

Causality between Health and Labor Market Hours? An IV Response

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Outline

- 1 Introduction
- 2 Data and Variables
- 3 Empirical Strategy
- 4 Results
- 5 Conclusions

Introduction

Importance to the topic

- Since Grossman's seminal work 'on the concept of health capital and the demand for health' (Grossman 1972a,1972b), many papers have studied health within the field of economics.
- More recently, some papers have studied the relationship between health status and labor market outcomes, mainly focused on older workers (e.g., Bound, Schoenbaum and Waidmann 1999; Currie and Madrian 1999; Au, Crossley and Schellhorn 2005; Disney, Emmerson and Wakefield 2006; Hagan, Jones and Rice 2009; Jones, Rice and Roberts 2010).
- Common Concern \Rightarrow Employment or long working hours may have adverse impacts on individual health, or individuals may use health conditions to justify their labor force status.
- When self-reported health is used in labor supply models, the health variable becomes endogenous.

In this paper

- We focus on the causal relationship between self-assessed health status and the time devoted to market work activities.
- We use data from the Spanish Time Use Survey (STUS).
- Our results indicate that health has a positive causal impact on the time devoted to market work activities.
 - 1 Estimated coefficients are larger for the GMM/IV than for the OLS estimates \Rightarrow OLS estimates suffer from endogeneity bias.
 - 2 We are able to correct for endogeneity bias, while still maintaining the measurement error bias \Rightarrow Produce lower bounds for the effects

Contribution and Findings

- We contribute to the debate on the causal relationship between health status and participation in the labour market.
- FINDINGS:
 - 1 Individuals who are not working may under-report their health status in order to justify their work status.
 - 2 The increase in the time devoted to the labor market due to improvements in health comes almost entirely from the time devoted to non-market work activities \Rightarrow Further research on how health influences other uses of time, such as household production and leisure.

Data

The Spanish Time Use Survey

- 2002-2003 Spanish Time Use Survey (STUS).
- Representative sample of 20,603 households and contains information on daily activities, gathered by means of the completion of a personal diary and household and individual questionnaires.
- An activities diary, which all members of the household aged 10 and older complete on a selected day (the same day for all members of the household).
- The diaries' time frame is twenty-four consecutive hours (from 6:00 a.m. until 6:00 a.m. the following day) and is divided into ten-minute intervals

Sample

- For the sake of comparison with previous studies, and to minimize the role of time allocation decisions that have a strong inter-temporal component over the life cycle, such as education and retirement, we restrict our samples to non-retired/non-student individuals between the ages of 24 and 65 (e.g., Aguiar and Hurst, 2007).
- We exclude 'low quality' diaries from the analysis, following the Multinational Time Use Study (MTUS) coding procedures.
- 22,303 observations.

Self-Assessed Health Status

- Health-Status: self-assessed health status, respondents in the STUS answer the question "how is your health in general?" with 4 possible responses: 'very poor/poor health' (0), 'fair health' (1), 'good health' (2), and 'very good health' (3).
- Self-assessed health status (SAHS) is an increasingly common measure of health in empirical research (e.g. Smith 1999; Kennedy et al. 1998; Deaton and Paxson 1998; Schofield 1996; Ettner 1996; Saunders 1996)

Table: Summary Statistics ¹

	Poor	Fair	Good	Very Good
Health Status	6.82%	19.58%	51.05%	22.55%

Notes: ¹ Robust standard errors in parentheses Sample consists of respondents aged 21-65 from the Spanish Time Use Survey 2002-2003.

- More than 70% of the sample report having 'very good health' or 'good health'

Time Use Variables

- We focus on the effects of health on the time devoted to market work, although we also analyze how it affects the time devoted to non-market work.
- Market Work: 'paid work - main job (not at home)', 'paid work at home', 'second or other job not at home', 'unpaid job to generate household income', 'travel as part of work', 'work breaks', 'other time at workplace', 'look for work', 'regular schooling, education', 'homework', 'leisure/other educational or training', 'travel to or from work' and 'education-related travel'.
- Non-Market Work: 'set table/wash/put away dishes', 'cleaning', 'laundry, ironing, clothing repair', 'home/vehicle maintenance/improvement', 'other domestic work', 'purchase goods', 'consume other services', 'pet care (other than walk dog)', 'adult care', 'voluntary work, civic, organization activity', 'worship and religious activity', 'travel for voluntary/civic/religious activity', 'physical, medical child care', 'teach, help with homework', 'read to, talk to or play with children', 'supervise, accompany, other child care' and 'child/adult care related travel'.
- Hhld. Production: Non-Market Work excluding childcare time.

Self-assessed Health Status and Time Use

Table: Summary Statistics ¹

	Poor	Fair	Good	Very Good
Health Status	6.82%	19.58%	51.05%	22.55%
Market Work	1.64	3.31	4.36	4.66
Non-Market Work	4.60	4.55	4.18	4.01
Hhld. Production	4.45	4.24	3.65	3.32

Notes: ¹ Robust standard errors in parentheses Sample consists of respondents aged 21-65 from the Spanish Time Use Survey 2002-2003.

- Individuals reporting 'good health' and 'very good health' devote more time to *Market Work* (4.36 and 4.66 hours per day, respectively) than individuals with 'poor health' (1.64 hours per day).
- Individuals reporting 'good health' and 'very good health' devote 4.18 and 4.01 hours per day to *Non-Market Work*, respectively, and individuals with 'poor health' devote 4.60 hours per day to these activities.
- Respondents with 'good health' and 'very good health' devote 3.65 and 3.32 hours per day to *Hhld Production*, while respondents with 'poor health' devote 4.45 hours per day to those activities.
- A positive correlation of 0.15 between health status and the time devoted to *Market Work*, and a negative correlation of -0.06 between health status and the time devoted to *Non-Market Work*.

Empirical Strategy

Problems with SAHS

- Previous literature has identified a number of reasons why self-assessed measures of health status may cause biases (see Bound, 1991, for a complete discussion).
 - 1 They may contain measurement errors \Rightarrow It may not be possible to compare respondent's judgements with those of other respondents.
 - 2 The possibility that people out of the labour force report poor health to justify their non-participation \Rightarrow Economic and psychological incentives may affect their reply to the question.
- It is the endogeneity problem that presents the major concerns in the literature.
- One of the major limitations in the STUS is that we have no objective indicator of health status \Rightarrow We propose an Instrumental Variable (IV) estimation to deal with endogeneity problems.

Empirical Strategy

- Instrumental Variable (IV) linear model:

$$l_i = \alpha_{il} + \beta_{1l}SAHS_i + \beta_{2l}X_i + \beta_{3l}Z_i + \gamma_{tl}Day_i + \epsilon_{il} \quad (1)$$

$$SAHS_i = \alpha_{ic} + \beta_{1c}IV_i + \beta_{2c}X_i + \beta_{3c}Z_i + \gamma_{tc}Day_i + \epsilon_{ic} \quad (2)$$

- l_i is the time devoted to both *Market Work* and *Non-Market Work* by individual 'i'
- $SAHS_i$ is the variable indicating the health status of individual 'i'
- X_i is a vector of personal characteristics
- Z_i is a vector of household characteristics
- Day_i is a vector of dummy variables scaling the day of the week (Ref.: Friday).
- We regress the endogenous variable $SAHS_i$ on a set of excluded instruments (IV_i) and included instruments (X_i , Z_i and Day_i).

IV (I)

- Some authors have used more objectively measured health such as subsequent mortality (Parsons 1982; Anderson and Burkhauser 1984,1985) or specific health conditions to instrument self-reported health (Stern 1989; Bound 1991; Bound, Schoenbaum and Waidmann 1999; Dwyer and Mitchell 1999; Campolieti 2002).
- The STUS does not contain any objective measure of health that may be free of endogeneity problems.
- We propose an alternative method, relying on regional statistics provided by the Spanish Statistical Office (Instituto Nacional de Estadística, INE).
- In 2003, the *Spanish Ministry of Health, Social Policy and Equality* carried out a national survey on health, named Encuesta Nacional de Salud, where Spanish individuals were asked about their health status.
- "In the last 12 months, would you say that your health status has been very good, good, fair, poor or very poor?" ⇒ We use the response to this as the basis for our instruments, matching at the regional level the percentage of people reporting each health status in the Encuesta Nacional de Salud with the data from the STUS.

IV (II)

Table: Proportion of People by Self-Reported Health Status ¹

	Very good	Good	Fair	Poor	Very poor
Andalucia	14.2	55.92	21.62	5.49	2.77
Aragon	7.34	68.83	17.64	5.34	0.86
Asturias	8.26	55.26	25.61	8.44	2.43
Baleares	18.02	50.58	23.55	6.16	1.69
Canarias	13.77	50.75	24.73	8.39	2.37
Cantabria	13.5	55.54	24.46	5.79	0.7
Castilla y Leon	8.33	64.94	20.8	4.92	1
Castilla-La Mancha	12.33	53.51	26.68	5.81	1.67
Catalua	17.89	54.3	20.22	5.87	1.72
Comunidad Valenciana	9.46	67.78	15.37	5.47	1.92
Extremadura	10.71	56.65	24.46	5.99	2.2
Galicia	10.66	50.51	27.32	8.27	3.24
Madrid	14.58	59.94	19.78	4.62	1.08
Murcia	16.25	56.72	19.55	5.32	2.15
Navarra	16.51	59.58	18.01	5.19	0.71
Pais Vasco	14.1	60.77	19.48	4.83	0.82
Rioja (La)	10.16	68.2	16.36	4.12	1.16
Ceuta y Melilla	16.58	55.47	19.3	7.19	1.47

Notes: ¹ Data come from the Encuesta Nacional de Salud (2003), with statistics obtained from the Spanish Statistical Office (INE). Columns (1) to (5) show the proportion of individuals in each health status obtained from answers to the question 'In the last 12 months, would you say that your health status has been very good, good, fair, poor or very poor?'

IV (III)

- We choose the proportion of people reporting "very good health", "good health" and "fair health" in each region as instruments.
- We must highlight that our instruments are also based on a SAHS measure \Rightarrow IV estimates will probably be free of endogeneity, but they may still be suffering from measurement error.
- Measurement errors are likely to lead to a downward bias in the effect of health status on labor force behavior, while the endogeneity of self-reported measures is likely to amplify the effects of disability/health on labor force behavior (e.g., Bound 1991) \Rightarrow With our IV strategy we are able to produce lower bounds for the effects of health status on labor force behavior.

Other Controls

- Personal characteristics: University education, secondary education, male, age, age squared.
- Household characteristics: Presence of children <5 , presence of children 5-12, presence of children 13-17, married or cohabiting, log number of household members, caring for an adult member, vehicle at home, urban residence.
- Day: Vector of day dummy variables (Ref.: Friday).

Results

Results

Table 1: Health Status and Time Use ¹

	OLS			IV		
	Market Work	Non-Market Work	Hhld Production	Market Work	Non-Market Work	Hhld Production
Hours per day						
Health status	0.55*** (0.04)	-0.13*** (0.02)	-0.14*** (0.02)	1.24*** (0.48)	-1.04*** (0.33)	-1.21*** (0.31)
Male	3.44*** (0.06)	-3.96*** (0.04)	-3.55*** (0.03)	3.41*** (0.06)	-3.92*** (0.04)	-3.50*** (0.04)
Age	0.13*** (0.03)	0.05*** (0.02)	0.09*** (0.02)	0.13*** (0.03)	0.04** (0.02)	0.07*** (0.02)
Age squared	-0.19*** (0.03)	-0.03* (0.02)	-0.07*** (0.02)	-0.19*** (0.03)	-0.04** (0.02)	-0.08*** (0.02)
Urban	-0.12** (0.06)	-0.11*** (0.04)	-0.14*** (0.04)	-0.13** (0.06)	-0.10** (0.04)	-0.13*** (0.04)
University education	0.88*** (0.09)	-0.65*** (0.06)	-0.84*** (0.05)	0.65*** (0.18)	-0.34*** (0.13)	-0.48*** (0.12)
Secondary education	0.42*** (0.07)	-0.18*** (0.05)	-0.26*** (0.05)	0.27** (0.12)	0.01 (0.09)	-0.03 (0.08)
Presence of children ≤ 5	-0.77*** (0.10)	1.71*** (0.07)	-0.19*** (0.06)	-0.81*** (0.10)	1.76*** (0.07)	-0.14** (0.06)
Presence of children 5-12	-0.30*** (0.09)	0.61*** (0.06)	-0.05 (0.06)	-0.32*** (0.09)	0.64*** (0.06)	-0.01 (0.06)
Presence of children 13-17	0.03 (0.10)	0.01 (0.06)	-0.10 (0.06)	0.02 (0.10)	0.02 (0.07)	-0.09 (0.07)
Caring for adult	-0.50*** (0.10)	0.82*** (0.08)	0.84*** (0.07)	-0.48*** (0.10)	0.79*** (0.08)	0.80*** (0.08)
Log family members	-0.04 (0.09)	0.52*** (0.06)	0.56*** (0.06)	-0.05 (0.09)	0.53*** (0.06)	0.57*** (0.06)
Married/cohabiting	-0.21** (0.10)	0.22*** (0.07)	0.13** (0.06)	-0.22** (0.10)	0.24*** (0.07)	0.16** (0.07)
Vehicle at home	0.58*** (0.09)	0.03 (0.06)	0.02 (0.06)	0.47*** (0.12)	0.19** (0.08)	0.20** (0.08)
Constant	0.30 (0.54)	3.69*** (0.35)	2.78*** (0.32)	-1.21 (1.18)	5.70*** (0.81)	5.16*** (0.76)
Observations	22,303	22,303	22,303	22,303	22,303	22,303
R-squared	0.30	0.38	0.37	0.28	0.34	0.30

Notes: ¹ Standard errors in parentheses. Sample consists of respondents aged 21-65 from the Spanish Time Use Survey 2002-2003. Day (Ref.: Friday) dummy variables are also included in the regressions. Time devoted to time use activities is measured in hours per day. * Significant at the 90 percent level. ** Significant at the 95 percent level. *** Significant at the 99 percent level.

Results

- OLS \Rightarrow Positive association between health and *Market Work* hours per day, while we find negative associations between health and the time devoted to *Non-Market Work* and *Hhld Production*.
- Comparing respondents reporting 'very poor/poor health' and respondents reporting 'very good health', the latter devote, ceteris paribus, 1.65 more hours per day to *Market Work*, and 0.39 and 0.43 fewer hours per day to *Non-Market Work* and *Hhld Production*.
- GMM/IV \Rightarrow Once we control for endogeneity, we also observe a positive association between health and *Market Work* hours per day, while we find negative associations between health and the time devoted to *Non-Market Work* and *Hhld Production*.
- Comparing respondents reporting 'very poor/poor health' and respondents reporting 'very good health', the latter devote, ceteris paribus, 3.72 more hours per day to *Market Work*, and 3.12 and 3.63 fewer hours per day to *Non-Market Work* and *Hhld Production*.
- Hansen's test of over-identifying restrictions, Anderson canonical correlations likelihood-ratio test, Cragg-Donald test, Anderson-Rubin Wald test of significance, F-stat form of the Cragg-Donald statistic \Rightarrow IV as good instruments

Summary of Results

- All the tests seem to accept that our variables are valid instruments of the SAHS measure in the STUS.
- Comparing OLS with GMM/IV estimations, we observe that coefficients of health on time use categories are larger for the GMM/IV estimates, which is consistent with the idea that the OLS estimates suffer from endogeneity bias \Rightarrow Our instruments correct endogeneity, but not measurement error, and allow us to produce lower bounds for the effects of health status on labor force behavior.

Conclusions

Conclusions

- We study the causal relationship between health status and the time devoted to both market and non-market work.
- Using the Spanish Time Use Survey (STUS) we find that 'good health' is productivity-enhancing, in the sense that it has a causal positive impact on the time devoted to paid work.
- OLS estimates suffer from endogeneity bias \Rightarrow Individuals who are not working may under-report their health status in order to justify their work status (e.g, justification hypothesis).

Conclusions

- Public policies aimed at the establishment of a minimum level of public health coverage could lead to an increase in the time devoted to market work of the working population.
- At the firm level, measures intended to increase the health of employees would result in an increase in the productivity of the firm by an increase in the hours of work
- The increase in the time devoted to the labor market due to improvements in health comes almost entirely from the time devoted to non-market work activities \Rightarrow Further research on how health influences other uses of time, such as household production and leisure.

THANKS!