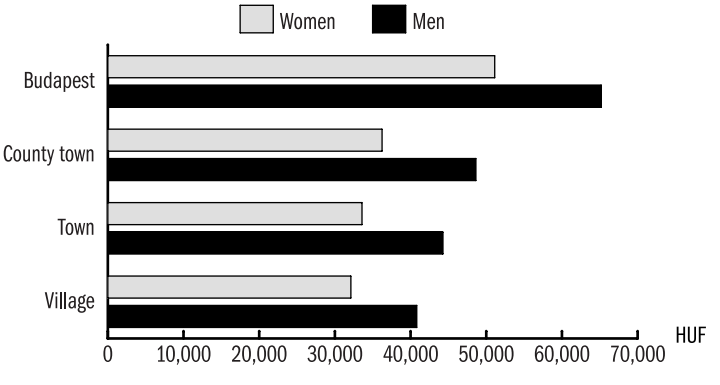
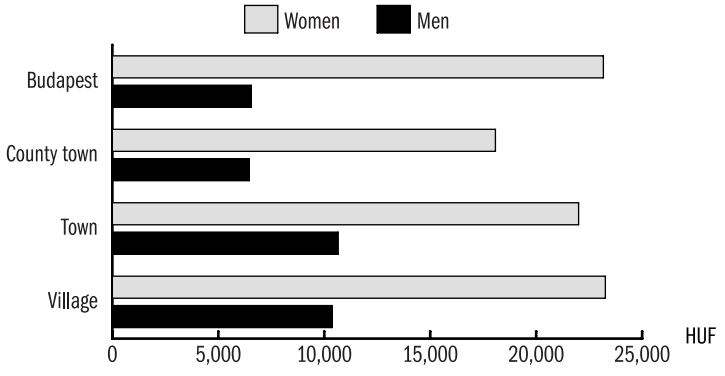


Figure 19: Monthly value of unpaid work by settlement



Summing up, we can conclude that – in line with our everyday experience – a somewhat higher proportion of males work for pay in a somewhat higher number of hours per month, while a significantly higher proportion of females do unpaid work for a significantly longer time. If, therefore, we ignore the goods and services produced by unpaid work, then we will underestimate the role of females in creating goods and services. The average monthly value of the males' paid working time is higher by almost a third than the corresponding average for the females, while the average time that males spend with unpaid work is only 40 per cent of the average time of the females.

The distribution of the values by age groups reflects well the different roles of males and females in the household division of labour, and also their different life-time profiles on the labour market as a consequence of these differences. One factor that influences the ratio of the paid and unpaid work is the individual's human capital, which we measured by the education level. The value of paid work was found to be higher for people with higher levels of education. In addition, we have seen that the differences between the two genders are more or less constant, and that male values were higher for every education levels. Similarly, the value of unpaid work tends to increase with the education level, and at all education levels females produce higher value than males. Finally, the value of paid work differs by settlement type. Going from the highest to the lowest values by settlement types we have the following order: Budapest, county seats, other towns, and villages. As far as unpaid work is concerned, there is no similar ranking for females, but males produce higher value in small towns and villages than in county seats and Budapest.

3.3 Estimating the effective labour supply, 1998–2000

Péter Galasi

Introduction

One possible and important application of the labour supply analysis is effective labour supply calculation. This measures the total labour supply of those people who are currently employed, and also of those potential employees who do not happen to be working at the moment but probably would take a job in case of an economic upturn, or continuing economic prosperity. Investigating this issue, important to both employment and economic policy, requires the use of sophisticated statistical estimation procedures, since there is no way of actually observing the labour supply of those people who are currently not working.

In what follows, we will estimate the labour supply of the 15–74 year old population, using data from the CSO LFS conducted in the first quarters of 1998, 1999, and 2000. The size of the available samples is satisfactory (in 1998, 65,112 persons aged 15–74 were included in the sample, while the sample size for 1999 and 2000 was 68,348 and 66,807, respectively).

We measured the labour supply in desired total weekly working time (in million hours), a figure received by multiplying the weighted number of the individuals in the sample – using weights that ensure that the sample should be representative – with the weekly supply of labour.

During the calculations, we used the measurement strategy of the classical individual labour supply models. In other words, we assumed that an individual who has worked zero hours could have had a positive labour supply, but we were unable to observe it. In addition, we assumed that the distribution of the non-zero labour supply is not necessarily the same as the distribution of the actual labour supply. That is, we assumed that there was a selection bias, which means that if we estimated the supply on the basis of actually observed working times, our estimates would have been biased. Therefore, our task was twofold: on the one hand, we had to attach a labour supply to those individuals who worked zero hours at the time of observation, and on the other hand, we had to filter out selection bias from the observed labour supply.

We used *Heckman's* (1979) procedure to get rid of the selection bias. With this procedure first we estimated the 15–74 year old population's labour force participation probability with a probit function, and then, based on the calculated probabilities, we defined a variable that corrects for the selection bias.[24] Next, we estimated labour supply equations for those who were actually working, with the inclusion of this selection correction variable. The product of the value of the selection correction variable and the

24 See footnote 20. on page 70. for definition of the value of the correction variable.

parameter estimate for it gives us the size of the bias (as the value of the correction variable is positive, and in most cases the estimated coefficient of this is negative, without this correction we would have overestimated the labour supply).[25]

Based on this, we estimated the labour supply of those individuals who did work at the time of observation. We assumed that the labour supply of working and non-working individuals with similar characteristics was identical, and therefore we used the estimated parameters of the labour supply function of working individuals to estimate the potential working time of those who were actually not working (of course, we also corrected those for the selection bias).

The working time variable we used was usual weekly working time at a full-time job. With this, on the one hand we tried to eliminate random fluctuations in working time at a full-time job (the time spent at work for the week prior to the survey was available). On the other hand, we also tried to disregard from fluctuations in the working time spent with part-time and supplementary jobs, which jobs are less stable and are taken by relatively few individuals.

We did the estimation and the calculations separately for males and for females – because of the possible differences in the labour market behaviour of the two genders.

Another question was to which cohorts within the 15–74 year old population we should estimate the labour supply. To answer this, we set up a 29-category labour market classification, and then used it to establish a seven-category combined classification. Individuals were categorised on the basis of the intensity of their participation in the labour market. Group one – the most intensive participants in the labour market – contained people who qualified as employed according to the ILO-OECD definition, irrespectively of what other characteristics they displayed according to other labour market classifications. This group contains people who are employed, but at the same time they also receive retirement benefits, or they are full-time students, or they receive childcare aid, assistance, and fees, or they are registered as unemployed at the regional employment offices. The second group contained people who were unemployed according to the ILO-OECD definition. The definition excludes the incorporation into this group anyone from the previous group, but here we can also find people in full-time education, receiving retirement benefits, registered as unemployed, etc. Group three – the registered unemployed – included individuals who do not qualify either as employed or unemployed according to the ILO-OECD definition, but who are nevertheless registered as unemployed. The fourth group consists of those childcare assistance recipients who are neither employed nor unemployed. The fifth and sixth groups those pen-

25 The estimated labour supply for the j^{-th} individual: the corrected labour supply is

$\hat{H}_j = X_j\alpha + m_j\gamma$, $\hat{H}_{kj} = X_j\alpha$,

where X is the matrix of the explanatory variables of the equation, α is the vector of the estimated parameters, γ is the estimated coefficient of the correction variable, and m is the vector that contains the value of the correction variable for different observations.

sioners and full-time students who are neither employed nor unemployed. Finally, group seven contains the remaining dependants. The people in this group are not employed, not unemployed, not receiving childcare assistance, not retired, and are not full-time students.

Using weights to ensure that the sample should be representative, we found about 7.7 million people in the 15–74 age group. In 1999, this number was about a half of a per cent lower than in 1998, while in 2000 it was about one per cent lower. However, we did not do the estimation for the entire population. In addition to people who are employed, there are two other groups with relatively strong connections to the labour market – the unemployed and the registered unemployed –, out of whom we assumed that a growing number would go to work if there were a long-term increase in the labour demand; we could observe in this case higher and higher proportion of their estimated labour supply. We can make a similar assumption regarding the persons receiving childcare assistance and other dependants. Regarding full-time students and retirees, we assumed that they would not look for a job even if the labour demand increased on the long run. We, therefore, regarded their effective labour supply as being zero. The argument for this is that those full-time students and retirees who showed some willingness to find jobs were already included among the employed or the unemployed. Therefore, we did our estimation for five groups (employed, unemployed, registered unemployed, persons receiving childcare assistance, and other dependants). The number of people in this estimation slightly exceeds 4.8 million. These numbers were roughly the same in both 1999 and 2000, which were in turn about 1.2 per cent lower than in 1998.

Results

We can observe that the weekly number of hours that people want to work and also the number of people who actually want to work is relatively inelastic in the short run, so we assumed that the effective total labour supply is the same for all the three years. The effect of improving labour market conditions can be captured by the changing distribution of the labour supply between the different labour market groups. In fact there was no significant change in the overall effective labour supply during the investigated period *(Table 15)*: 195.1 million hours in 1998, 193.7 million in 1999, and 195.8 million in 2000.

Table 15: Effective labour supply, 1998–2000.

	Weekly working hours			1000 persons			Total working hours (million)		
	1998	1999	2000	1998	1999	2000	1998	1999	2000
Women									
Employed	37.9	38.9	39.4	1,639.8	1,695.9	1,711.1	62.1	65.9	67.4
Unemployed	36.8	38.4	39.3	138.3	115.0	104.7	5.1	4.4	4.1
Registered unemployed	36.3	38.2	39.2	122.1	74.1	67.5	4.4	2.8	2.6
Child care leave	36.5	37.4	39.0	265.0	267.5	276.9	9.7	10.0	10.8
Other dependant	35.4	37.1	38.9	265.0	239.4	237.3	9.4	8.9	9.2
Total	37.3	38.5	39.3	2,430.2	2,391.8	2,397.4	90.7	92.0	94.2
Men									
Employed	42.3	41.7	41.6	1,978.3	2,048.7	2,066.9	83.7	85.4	86.0
Unemployed	42.1	41.2	41.3	208.4	186.6	169.3	8.8	7.7	7.0
Registered unemployed	42.0	40.8	40.7	128.9	81.1	75.2	5.4	3.3	3.1
Child care leave	42.4	41.1	41.5	4.0	3.6	4.0	0.2	0.1	0.2
Other dependant	42.1	40.4	40.5	149.7	127.8	132.1	6.3	5.2	5.3
Total	42.3	41.6	41.5	2,469.2	2,447.7	2,447.5	104.4	101.7	101.6
Together									
Employed	40.3	40.4	40.6	3,618.0	3,744.5	3,778.0	145.8	151.3	153.4
Unemployed	40.0	40.1	40.6	346.6	301.6	274.0	13.9	12.1	11.1
Registered unemployed	39.2	39.6	40.0	251.0	155.2	142.7	9.9	6.1	5.7
Child care leave	36.6	37.4	39.1	269.0	271.1	280.9	9.8	10.1	11.0
Other dependant	37.8	38.3	39.5	414.7	367.1	369.3	15.7	14.1	14.6
Total	40.4	40.0	40.4	4,899.4	4,839.5	4,844.9	195.1	193.7	195.8

The increasing demand in the labour market had no significant effect on the average number of weekly working hours either, with the average being 40.4 in 1998 and 2000, and 40.0 in 1999. Besides this, the number of persons who were considered part of the effective labour supply dropped by about 60,000 from 1998 to 1999, and did not change significantly between 1999 and 2000. The decline between 1998 and 1999 was partly due to demographic causes, since – as we have already seen – there was a decline in number of the 15–74 year old population. Another reason was that the number of full-time students, who were excluded from the labour supply estimates, increased.

In all of these years, the total labour supply of males exceeded the labour supply of females. However, the share of females did increase somewhat during the investigated period, increasing from 46.5 per cent in 1998 to 47.5 per cent in 1999, and to 48.1 per cent in 2000. The principal reason of this was that male working time was longer than female in all of the three years, but showed either a decline or stagnation, while female weekly working time increased. In 1998 the average weekly working time for males was 42.3 hours, in 1999 it was 41.6 hours, and in 2000 it was 41.5 hours. Meanwhile, female working time rose from 37.3 hours to 38.5 hours, and then to 39.3 hours. The proportion of females did not change substan-

tially, it was always somewhat lower than 50 per cent (49.4–50 per cent). In 1998, the effective labour supply consisted of 2,430,000 females and 2,469,000 males. The corresponding figures in 1999 were 2,392,000 and 2,448,000, and in 2000 they were 2,397,000 and 2,448,000. The share of female employees in the total supply of working time is lower than the average: it ranged between 42 per cent and 44 per cent.

Table 16 illustrates the time trend of the these three indicators. Relative to 1998, weekly working time rose by 0.6 per cent in 1999 and 1.5 per cent in 2000, while the number of persons making up the effective labour supply declined by 1.2 per cent and 1.1 per cent. The two factors reduced total working time by 0.7 per cent in 1999, and increased it by 0.4 per cent in 2000.

Table 16: Changes in effective labour supply (1998=100)

	Weekly working hours		1000 persons		Total working hours (million)	
	1999	2000	1999	2000	1999	2000
Employed						
Women	2.6	4.0	3.4	4.3	6.2	8.6
Men	-1.5	-1.7	3.6	4.5	2.0	2.7
Total	0.3	0.8	3.5	4.4	3.8	5.2
Unemployed						
Women	4.2	6.7	-16.8	-24.3	-13.3	-19.2
Men	-4.8	-1.9	-10.4	-18.7	-12.5	-20.3
Total	0.9	1.3	-13.0	-21.0	-12.8	-19.9
Registered unemployed						
Women	5.1	7.9	-39.3	-44.7	-36.3	-40.3
Men	-2.8	-3.0	-37.1	-41.6	-38.9	-43.4
Total	0.9	2.1	-38.2	-43.1	-37.7	-42.0
On child care leave						
Women	2.3	6.9	0.9	4.5	3.2	11.7
Men	-3.0	-2.1	-10.4	-0.2	-13.1	-2.3
Total	1.3	4.5	0.8	4.4	2.9	11.4
Other dependant						
Women	5.0	10.1	-9.7	-10.5	-5.1	-1.4
Men	-4.0	-3.9	-14.7	-11.8	-18.1	-15.2
Total	1.3	4.5	-11.5	-10.9	-10.3	-6.9
Together						
Women	3.1	5.3	-1.6	-1.3	1.5	3.9
Men	-1.7	-1.8	-0.9	-0.9	-2.6	-2.7
Total	0.6	1.5	-1.2	-1.1	-0.7	0.4

However, there were significant differences between males and females. Among females, weekly working time increased (by 3.1 per cent and 5.3 per cent), while the number of females declined somewhat (1.6 per cent and 1.3 per cent), leading to an increase in their total labour supply (1.5

per cent and 3.9 per cent). Among males, however, there was a decline in both weekly working time (1.7 per cent and 1.8 per cent) and in the numbers (0.9 per cent and 0.9 per cent), so the total labour supply also declined (2.6 per cent and 2.7 per cent).

An investigation of the changes of these three indicators within the various labour market groups uncovers significant differences. Here we might expect weekly working times to change in the same direction as the averages for the entire population, and we might also expect this if we investigate males and females separately. At the same time, the number of people belonging to the various labour market groups fluctuated quite heavily – triggered by the increasing demand in the labour market –, and therefore we have found substantial changes in the total labour supply of the different groups. Relative to 1998, the number of employed people increased substantially – by 3.5 per cent and then by 4.4 per cent –, rising at a similar rate for both males and females. The total weekly working time of employed persons also increased. Within that, female weekly working time increased more rapidly than the average, while male weekly working time declined. However, the effect of the declining male weekly working time on the overall labour supply was more than compensated for by the increase in the number of individuals, among both males and females (and consequently, overall, too), leading to an increase in the total labour supply of employed persons. From 1998 to 1999, the total labour supply of employed females rose by 6.2 per cent, and from 1998 to 2000, it increased by 8.6 per cent. The corresponding values for males were significantly lower (2.0 per cent and 2.7 per cent), leading to a total labour supply of the whole population of employed individuals that was 3.8 per cent and 5.2 per cent higher than in the base year.

With the exception of persons receiving childcare assistance, the number of persons in all other labour market groups dropped significantly, sometimes drastically, in both years for both genders. In 2000, the number of unemployed individuals was 21 per cent lower than the number measured in 1998. Within that there was a more dynamic decline among females than among males. The number of registered unemployed dropped to an even greater extent. The value in 1999 was 38.2 per cent lower than in 1998, and in 2000 it was down by 43.1 per cent. The number of females in the registered unemployed group showed an even more rapid decline relative to the males. There was a less rapid but nonetheless significant decline among other dependants, which showed an 11 per cent drop in 1999 and 2000, relative to the base year. The number of male dependants decreased somewhat more rapidly than the number of females in both of these years. As a result of these declines, the total labour supply of these groups also decreased quite rapidly. In 2000, the effective labour supply of the unem-

ployed persons declined by 20 per cent relative to 1998, while the labour supply of registered unemployed individuals declined by 42 per cent, and that of other dependants by 7 per cent.

Due to these changes, the structure of the labour supply has also altered *(Table 17)*. Since weekly working time is rather stable, the labour market group based distribution of the labour supply has more or less the same pattern if we measure it in numbers of persons or in total working time. *Figures 20–22* illustrate the distribution of the labour supply measured in total working time for females *(Figure 20)* and for males *(Figure 21)*, while *Figure 22* shows the combined distribution for both genders.

Table 17: The structure of effective labour supply by gender and labour market status

	1000 persons			Working hours (million)		
	1998	1999	2000	1998	1999	2000
Women						
Employed	67.5	70.9	71.4	68.5	71.6	71.5
Unemployed	5.7	4.8	4.4	5.6	4.8	4.4
Registered unemployed	5.0	3.1	2.8	4.9	3.1	2.8
Child care leave	10.9	11.2	11.5	10.7	10.9	11.5
Other dependant	10.9	10.0	9.9	10.3	9.7	9.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
Men						
Employed	80.1	83.7	84.5	80.2	84.0	84.7
Unemployed	8.4	7.6	6.9	8.4	7.6	6.9
Registered unemployed	5.2	3.3	3.1	5.2	3.3	3.0
Child care leave	0.2	0.1	0.2	0.2	0.1	0.2
Other dependant	6.1	5.2	5.4	6.0	5.1	5.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Figure 20: Total labour supply by labour market status, per cent, women

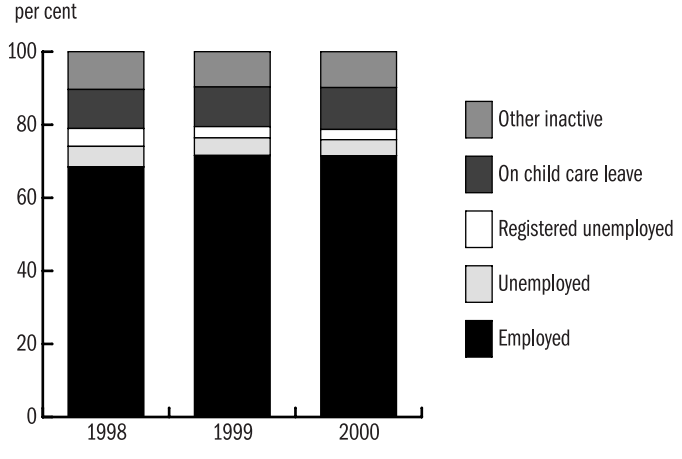


Figure 21: Total labour supply by labour market status, per cent, men

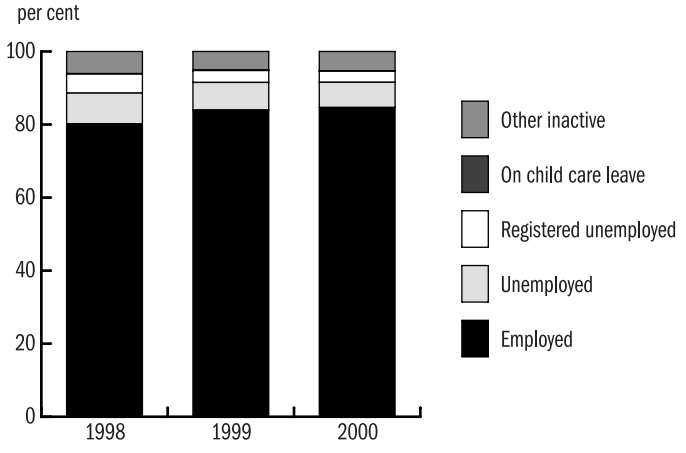
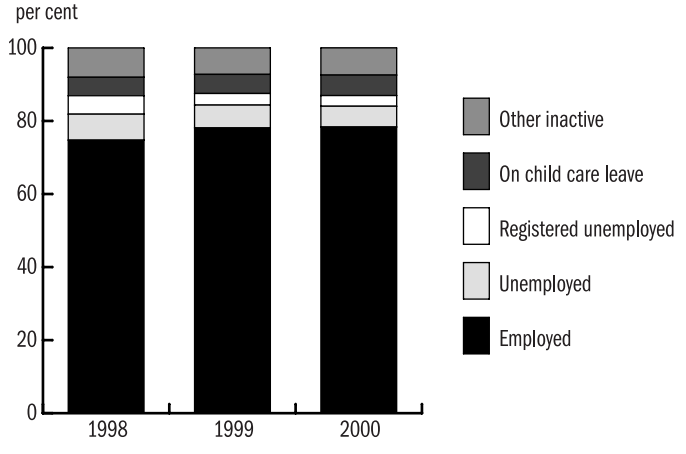


Figure 22: Total labour supply by labour market status, per cent, together



The first thing that we notice is the gender-based differences in the distributions. In each year, the labour supply of employed males is higher than that of employed females. In the unemployed group, we see exactly the opposite, while in the registered unemployed group there are no significant differences between the genders. Finally, for people receiving child-care assistance and other dependants, the total labour supply of females is larger than that of males.

Therefore, the proportion of the total labour supply of employed males and females increases with time, an increase that essentially occurred in 1999. The proportion of the labour supply of unemployed and registered unemployed persons dropped for both genders. However, the correspond-

ing proportions of persons receiving childcare assistance and other dependants remained essentially unchanged.

We see, therefore, that the changes in the structure of the labour supply can be captured by the increase in the number of employed individuals, and by the corresponding decrease of the proportions of the two unemployed groups.

Summary

We estimated the labour supply of the 15–74 year old population using the first quarter wave of the CSO LFS for 1998, 1999, and 2000. During the calculations we used the individual labour supply models. We tried to estimate the unobserved labour supply, and also to filter out the selection bias in the actually observed labour supply data.

We measured the individual labour supply as the desired number of weekly working hours, and calculated the total labour supply as the product of the weekly working hours and the number of persons making up the effective labour supply.

We did the estimations separately for males and females, and also distinguished between five labour market groups: ILO-OECD-employed, ILO-OECD-unemployed, registered unemployed, persons receiving childcare aid, assistance or fees, and other dependants.

During the investigated period, the total effective labour supply did not change significantly: in 1998 it consisted of 195.1 million hours, in 1999 of 193.7 million, and in 2000 of 195.8 million. The weekly desired working hours were also found to be stable: 40–40.4 hours. However, the number of people who made up the effective labour supply declined by about 60,000 from 1998 to 1999, partly for demographic reasons.

There were significant differences between males and females. Among females, weekly working time increased, while the number of females slightly decreased, so the total labour supply increased. Among males both weekly working time and the number of males declined, so the total labour supply also went down.

We found significant changes in the effective labour supply of the different labour market groups. In both years the number of employed persons increased (by 3.5 per cent and then by 4.4 per cent), and the increase was of similar magnitude for both males and females. The total labour supply of this group also increased. From 1998 to 1999, the total labour supply of employed females rose by 6.2 per cent, and by 2000 it rose by 8.6 per cent. Male values were lower (2.0 per cent and 2.7 per cent), leading to an overall increase in the labour supply of employed persons of 3.8 per cent and 5.2 per cent, relative to the base year. In both of these years the numbers of all other groups declined significantly, sometimes drastically, for both

genders. In 2000, the number of unemployed was 21 per cent below its 1998 level. Within this, the decline was sharper for females than for males. The number of registered unemployed people dropped even more sharply, by 38.2 per cent in 1999 and 43.1 per cent in 2000, relative to 1998. The number of registered unemployed females dropped even more rapidly than the number of registered unemployed males. Less rapid but significant declines were observed among other dependants, where numbers declined on average by 11 per cent in 1999 and 2000 relative to the base year. In both years, the number of males dropped somewhat more rapidly than that of females. The result of the drop in numbers was that the total labour supply of these groups also dropped quite substantially. In 2000, the effective labour supply of unemployed persons was 20 per cent lower than in 1998, while the same figure for registered unemployed was down by 42 per cent, and for other dependants by 7 per cent.

As a result of the above changes, the structure of the labour supply also has altered. This was mainly the consequence of the increase of the number of the employed persons, and of a corresponding decrease in the proportion of the two unemployed groups.

REFERENCES

Apps, P. F. – Rees, R. (1988) Taxation and the Household. *Journal of Public Economics,* Vol. 35. pp. 155–168.

Apps, P. F. – Rees, R. (1997) Collective Labor Supply and Household Production. *Journal of Political Economy,* Vol. 105. pp. 178–190.

Becker, G. S. (1965) A Theory of the Allocation of Time. *The Economic Journal,* Vol. 75. pp. 493–517.

Becker, G. S. (1975) *Human Capital*. University of Chicago Press, Chicago.

Cogan, J. F. (1980) Labor Supply with Fixed Costs of Entry. In: Smith, J. P. (ed): *Female Labor Supply: Theory and Estimation*. Princeton University Press, Princeton, pp. 327–364.

Galasi Péter (2000): Szelekciós torzítás: hatás a férfinői kereseti különbségre. In: Fazekas Károly (ed): *Munkaerőpiaci tükör, 2000*. MTA Közgazdaságtudományi Kutatóközpont, Budapest.

Galasi Péter – Nagy Gyula (2001) A fizetett és nem fizetett munka értéke. *Munkaügyi Szemle,* vol. XLV., No. 3., pp. 23–28.

Gronau, R. (1977) Leisure, Home Production and Work – The Theory of the Allocation of Time Revisited. *Journal of Political Economy,* Vol. 85. No. 6. pp. 1099–1123.

Gronau, R. (1986) Home Production. A Survey. In: Ashenfelter, O. – Layard, R. (ed): *Handbook of Labor Economics*. Vol. I. North-Holland, Amsterdam, pp. 273–304.

Heckman, J. (1979) Sample Selection Bias as a Specification Error. *Econometrica,* Vol. 47. pp. 153–161.

Kertesi Gábor (1994) Cigányok a munkaerőpiacon. *Közgazdasági Szemle,* No.11., pp. 991–1023.

Kertesi Gábor – Köllő János (1997) Reálbérek és kereseti egyenlőtlenségek, 1986–1996. A bérszerkezet átalakulása Magyarországon, I. *Közgazdasági Szemle,* No. 7–8., pp. 612–634.

Killingsworth, M. R. (1983) *Labor Supply*. Cambridge University Press, Cambridge.

Killingsworth, M. R. – Heckman, J. J. (1986) Female Labor Supply: A Survey. In: Ashenfelter, O. – Layard, R. (ed): *Handbook of Labor Economics*. Vol. I. North-Holland, Amsterdam, pp. 224–256.

OECD (1999) *Employment Outlook*. OECD, Paris.

Pencavel, J. (1986) Labor Supply of Men: A Survey. In: Ashenfelter, O. – Layard, R. (ed): *Handbook of Labor Economics*. Vol. I. North-Holland, Amsterdam, pp. 3–102.

Sik Endre – Szép Katalin (2000) A háztartási termelés pénzértéke. *Tárki Társadalompolitikai Tanulmányok,* No. 21. Tárki, Budapest.

Solberg, E. J. – Wong, D. C. (1992) Family Time Use: Leisure, Home Production, Market Work and Work Related Travel. *Journal of Human Resources,* Vol. XVII., No. 3., pp. 485–510.