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THE HEALTH PRODUCTION FUNCTION REVISITED: THE ROLE OF SOCIAL NETWORKS AND LIQUID WEALTH

Carolina Santos
Pedro Pita Barros

Nova School of Business and Economics

Motivation


The Economist World politics Business & finance Economics

Looking after the elderly

Sans everything

Social care for pensioners is in crisis

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"He pays for his care from the proceeds of the **sale of his former flat**, but that money has nearly run out."

"The thinning out of state-provided social care may force a **cultural shift towards families and neighbours lending more support**."


FINANCIAL TIMES

JULY 28, 2017

Retirement

Can you afford to live to 100?

Financial innovation has not kept up with life expectancy. How will you fare?

"The idea of leaving your home to your children may soon become history if **equity release** becomes a mainstream way of maintaining a standard of living in retirement."

Research Questions

For older individuals:

- Do social networks have a positive impact on health production?
- Does a greater share of liquid wealth have a positive effect on health production?
- How do these two inputs – social networks and share of liquid wealth – relate in the health production function? Are they substitutes, complements or independent?

Literature Review

- Model of health production introduced by **Grossman (1972)**.
- Extended in several directions, but little attention has been devoted to understand how the composition of wealth portfolios affects health production.
- **Yogo (2016):** developed a life-cycle model in which retirees' consumption, health expenditure and the allocation of wealth between bonds, stocks and housing wealth depend on a stochastic health depreciation rate.
- Broad literature pointing to a positive relation between social networks and health (e.g. **Berkman *et al*., 2000**; **Smith *et al*., 2010**).
- No study focuses on the joint effect of social networks and liquid wealth in the health production function => **This is one contribution from this work**

Extended Grossman model of health production

- One period-analysis.
- Introduced social networks and the share of liquid wealth as choices.
- Individual maximizes an additive separable utility function on the stock of health, commodity goods and services accrued from wealth.
- Income and liquid wealth used to buy medical goods/services and other commodity goods.
- Endowment of time is split between work, health enhancing activities and social network contacts.

What does the extended model of health production predict?

- Social networks have a positive impact on health production.
- The greater the share of liquid wealth, the better is the health.
- In the health production function, the relation between social networks and share of liquid wealth is non-trivial. => This is essentially an empirical question.

Empirical analysis: variables used

Variables	Daily contacts	Liquid wealth	Doctor visits	Self-perceived health	Variables	Daily contacts	Liquid wealth	Doctor visits	Self-perceived health
Age	✖	✖	✖	✖	Stocks		✖		
Female	✖	✖	✖	✖	Mutual_funds		✖		
i.Marital status	✖	✖	✖	✖	Retirement_acc		✖		
Children	✖	✖	✖	✖	Contractual_saving		✖		
Education	✖	✖	✖	✖	Life_insurance		✖		
i.Employment	✖	✖	✖	✖	i.Health_system			✖	
i.Income	✖	✖	✖	✖	Chronic			✖	✖
i.Country	✖	✖		✖	Eurod			✖	✖
SizeSN	✖				Smoking			✖	✖
Very_close	✖				i.Sports			✖	✖
FamilySN	✖				OOP/lw			✖	
Proximity	✖				Liquid_wealth			✖	✖
Mobility_ind	✖		✖	✖	Daily_contact			✖	✖
Homeowner		✖			Doctor_visits				✖
Bonds		✖			Daily_contact_lw				✖

Conditional Mixed-Process Estimator

- *cmp*: user-written command developed by David Roodman (2011)
- *cmp* is written as a seemingly unrelated regressions (SUR) estimator, but it can also be applied to a broader range of simultaneous-equation systems, such as recursive and fully-observed systems.
- “Conditional”: the model can vary by observation. An equation can be dropped for observations for which it is not relevant. The type of a dependent variable can even vary by observation.
- “Mixed”: different equations can have different kinds of dependent variables (response types).

Application of *cmp*

```
.
. cmp (Daily_contact=Age Female i.Country i.Marital_status Children Education i.Employment i.Income SizeSN Very_clos
> e FamilySN Proximity) (Liquid_wealth=Age Female i.Country i.Marital_status Children  i.Employment i.Income Homeown
> er Bonds Stocks Mutual_funds Retirement_acc Contractual_saving Life_insurance) (Doctor_visits=Age Female i.Health_
> system Education i.Employment i.Income Chronic Mobility_index Eurod Smoking i.Alcohol i.Sports Daily_contact Liqui
> d_wealth) (SP_Health=Age Female i.Country i.Marital_status Education i.Income Doctor_visits Daily_contact Liquid_w
> ealth Daily_contact_lw), ind($cmp_cont $cmp_cont $cmp_cont $cmp_oprobit) robust
```

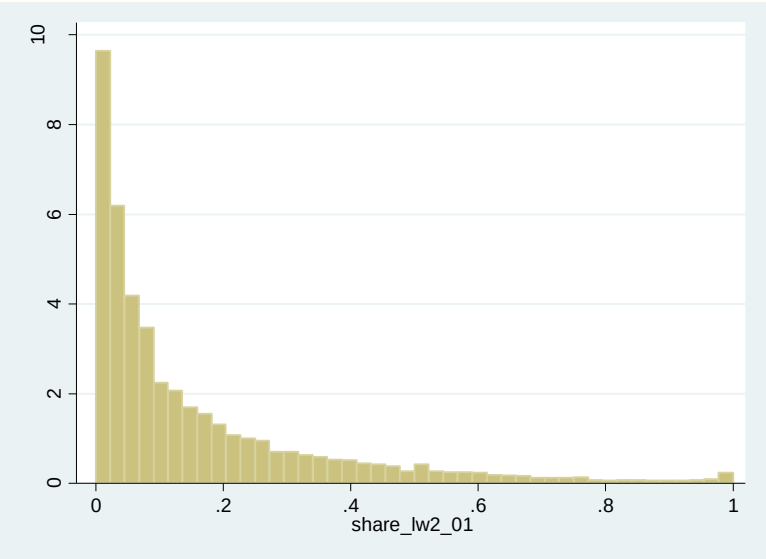
Which commands would have been useful?

- Roodman (2011) states that “Heteroskedasticity, however, can render **cmp** inconsistente.”

- Nevertheless, to the best of my knowledge, the typical tests for Heteroskedasticity (Breusch-Pagan, White) cannot be used after **cmp.**

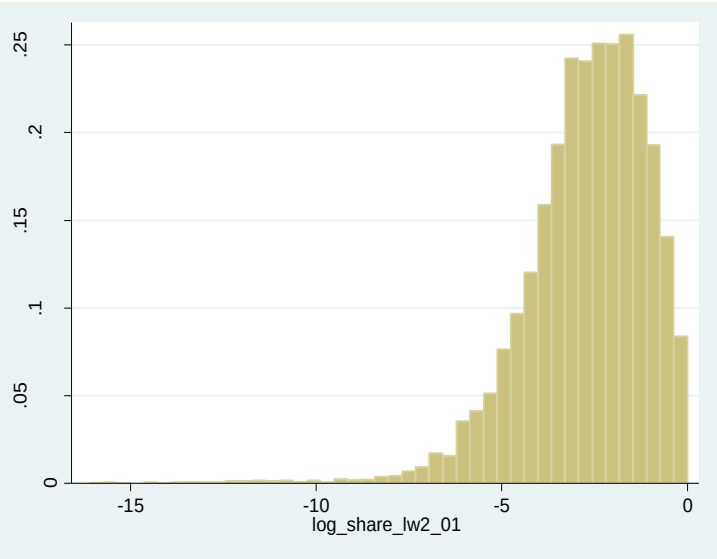
Zero-skewness Box-Cox transformation

Share of liquid wealth (assuming that illiquid wealth is only composed of real estate assets and considering only values above 0 and below 1)



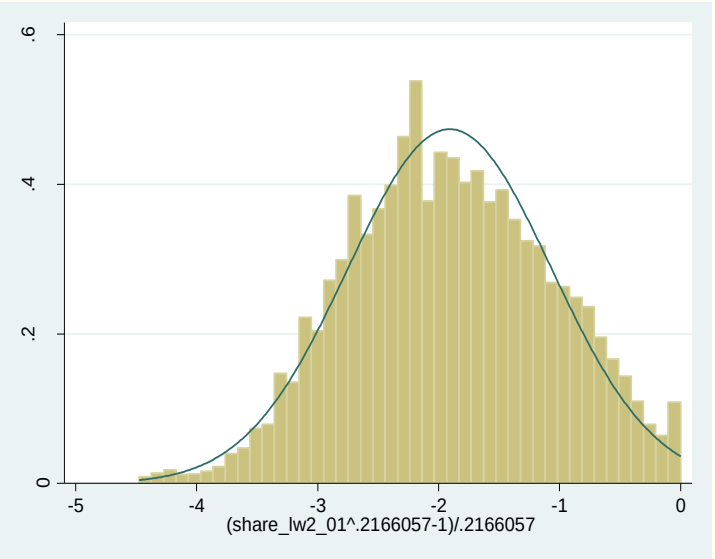
Skewness = 1.94

Natural **logarithmic transformation** of the share of liquid wealth (assuming that illiquid wealth is only composed of real estate assets and considering only values above 0 and below 1)



Skewness = -1.49

Box-Cox transformation of the share of liquid wealth (assuming that illiquid wealth is only composed of real estate assets and considering only values above 0 and below 1)



Skewness = 0.0001475

Zero-skewness Box-Cox transformation

- The Box-Cox transformation is given by:

$$y^{(\lambda)} = \begin{cases} \dfrac{y^{\lambda} - 1}{\lambda}, for\ \lambda \neq 0 \\ \log(y), for\ \lambda = 0 \end{cases}$$

- The Box-Cox transformation preserves the direction of the original variable, even when $\lambda < 0$. For exemple, if $\lambda = -1$:

y	y^{-1}	$\frac{y^{-1} - 1}{-1}$
1	1	$-1 + 1 = 0$
2	$^1/_2$	$^{-1}/_2 + 1 = {}^1/_2$
3	$^1/_3$	$^{-1}/_3 + 1 = {}^2/_3$

Application of *bcskew0*

- **bcskew0** *newvar* = *exp* [*if*] [*in*] [, *options*]
- The Box-Cox power transformation (Box and Cox, 1964), sets L so that the skewness of *newvar* is approximately zero:

$$newvar = exp^{(L)} = \frac{exp^{L} - 1}{L}, for\ L \neq 0$$

- Applying the *bcskew0* command to the share of liquid wealth:

```
. bcskew0 share=share_lw2_01, level (95)

      Transform |          L      [95% Conf. Interval]         Skewness
----------------+---------------------------------------------------------
(share_lw^L-1)/L |   .2166057      .2088125    .2243218        .0001475
```

Selected estimation results for the health production function

Variables	SP_Health	Standard error
5th decile	0.111*	(2.16)
6th decile	0.113**	(2.60)
7th decile	0.150***	(3.40)
8th decile	0.158***	(3.51)
9th decile	0.228***	(5.58)
10th decile	0.238***	(4.97)
Daily_contact	0.0191	(0.86)
Liquid_wealth	0.0730***	(3.87)
Doctor_visits	-0.572***	(-8.90)
Daily_contact_lw	-0.0254*	(-2.51)

Endogenous variables

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Current research

- Currently we are extending the analysis to incorporate wave 6 from SHARE.

- This allows us to exploit the longitudinal dimension of SHARE and, therefore, to study the robustness of the results obtained with the model presented here.

References

- Box, G. E., & Cox, D. R. (1964). “An analysis of transformations”. *Journal of the Royal Statistical Society.* Series B (Methodological), 211-252.

- Roodman, David. (2011). “Fitting Fully Observed Recursive Mixed-Process Models with CMP”. *Stata Journal*. 11. 159-206.