Labour supply of households with a disabled member in Hungary*

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Preliminary version

Abstract

We look at the impact of work impairment on the employment status of older couples (age 50-61) using the Hungarian Labour Force Survey from 2011 and 2008. Our estimation strategy relies on comparing couples with disabled members with households where a person suffers from a long-term illness, but is not work impaired. We also account for the potential endogeneity of self-reported health status by using objective measures of illnesses and activity limitations as instruments. Our results indicate that own disability reduces the probability of employment by around 30 percentage points, while spousal disability has a very small effect on employment, and the sign of this effect depends on the presence of other working age persons in the household

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* We would like to thank János Köllő and Gyula Nagy for comments on an earlier version of this paper, and Katalin Bördős for expert research assistance. We gratefully acknowledge the financial support of the Hungarian National Science Foundation (OTKA Grant No. 101925). All remaining errors are our own.

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1. Introduction

The employment of disabled workers has emerged as one of the priority issues in European employment strategy, as a target area of policies for social inclusion, population ageing and flexible and efficient labour markets. Hungary has introduced various policy measures in the area, ranging from a quota system for disabled persons employment in larger firms enacted in 1993, to more recent efforts of activating workers claiming disability benefits through registration with the local job centre, more stringent medical tests of work capacity and new rules limiting access to a disability pension. These incentives were not coupled with an increase in the range and scope of rehabilitation services to facilitate the re-employment of disabled workers, which is often explained by their extraordinary costs. This reasoning however neglects the potential long term gains in the employment and earnings of both the disabled individual and of the members of their households. This paper aims to contribute to policy making in the area by assessing these long term gains, especially as regards the secondary labour market effects via the reduced supply of household members.

An empirical evaluation of the impact of having a disabled household member on the employment of their spouses is motivated not only by its policy relevance, but also since economic theory does not give clear-cut predictions. The empirical strategy we put forward in this paper is to contrast the employment of couples where at least one of the spouses has a long-term illness that limits her work capacity to the outcomes of couples where one of the partners suffers from similar health problems but does not report work disability. We rely on data from the 2008 Q4 and the 2011 Q2 waves of the Hungarian Labour Force Survey (HLFS) which included an extra set of questions on long term illness and disability, and concentrate on older couples, where the incidence of such health conditions is especially pronounced. Our econometric methodology entails modelling simultaneously the employment probability of both spouses along with the severity of the health condition to account for the fact that subjective health measures might be endogenous to labour force status. The results indicate that the employment probability of a person with work incapacity tends to be 25-30 percentage points lower than a person suffering from similar long-term health problems, while the impact of work disability on their (healthy)

spouses' labour supply is small. We find signs of heterogeneous effects, insofar as the effect of work-limiting health problems depend on the presence of other working-age adults in the household.

2. Overview of the economic theory, empirical problems and previous literature

Before describing our approach to the empirical modelling of the effect of work disability on impaired persons' and their spouses' labour supply, we provide a short overview of the predictions of economic theory on this issue[1], as well as a brief discussion of the econometric challenges.

The effect of work disability on labour supply: theory

In the classical (static) labour supply model, disability can reduce impaired persons' labour market participation through several channels. First, one can envision that work incapacity reduces potential earnings due to drop in productivity. A second mechanism that might induce withdrawal from the labour market is the increased fixed costs of working. Third, there is a rise in (potential) non-work benefits[2] which will also induce impaired persons to quit employment. However, once one takes life-cycle considerations into account, the theoretical predictions are less clear-cut, as work disability implies a decrease in life-time wealth, and hence leads to an *increase* in labour supply.

The analysis of the effect of disability on the labour supply of unaffected spouses is slightly more involved. One might expect to observe the *added-worker effect*, eg. a rise in the spouse's labour supply, as there is a decrease in (lifetime) family income due to the partner's work limitation. However, two factors imply a reaction of decreased labour supply to one's spouse's disability. First, an increase in care needs of the incapacitated will lead to a decrease of labour supply of the spouse either through an increase in the value of home production (if the supply of quality long-term care is limited) or an increase in her fixed pecuniary costs of working (in case a caretaker needs to be hired). Second, if the spouses' leisure time is complementary,

[1] Note that we follow the labour supply literature, and do not treat health as a form of human capital, hence we consider health shocks as exogenous. Note also that we do not consider the case where the disability occurs before entry into the labour market, hence we ignore the effect of long-term health problems on human capital accumulation.

[2] As typically the replacement rate of disability benefits is much higher than unemployment assistance.

and the spouse's disability implies a shorter life expectancy, then the unaffected partner will substitute towards more (current) leisure.

There are several important issues to consider, which suggest a more heterogeneous, more nuanced effect of disability on family labour supply. The first of these has to do with the nature of the health shock leading to work incapacity: its severity, its forecastability, and the age of onset. If the health shock is more severe, less forecastable or its onset is earlier, it will imply a greater fall in family income, hence a stronger added worker effect for spouses' labour supply. On the other hand, a more severe health condition might imply greater care needs, higher (expected) disability benefits and lower expected lifespan, which will all lead to a decrease in spouses' labour supply.

The second source of heterogeneity is related to the financial incentives provided by the disability benefit/early retirement system. Since disability benefits are typically regressive, the work incapacity of a high earning spouse implies a higher fall in lifetime income, and hence the financial incentives of the disability benefit/early retirement system imply a stronger added worker effect.

Finally, one has to take into consideration family structure. The presence of other (typically younger) working-age household members can lead to a substitution of long-term care away from the unaffected spouse - if the other household members' potential earnings are lower than that of the spouse, but equally productive in providing care – and hence a higher added worker effect. On the other hand, since an additional year of non-working for young individuals entails a greater loss in future earnings and retirement benefits, it might be the unaffected spouse that provides long-term care for the impaired person, hence a more negative effect on the spouse's labour supply.

Econometric issues

There are several potential problems in the empirical modelling of the effect of disability on household labour supply that have to do with (a) the measures of health available in surveys, (b) individual (unobserved) heterogeneity in terms of productivity and tastes for work, (c) the correlation between spouses' labour market behaviour

due to assortative mating based on (non-measureable) tastes and (d) correlation between household members' health as a result of common health shocks.

The majority of survey-based studies have had to contend with self-reported disability and health measures, and a major concern in the literature is that not only might these be error-ridden measures of 'true work disability', but that the measurement errors might be systematically correlated with work status. In other words, self-reported work limitations might be subject to 'justification bias', as persons with low tastes for work might tend to exaggerate their health problems. This implies that the (negative) effect of work disability on labour supply will be downward biased for persons affected by health problems. A second source of bias is the heterogeneity of (unobserved) productivity, which in conjunction with the incentives of disability/early retirement benefit systems (or differences in lifestyle), will also lead to a spurious (negative) correlation between reported health and labour supply.

Do the same type of endogeneity problems also mar the estimates of the effect of spousal disability on unaffected person's labour supply? If there is assortative mating on unobserved productivity or tastes for work, or if there is correlation in health shocks due to common lifestyles, these biases will also affect spousal labour supply. To put it simply: it might not be only because their husbands are affected by long-term illness that wives leave the labour market, but also because they faced lower labour market opportunities, they had lower tastes for work or they were also confronted with (more mild) health issues themselves.

Literature review on spousal labour supply

The majority of the papers published on the topic is in the United States, use the Health and Retirement Study (HRS), which is a longitudinal study that surveys a representative sample of more than 26,000 Americans over the age of 50 and their family members every two years, and includes detailed information on health condition and health shocks. Charles (1999) used waves between 1992 and 1994 to estimate the effect of spousal health shock on labour supply of 45-65 year-old men and women. Controlling for potential bias caused by the endogeneity of health status (claiming ill health during the interview to justify unemployment), he used the measure of limitations in activities of daily living (ADL) as instruments and applied a within-IV (instrumental variables with family fixed effects) methodology as well as a

pooled OLS and a simple pooled IV. His results indicate that men react to their wives' health shocks by reducing their work hours whereas women raise their labour supply if their husbands fall ill. The author explains that the reason might be the specialisation of roles within the family: usually, men are the primary earners while women specialise more in housework, and when one of them falls ill and is unable to carry out their specialised tasks, the other starts to pick up the ill spouse's duties. Coile (2004), who used the same HRS survey data but appending more waves (1992-2002), reached different conclusions. She estimated significant but small negative effect for women's employment and hours of work and small positive results in the cases of men. Women react stronger if the husband's health shock is more serious, that is, there is a large reduction in ADL-limitations or the self-speculated probability of surviving until age of 75 is low, and have a higher probability of starting retirement as a reaction. Coile lists three possible explanations for her results. First, she argues that spousal leisure time might be complementary for husbands and wives and the level of this complementary declines for men if the wife falls ill, but less so in the cases of women if the husband falls ill: some answers in the questionnaire imply that men enjoy the company of their wives less if her health deteriorates. Second, it is also possible that men with ill health are looked after by their wives but women are taken care of by other persons, not their husbands. And third, men and women might react to financial incentives (e.g., disability pension) differently. Another study (Coe and Van Houtven [2010]) uses the RHS and finds that results depend on the methodology used. When using probit regression to model whether the spouse enters retirement as a reaction to the partner's health shock, the authors find a significant increase in the probability of retirement for men and no significant effect for women. When modelling the duration of working before retirement via Weibull hazard models, it seems that men delay their retirement decision when their partners get sick whereas women's reaction depend on the type of health shock the husband receives. The authors state that including the financial background and incentives such as social security benefits, private pension payments, labour incomes and household wealth is important as leaving them out from the models causes omitted variable bias.

In Europe, Jiménez-Martín, Labeaga, and Martinez-Granado (1999) examines the joint retirement decisions of older couples in 12 EU member states, using the 1994-

95 waves from the European Community Household Panel. They show that the husband´s health affects the couple´s retirement decisions more strongly than the wife´s health does, suggesting that women are more likely to become informal carers than men. Own ill health also affects retirement decision for both sexes, and both men and women are more likely to stop working and to enter retirement if they have health problems and their partner is already retired compared to when their partner is still working, which implies either complementary in leisure time or that unobservable characteristics affect both members of the couple simultaneously. Nahum (2007) examines the labour supply response to spousal sickness absence longer than 28 days using 1996-2002 panel data from Sweden. Unlike the RHS or the ECHP, her survey data does not include information on the type or severity of the health problem. She finds significant negative effects for both husbands and wives, stronger effects for women than for men, and that the effect on labour supply increases with spousal earnings level. Braakmann (2012) examines the effects of individual and spousal disability on labour supply (and subjective well-being) based on data from the German Socio-Economic Panel for the years 1984 to 2006. He finds that the partner's disability reduces employment probabilities by 5-5.5% for 18-75 years old men and by 5.4-7% for women, but does not find significant effects on working hours or wages. He also finds that including the net household income does not change the results significantly.

3. Data and sample

We use data from the 2008 Q4 and the 2011 Q2 waves of the Hungarian Labour Force Survey (HLFS), which included an extra set of questions on long term illness and disability, beside the standard questions on demographic variables and labour market behaviour. Of these two, we will primarily concentrate on the results based on the 2011 Q2 wave of the HLFS, since not only is it more recent, but the health-related supplemental questionnaire was designed in accordance with EU Commission Regulations, hence are internationally easily comparable. Our choice of data was dictated by the fact that there are no other large-scale survey that contain information both on labour market outcomes and health status.

The ad-hoc module on the 'Employment of disabled persons' in 2011, contains two questions on respondents' health.[3] The first of these asks the person to name up to two out of a list of fifteen long-standing health conditions or diseases that she has[4]; while the second asks the respondent whether she has experienced difficulties (for at least 6 months) with some specific basic activities, again she is asked the two most important of these (from a list of ten different activities). A respondent was considered as *suffering from long-term health problems* if she affirmed having any of the health conditions or difficulties.[5]

The questions in the ad-hoc module then go on to enquire whether the individual's health limits her in getting to work or constrains the amount or the kind of work she is able to perform. Persons reporting any of these limitations are considered as *work impaired/disabled*, which will be our main variable of interest. Finally, the questionnaire asks whether the respondent needs personal assistance, special equipment or special work arrangement due to her health condition or activity difficulties to enable them to work. Those in necessitating of any the above in order to work were recorded as *needing of help to work*.[6] Note that only those respondents could be coded as impaired/disabled or necessitating help who initially reported suffering from long-term health problems.

The HLFS also includes information on households' demographic structure, and for those considered 'active age' a set of questions on their labour market status. Hence we have data on the age, education, place of residence and labour force characteristics of respondents. Furthermore, we can identify the industry and occupation of those currently employed, as well as for those who have been out of work for at most 8 years (for their last employment spell). However, the publicly available version of the HLFS does not include respondents' earnings or wages.

From the full dataset, we assembled data on couples, more specifically on household heads (who are typically male) and their partners. In the current paper, we only use

[3] The ad-hoc module in the 2008 Q4 HLFS are largely comparable, though there are small differences in the exact order and the phrasing of questions.
[4] Due to a low number of persons reporting certain health conditions, we aggregated these into twelve categories.
[5] We used the health condition/activity difficulty that was deemed the most important. We also experimented with using the two 'most important', but the results were very similar.
[6] It needs to be noted that the ad-hoc module does not enquire more in detail neither about the time of onset of the health condition, nor the (self-assessed) reason of the disability. These were included in the 2002 Q2 ad-hoc module.

older couples, since the prevalence of long-term health conditions is growing at an increasing pace with age. Our definition of older couples included household heads aged at least 50 and younger than the current retirement age (62), while – to take into account that wives tend to be about three years younger than their husbands – the household head's spouse was aged between 45 and 61. After discarding persons with missing data, we were left with 4200 couples (4130 for the 2008 sample).[7]

4. Empirical strategy

Our empirical strategy essentially entails comparing the probability of being in work[8] of those couples where (say) the husband was work impaired and his wife were unaffected, with the employment outcomes of couples where the male household head was suffering from long-term health problems (but did not report being work impaired) and his spouse was 'healthy'. The idea behind this approach - instead of comparing 'healthy' couples to couples with a work impaired member - is that we can model work disability using the information about specific health conditions and activity difficulties, hence allow work impairment status to be endogenous.

Since we have no information on wages, we first estimate reduced form employment equations, including own and spouse's work impairment/disability status, for both spouses simultaneously in order to allow for correlation of productivity or tastes for work across members of a couple. Hence we estimated bivariate probit models of the form:

$$EMP_{1i} = D_{1i}\eta_{11} + D_{2i}\eta_{12} + X_{1i}\beta_1 + \varepsilon_{1i}$$

$$EMP_{2i} = D_{1i}\eta_{21} + D_{2i}\eta_{22} + X_{2ii}\beta_2 + \varepsilon_{2i}$$

We also assume that the error terms (ε_{1i}, ε_{2i}) are i.i.d. normal with the following variance covariance matrix: $\mathbf{V} = \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}$

[7] An important issue is who responeded to the health-related questions: one might be concerned that if it is not one of the couple, but rather some other household member, it is more likely to lead to measurement errors. We did a robustness check where we discarded all such observations (this meant 345 couples, or 8.2% of the sample), but our results did not change.

[8] We also experimented with using labour market activity as an outcome variable, as it corresponds to pure labour supply effects, however, our qualitative results did not change. In this research report, we only present result for employment outcomes, as we consider these as more policy relevant.

In the equations above the indices *1i* and *2i* represent the two spouses in household *i*; EMP stands for the dummy variable whether the individual was working; D_1 and D_2 are dummy variables for own and spouse's disability status; and *X* is a vector of control variables, including education (four levels), age, a dummy for early retirement eligible age, region of residence and household characteristics (number of household members, dummy variables for the presence of children, for the presence of retirement age individuals, and for the presence of other working age individuals). We estimate the above bivariate model separately for three sub-samples: couples where the male household head suffers from a long-term health problem, but his partner is 'healthy'; couples where the female partner has health problems, but the household head is 'healthy'; and couples where both spouses have long-term health issues.[9] This effectively means that in our empirical models disability status stands for the 'severity' of health problems, in the sense that they limit work capacity.

In our second model, we account for the possible endogeneity of (self-assessed) disability status by simultaneously estimating the spouses' employment equations with equations describing the spouses' health status. More precisely, following a long line of studies (including Stern(1989), Bound et. al. (1999)) we instrument disability status with 'more objective' measures of health: specific health conditions and activity limitations. Hence we estimate a system of four (three) equations[10]:

$$EMP_{1i} = D_{1i}\eta_{11} + D_{2i}\eta_{12} + X_{1i}\beta_1 + \varepsilon_{1i}$$

$$EMP_{2i} = D_{1i}\eta_{21} + D_{2i}\eta_{22} + X_{2ii}\beta_2 + \varepsilon_{2i}$$

$$D_{1i} = Z_{1i}\delta + X_{1i}\beta + u_{1i}$$

$$D_{2i} = Z_{2i}\delta + X_{2i}\beta + u_{2i}$$

Where the error terms (ε_{1i}, ε_{2i} u_{1i}, u_{2i}) are distributed as mean zero multivariate normal, with a variance-covariance V, where V has values 1 on the leading diagonal and correlations $\rho_{jk} = \rho_{kj}$ as off-diagonal elements.

[9] Couples where neither of the partners has long-lasting health issues are not included, since they cannot be work impaired/disabled by definition.

[10] When only one of the two spouses is suffering from longstanding health problems, only her disability status needs to be estimated simultaneously with the employment equations, hence a trivariate probit is estimated.

In the model above, *Z* are the vector of dummy variables for specific health conditions and activity limitations. This model will estimate consistently the effect of disability on employment if 'objective' health measures are exogenous, in the sense that they are uncorrelated with the error terms in the employment equations.[11] Hence, our "exclusion restriction" is that health conditions and activity limitations do not affect employment probability directly, only through their influence on self-reported disability status.[12] We estimate this multivariate probit, following the same logic as before, on three separate sub-samples identified by which of the spouses is affected by long-term health condition.[13]

We estimated several versions of both the 'naïve' (bivariate probit) model and the model where we take the endogeneity of self-reported health impairment into account (the multivariate probit). The baseline specification, as mentioned above, only includes the spouses' self-reported disability status in the employment equations (next to the control variables). In the next, extended specification, we allowed for the activity limitations to have an independent effect on the employment probability, hence we identify the effect of health impairment by comparing the employment outcomes of two individuals (and their spouses) who are limited in similar daily activities, but one of them identify these as affecting her work, while the other not. In the third specification, we allowed the effect of work disability on employment to differ across households where there are other working age individuals present and those where the household head and his partner are the only working age persons in the household. The reason for estimating this interactive model is that other working age individuals can either partially bear the burden of long-term care, or they can – through potentially increased labour supply – cushion some of the financial loss from having a work impaired person in the household.[14] As a final robustness check, we replaced the self-reported work impairment with the 'need for help/special equipment/special work arrangements', since we might hope that answers to these

[11] This effectively means that "objective health conditions" are not subject to measurement error or justification bias.

[12] In our „extended" specidifaction, we allow activity limitations to affect work propensity directly, and only health conditions are used as exclusion restrictions.

[13] The multivariate probit models were estimated using the mvprobit command in STATA (Capellari and Jenkins), which applies the GHK simulator to approximate choice probabilities.

[14] We also experimented with an alternative specification for heterogeneous effects, where we allowed the effect of disability to differ by the level of education of the work impaired individual. Our logic behind this was that the loss in potential labour income due disability is higher for more educated individuals. However we did not find any significant differences across education levels defined by having finished high school (versus with a lower level of education).

more specific questions might be a less error-ridden indicator of work disability than self-assessed work limitation.

We need to mention two major shortcomings of our empirical analysis. The first of these is that we have no direct information on (potential) wages, which might lead to an omitted variable bias. This will come about if more productive individuals tend to have less severe health issues, hence disability status might also act as a proxy for having low labour market opportunities and as a consequence the effect of disability on employment will be biased downwards. If due to (positive) assortative mating, there is a positive correlation between spouses (potential) wages, this omitted variables bias will also be transmitted unto the estimate of the effect of partners' disability on spouses' labour supply. The second issue is that we are not able to model the probability of becoming long-term ill,[15] hence we are unable to address sample selection. One may be willing to assume that more productive workers have better health, hence we use a negatively self-selected sample, which might yet again lead to overstating the effect of disability on labour supply.

5. Long-standing health conditions, activity limitations and disability

Before turning to the association between work disability and employment probability, we briefly discuss - based on the 2011 Q2 wave of the HLFS - the determinants of long-term illnesses, their incidence and their influence on self-reported work impairment.[16]

In our sample of active age older couples 43.5% of men and 39.2% of women have either a longstanding health condition or activity limitation. Running (bivariate) probits of long-term illness on a host of background variables[17], we found that – in line with the literature - both age and education are important determinants of health. There are also sizeable differences in the incidence of long-lasting health conditions across regions, and there is some evidence that men living in micro-regions where the

[15] One source of identification might be geographical variation of health care facilities, but it is not clear how useful this might be to estimate the gender-specific incidence of long-standing health conditions. Another source of information might be occupation/industry specific workplace injuries and work-related health issues. We did not use this information since (a) occupation/industry is missing for those who have not been employed for a longer period; and (b) information on injuries/illnesses is sparse.
[16] While the prevalence of both longstanding health conditions (49.9%) and work impairment (28.6%) is somewhat higher in the 2008 Q4 HLFS data, the qualitative results (the prevalence of different types of illnesses and their association between reported work impairment) are very similar.
[17] Results are available from authors upon request.

unemployment rate is higher have a higher probability of reporting ill health. Our data also bear out the notion that health condition is positively correlated across spouses, as the estimated correlation between the unobserved determinants ill health of husbands and wives is 0.47. Another way of displaying this is that among older couples a full 26% have both spouses experiencing long-standing health conditions, and only 43.4% have no long-term ill household members. As one can observe Table 4 and 5, there is a strong association between the education of spouses and the number of persons in the household with health conditions, with the proportion of persons with tertiary education being almost three times as high among 'healthy' couples than among couples where both persons are long-term ill.

Turning to the prevalence of different long-standing health conditions, we find that heart, circulation and blood pressure problems are mentioned as the most important health problem among those who are ill (41% of men and 36.6% of women), and problems (arthritis or rheumatism) of limbs and back are also widespread (37.5% for men and 31.5% for women). It is important to point out that more than a third of those who have a self-reported longstanding health condition do not have difficulties with any of the basic activities mentioned in the questionnaire. Given the prevalence of health conditions mentioned above and the respondents' age, it is no surprise that about a quarter of those in ill health report problems with walking/climbing steps/standing, and a further quarter have problems with lifting and carrying.

What is the prevalence of self-reported work impairment, and how are health conditions and activity limitations related to self-reported work impairment? Among both husbands and wives about 54-55% of those suffering from longstanding health problems are work disabled, which amounts to 23.5% of all men and 21.7% of women in our sample (See Table 1). The two activity limitations with the highest incidence (walking and carrying) seem to be also the two most important determinants of self-reported work impairment, while those with less prevalent but more serious health conditions – including cancer, depression, chronic anxiety or other mental problems - have the highest probability of reporting work impairment. While the type of longstanding health condition and activity limitation are the most powerful determinants of work impairment, we found again that more educated persons report being disabled less often, and there are also regional disparities in the severity of health conditions.

6. Empirical results: the association between work disability and employment

In this section we first briefly look at descriptive evidence (raw employment rates) across different household types identified by the number of persons suffering from longstanding health conditions (and severity of these). Then we turn to the results on the association between work disability and own and spousal employment probability, presenting the empirical estimates of the bivariate probit models. Finally, we look at whether relaxing the assumption that work limitation reporting is not correlated with tastes for work changes these findings, we examine the evidence from the multivariate probit models.

Descriptive evidence

Based on the employment rates of household heads and partners, presented in Tables 2 and 3, one can see that while a persons' own work impairment status is very strongly negatively associated with her own work probability, the spouses' employment status seems to respond to this much less. Those suffering from long-term health problems have an employment rate that is about 13 percentage points lower than those who are 'healthy', the difference between the employment rate of persons who report having long-term health problems and those who are work impaired is an astonishing 45-50 percentage points.

Looking at raw employment rates by spouse's health status one can see a much more nuanced picture. Among male household heads, the employment rate of 'healthy' individuals seems to decrease (by about 10 percentage points) when their spouse is work disabled (but not if the spouse is long-term ill). For women, on the one hand, 'healthy' individuals have a lower employment rate if the household head is ill, but the severity of the health condition does no seem to matter. On the other hand, among work impaired women, the employment rate is higher if their spouse is long-term ill, while in response to the spouse's disability, women's employment rate tends to fall. Since our identification strategy relies on comparing persons employment probability if we 'switch' the health status of their spouse from suffering from long-term ill health to work impairment, we can see a small negative 'effect' of

husbands' disability on wives' employment, while the negative response to spousal work impairment is somewhat larger for men.[18]

Bivariate probit models

In order to have a first idea of the association between work disability and spouses' employment, we discuss the estimates when we treat self-reported work disability as exogenous. These estimates convey the idea that work impairment has a very large negative influence on a person's employment probability. Spouses' work disability has only a minor 'effect', and the direction/size of this effect depends on the individual's gender and household arrangements. We will only present the marginal effect of own and spouse's disability on the marginal probability of being employed because our primary purpose is to test whether a person's spouse's disability has any influence on employment.[19][20]

In our baseline specification (Table 6), where we include only own and partners' work impairment (along with a set of background variables), we find that own disability decreases own employment by about 35 percentage points (irrespective of the person's gender and spouse's health status). This in fact is a very pronounced association, it is about twice as large as the difference between the employment probability of a man with tertiary education and a man who only finished primary education. In contrast to this, spouse's disability status has no overall effect on a person's employment. Controlling also for the long-term sick person's activity limitation (Table 7) dampens the negative correlation between own disability and the employment probability, hence part of the 'effect' of disability comes from the fact that those reporting work impairment have complaints which typically influence work capacity as opposed to the 'severity' of their condition. In our third specification (Table 8), when we use a more restrictive definition of disability – needing help in order to work – instead of using self-reported work impairment, we find a substantially smaller effect of disability on employment. Those who report that they

[18] The same associations can be discerned from the 2008 Q4 data, though the negative 'effect' of spousal disability on household heads' employment rate is more pronounced, as is applies to all men, irrespective of their own health status.

[19] We do not present the effect of our control variables, but these are largely in line with expectations: education increases a person's employment probability, age decreases it, as well as eligibility for early retirement, and we also find significant regional variation in employment probability.

[20] We have found that there is only a weak positive correlation between the error terms of spouses' employment equations, and with the exception of households where both members suffer from a long-term illness, these correlations were not significant.

can only work under special conditions have an employment probability that is roughly 25 percentage points lower than those who report having a long-term health condition.[21][22]

Our most interesting and nuanced results are based on the specification when we allow the effect of disability to depend on the presence of other working-age household members (Table 9).[23] The first finding is that in general, the effect of own disability on one's own employment in households where there are other working-age members is more negative than in households with no other working age-members, and this result does not depend on the gender of the individual or the health status of her spouse. This is consistent with the notion that in households where other members can contribute to household income, the (relative) drop in per capita income due to work impairment is lower, hence work disabled persons have less of an incentive to continue working.

The impact of spousal work disability and its interaction with the presence of other household members is more mixed, it differs by gender. Though most of these cross-effects are not significant, men's labour supply tends to decrease more in response to their spouses' work disability if there are no other working age individuals present in the household. By contrast, women in households with no other potential earners tend to have higher employment probability if their husband is work incapacitated, while this effect is dampened in households with other working-age persons present. One notion that can explain this differential effect across genders can be that women's work incapacity might also affect their productivity in home production, hence the value of men's home time is raised, leading to some men dropping out of employment. In households with other working age members present (whose potential market wage is presumably lower than the household head's), we might not see this type of effect, since it is the other household members that substitute for the disabled woman's time in home production. As opposed to this phenomenon, the work incapacity of a household head in families without other working age members leads to larger (relative) drop in income, leading to the added worker effect for wives.

[21] A possible explanation of this phenomenon is that these more narrow questions lead to less self-justification bias, and hence we have less downward biased estimates.
[22] For these three specification, though there are some minor differences across the results for 2011 and 2008, they do not differ in terms of qualitative findings.
[23] Note that in previous specifications we also controlled for the presence of other working age individuals.

Allowing for simultaneous determination of work impairment and employment status

When we allow for the endogeneity of work impairment, the most important finding is that we do not find any evidence of justification bias. In fact, in all the specifications we use (in both 2011 and 2008), we find a moderate-size (0.3-0.5), statistically significant positive correlation between the residuals of the disability equation and the own employment equation, which implies that persons with above-average tastes for work seem to be of below-average health.[24] Taken at face value, this suggests that classical measurement error is more of a concern than justification bias.[25] The above results underscore the importance of taking into account the (possible) correlation between disability reporting and labour market status.[26]

The results on the effect of health condition on employment probability are more pronounced in the endogeneity corrected models, though they are somewhat sensitive to model specification (see Tables 10 – 12). These models confirm that work impairment has a very strong negative effect on a person's employment status, as the marginal effect on (marginal) employment probability is about 50 percentage points. In line with the result of the bivariate probit models, controlling for the effect of work limitations on employment, the negative effect of work impairment on employment is reduced. We also find support for the notion that the presence of other (potential) breadwinners in the household can cushion the household from some of the income loss stemming from work disability, hence the employment rate of disabled persons is lower in households with other working age persons present.

The cross-effect of spousal disability is also more important in the multivariate probit models, albeit they are an order of magnitude smaller than the own effect. The most marked of these appears in the case of couples where the wife is 'healthy': the work impairment of the husband leads to a decrease in the wife's employment probability by about 10 percentage points. In all other cases, the results are much more sensitive to the specification of the employment equation, but in general they range between -5 and 5 percentage points. It is also apparent from our findings that

[24] We also find a strong positive correlation between spouses health status in couples where both partners suffer from long term illness.
[25] However, when we add activity limitations to the employment equation they are statistically significant and there is a decrease in the correlation between the residuals from the employment equation, which casts some doubt our identifying assumptions.
[26] In a recent paper, Kapteyn et al. (2009) have not found evidence of justification bias based on Western European data.

household structure matters for the effect of spousal work impairment. We consistently find for both genders and for both healthy and long-term ill persons that when other working-age persons are present in the household, the disability of one's spouse has a smaller negative effect on (own) employment probability. The explanation for this result is not clear, it might potentially be that the increased 'care needs' of the disabled person are (partly) covered by other adult family members, hence there is less of a need for the disabled person's spouse to leave the labour force in order to provide long-term care for the disabled person. The heterogeneity of the effect of spousal disability across different household structures is also an indication that one may also want to model other household members' reaction to the presence of work disabled persons.

6. Conclusions

While ill health and work incapacity is one of the major determinants of older persons' labour market position, only very limited econometric evidence on this issue has been presented for Hungary, where more than 40 percent of individuals above age 50 consider themselves to be limited in their labour market activity by their health status. In our study, we show that the employment rate of persons who report being work incapacitated is 40 percentage points lower than for individuals with similar background characteristics and activity limitations. Furthermore, we find little evidence of reverse causality between employment status and self-reported work incapacity. In contrast to the pronounced effect of own health status on employment probability, we do not report consistently negative impacts of spousal work incapacity on employment status. More precisely, we show evidence that when disentangling the cross-effects of work incapacity household structure matters. Our results are consistent with the notion that in households where younger, active age individuals are present, they substitute for the work incapacitated person's spouse in caring duties.

Our study points in several directions that we consider fruitful to follow in future research. First, it is important to estimate the effect of disability on labour market outcomes using data with adequate measures of income**,** in order disentangle the effect of incentives of work incapacity benefits. Second, a more complete modelling of labour supply responses of all household members needs to follow, which is to go

hand-in-hand with an effort to determine whether household structure is affected work incapacity.

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Tables

Table 1The distribution of households by spouses' health status

	Male not long-term ill		Male long-term ill, not disabled		Male disabled	
	N	%	N	%	N	%
Female not long-term ill	1734	40.8	314	7.4	452	10.6
Female long-term ill, not disabled	204	4.8	329	7.7	188	4.4
Female disabled	354	8.3	178	4.2	496	11.7

Table 2 Employment rate of husbands by spouses' health status (%)

	Male not long-term ill	Male long-term ill, not disabled	Male disabled
Female not long-term ill	76.59	60.19	17.48
Female long-term ill, not disabled	78.92	65.65	14.36
Female disabled	67.23	61.24	14.72

Table 3 Employment rate of wives by spouses' health status (%)

	Male not long-term ill	Male long-term ill, not disabled	Male disabled
Female not long-term ill	79.82	76.75	75
Female long-term ill, not disabled	66.67	65.96	62.23
Female disabled	15.54	27.53	20.77

Table 4 Education level of husbands by spouses' health status (column %)

	Neither spouses ill	Husband long-term ill	Wife long-term ill	Both spouses long-term ill
Primary school	12	18.3	16.8	27
Vocational training school	41.2	49.5	46.6	48.6
High School	26.1	21.9	24.7	17.5
Tertiary education	20.7	10.3	11.8	6.9

Table 5 Education level of wives by spouses' health status (column %)

	Neither spouses ill	Husband long-term ill	Wife long-term ill	Both spouses long-term ill
Primary school	17.2	29.2	34.9	39.7
Vocational training school	21.5	23.6	26.5	26.1
High School	37.6	31.7	29.2	26.3
Tertiary education	23.8	15.4	9.3	7.9

Table 6: Marginal effects from baseline bivariate probit specification

		AME on husband's probability of employment	AME on wife's probability of employment
Husband long-term ill	Husband's disability	-0.354	0.006
		(0.024)***	(0.036)
	N	765	
Wife long-term ill	Wife's disability	-0.050	-0.357
		(0.038)	(0.026)***
	N	556	
Both spouses long-term ill	Husband's disability	-0.382	-0.010
		(0.020)***	(0.032)
	Wife's disability	0.009	-0.311
		(0.029)	(0.027)***
	N	1191	

Standard errors in brackets; * p<0.1; ** p<0.05; *** p<0.01

Table 7: Marginal effects from bivariate probit specification controlling for activity limitations

		AME on husband's probability of employment	AME on wife's probability of employment
Husband long-term ill	Husband's disability	-0.272	0.024
		(0.033)***	(0.041)
	N	765	
Wife long-term ill	Wife's disability	-0.271	-0.271
		(0.034)***	(0.034)***
	N	556	
Both spouses long-term ill	Husband's disability	-0.341	0.007
		(0.028)***	(0.037)
	Wife's disability	-0.005	-0.254
		(0.034)	(0.033)***
	N	1,191	

Standard errors in brackets; * p<0.1; ** p<0.05; *** p<0.01

Table 8: Marginal effects from bivariate probit specification, with 'needs help/special equipment/work arrangements as a proxy for work disability

		AME on husband's probability of employment	AME on wife's probability of employment
Husband long-term ill	Husband's disability	-0.244	-0.020
		(0.033)***	(0.036)
	N	765	
Wife long-term ill	Wife's disability	-0.014	-0.238
		(0.038)	(0.039)***
	N	556	
Both spouses long-term ill	Husband's disability	-0.354	-0.017
		(0.028)***	(0.034)
	Wife's disability	0.050	-0.239
		(0.031)	(0.032)***
	N	1,191	

Standard errors in brackets; * p<0.1; ** p<0.05; *** p<0.01

Table 9: Marginal effects from bivariate probit specification, interaction with household structure

			AME on husband's probability of employment	AME on wife's probability of employment
Husband long-term ill	Husband's disability	Other working age present	-0.382	0.010
			(0.044)***	(0.045)
		No other working age	-0.443	0.000
			(0.048)***	(0.058)
		N	765	
Wife long-term ill	Wife's disability	Other working age present	-0.026	-0.523
			(0.046)	(0.054)***
		No other working age	-0.093	-0.328
			(0.062)	(0.068)***
		N	556	
Both spouses long-term ill	Husband's disability	Other working age present	-0.521	0.049
			(0.044)***	(0.043)
		No other working age	-0.407	-0.075
			(0.045)***	(0.046)
	Wife's disability	Other working age present	0.038	-0.415
			(0.038)	(0.047)***
		No other working age	-0.020	-0.278
			(0.042)	(0.048)***
		N	1191	

Standard errors in brackets; * p<0.1; ** p<0.05; *** p<0.01

Table 10: Marginal effects based on baseline specification, multivariate probit

		Husband long-term ill			Wife long-term ill			Both long-term ill		
		AME	se (jackknife)	n	AME	se (jackknife)	n	AME	se (jackknife)	n
Husband work disabled	Husband's employment	-0.527	0.006	764	-	-	555	-0.512	0.003	1190
	Wife's employment	-0.104	0.002	764	-	-	555	-0.010	0.000	1190
Wife work disabled	Husband's employment	-	-	764	-0.055	0.001	555	-0.035	0.001	1190
	Wife's employment	-	-	764	-0.585	0.005	555	-0.532	0.002	1190

Table 11: Marginal effects based on baseline specification including controls for activity limitations, multivariate probit

		Husband long-term ill			Wife long-term ill			Both long-term ill		
		AME	se (jackknife)	n	AME	se (jackknife)	n	AME	se (jackknife)	n
Husband work disabled	Husband's employment	-0.353	0.005	764	-	-	555	-0.499	0.004	1190
	Wife's employment	-0.123	0.002	764	-	-	555	0.049	0.001	1190
Wife work disabled	Husband's employment	-	-	764	-0.053	0.001	555	-0.074	0.001	1190
	Wife's employment	-	-	764	-0.397	0.006	555	-0.525	0.003	1190

Table 12: Marginal effects, interaction with household structure, multivariate probit

		Husband long-term ill					
		No other working age individual			Other working age individual present		
		AME	se (jackknife)	n	AME	se (jackknife)	n
Husband work disabled	Husband's empl.	-0.550	0.010	335	-0.507	0.007	428
	Wife's employment	-0.124	0.003	335	-0.094	0.002	428
		Wife long-term ill					
		No other working age individual			Other working age individual present		
		AME	se (jackknife)	n	AME	se (jackknife)	N
Wife work disabled	Husband's empl.	-0.098	0.003	251	-0.031	0.001	303
	Wife's employment	-0.486	0.006	251	-0.639	0.007	303
		Both long-term ill					
		No other working age individual			Other working age individual present		
		AME	se (jackknife)	n	AME	se (jackknife)	N
Husband work disabled	Husband's empl.	-0.450	0.005	626	-0.571	0.004	563
	Wife's employment	-0.055	0.001	626	0.037	0.001	563
Wife work disabled	Husband's empl.	-0.069	0.001	626	-0.003	0.000	563
	Wife's employment	-0.469	0.003	626	-0.569	0.003	563