Household Responses to Individual Shocks: Disability and Labor Supply

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Objective of Paper

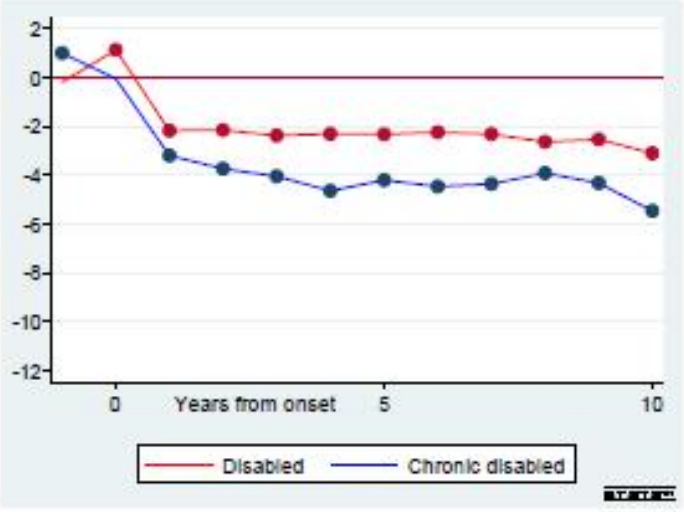
- What is the labor supply response of different types of households to idiosyncratic health shocks?
- Which models can replicate the data?

Data

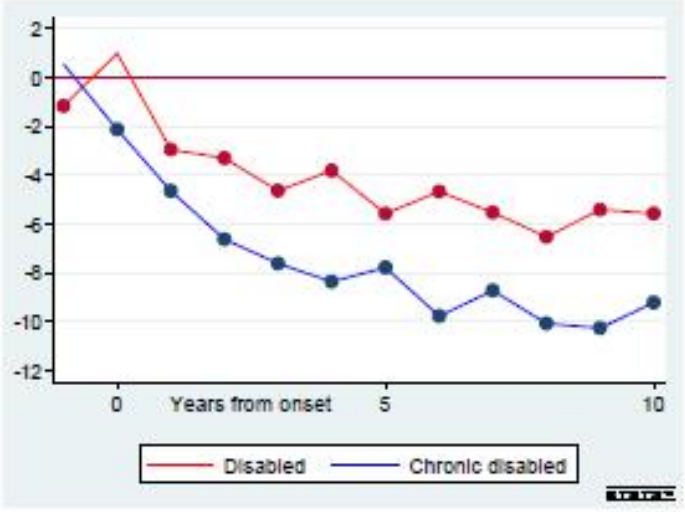
- Canadian Survey of Labour and Income Dynamics (SLID)
  - Longitudinal survey of Canadian households
  - 1999 and 2002 panels
- Advantages over Panel Study of Income Dynamics (PSID)
  - Accurate income data - about 70% of data comes directly from tax returns
  - Twice as large
  - More detailed about type of disability and consequences on economic life
- Disadvantage over PSID
  - Only six years of data - cannot observe long run effects of disability

Data - Labor Supply Responses to Disability Shocks

Figure 1: Change in Hours Worked for Men - Hours per week



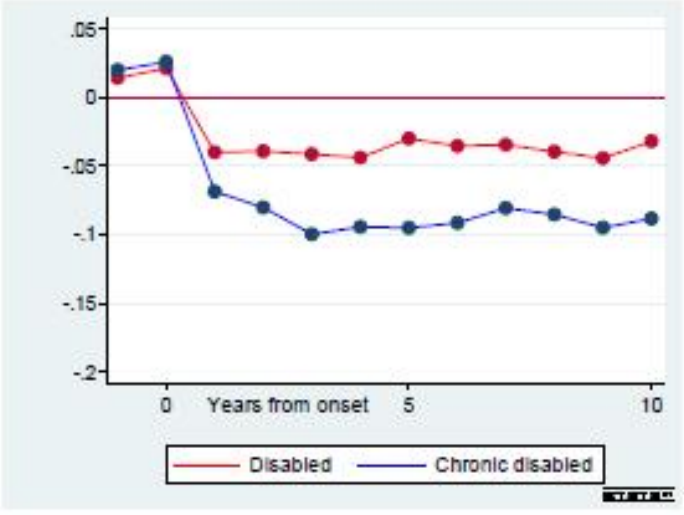
(a) Total hours: Married men



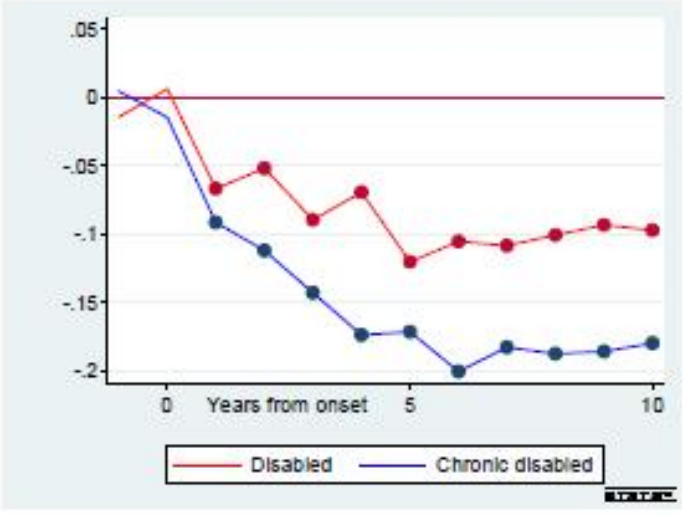
(b) Total hours: Single men

Data - Labor Supply Responses to Disability Shocks

Figure 2: Participation Rates for Men



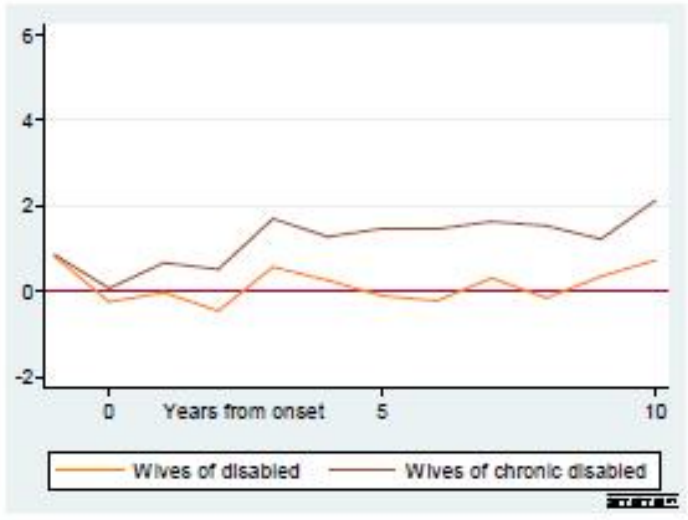
(e) Participation: Married Men



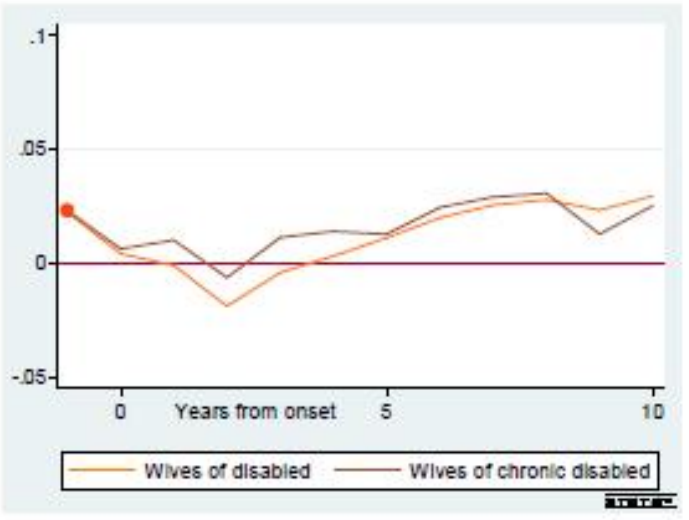
(f) Participation: Single men

Data - Labor Supply Responses to Disability Shocks

Figure 3: Change in Hours Worked for Spouse - House per week



(a) Total hours: wives of disabled men



(b) Participation: wives of disabled men

Testing Models

What ingredients do we need in a model to replicate these features of the data?

Basic Model of Household

Single Individual Dynamic Problem

$$V^S_{j,g}(X_g, a) = \max_{\{c,l,a'\}} \; u(c,l) + \beta\zeta_g E_j[V^S_{j+1,g}(X'_g, a'|X_g)]$$

subject to

$$\begin{aligned} c_g + a' &= (\tilde{T}_g - l_g)w_g + (1+r)a + b(.) \\ l &< \tilde{T}_g \\ a' &\geq \bar{a} \end{aligned}$$

$$\begin{aligned} w'_g &= f(Y'_g) + \eta' \\ \eta' &= \rho\eta + \epsilon \\ \epsilon &\sim (0, \sigma^2_\epsilon) \end{aligned}$$

Basic Model of Household

We define the following variables

- ζ_g
  - Probability of survival
- $\tilde{T}_g$
  - Time endowment
- $f(Y'_g)$
  - Deterministic states that determine wage
- $b(.)$
  - Government benefits

Basic Model of Household

Household-Level Dynamic Problem

$$U_j^H(X_f, X_m, a; \lambda, \theta^m) = \max_{c_f, l_f, c_m, l_m, a'} (1-\lambda) V_{j,m}^M + \lambda V_{j,f}^M$$

subject to

$$\begin{aligned} c_m + c_f + a' =& (\tilde{T}_m - l_m) w_m + (\tilde{T}_f - l_f) w_f \\ &+ (1+r)a + b(.) \\ l_m <& \tilde{T}_m \\ l_f <& \tilde{T}_f \\ a' \geq& \bar{a} \end{aligned}$$

w_m and w_f follow the same wage process as before.

Basic Model of Household

Value Function of Married Individual

$$V^M_{j,g}(X,a) = u(c_g, l_g) + \zeta_g \zeta_{-g} \beta_g E[V^M_{j+1,g}(X', a'; \lambda, \theta^M)|X] + \zeta_g (1 - \zeta_{-g}) \beta_g E[V^S_{j+1,g}(X'_g, a')|X_g]$$

Basic Model of Household

Nash Bargaining determines marriage contract

$$\lambda^* = \underset{\lambda}{\text{argmax}}\, S(j, a_f, a_m, X_f, X_m; \lambda, \theta^M)$$

subject to

$$\begin{aligned} S(.) =& [V^M_{j,m}(a_m + a_f, X; \lambda, \theta^m) - V^S_{j,m}(a_m, X_m)] \\ & [V^M_{j,f}(a_m + a_f, X; \lambda, \theta^m) - V^S_{j,f}(a_f, X_f)] \end{aligned}$$

Basic Model of Household

- Bargaining provides the only endogenous aspect of marriage in the basic model
- We do not allow for divorce
- Marriage occurs only if both members of potential couple find it optimal to marry. In this model, we set θ_M so that matched individuals always prefer to marry.

Basic Model of Household

Model does not match data

- Married men experience larger reductions in labor supply than single men because of the insurance value of marriage
- If shock is strong enough to affect HH's permenant income, we should see spousal labor income increase
- Effects of disability on labor supply should not outlast the disability itself and may even lead to high labor supply in the long run

Introducing Different Types of Labor Shocks

We introduce two types of disability shocks: labor-limiting δ_n and leisure-limiting δ_l. We rewrite the constraint of the married household:

$$
\begin{aligned}
c_m + c_f + a' =& \frac{(\tilde{T}_m - \delta_m l_m)}{\delta_n} w_m + (\tilde{T}_f - l_f) w_f \\
&+ (1 + r)a + b(.) \\
l_m <& \frac{\tilde{T}_m}{\delta_l} \\
l_f <& \tilde{T}_f \\
a' \geq& \bar{a}
\end{aligned}
$$

This will produce an additional "time loss" effect, which limits physical possibilities of individual.
Similarly rewrite the constraint of the single household.

Introducing Learning by Doing

Introduces a wage process that incorporates learning by doing

$$w_f' = \Theta_f(n_f, w_f)$$
$$w_m' = \Theta_m(n_m, w_m)$$

Authors estimate process...see paper for more details!

Introducing Time Transfers

- Allows for insurance through transfer of time
- In the presence of disability, time transfers allow healthy spouse to increase amount of leisure husband can enjoy - "caring"
- Out of natural endowment, every agent must devote some number of hours to non-labor, non-leisure tasks, nll_i.
- In the absence of task-sharing, an agent must spend $\bar{h}_i$ to complete tasks in nll_i bundle.
- Total hours spent in all nll activities is $\tilde{h}_i$.
- When wife devotes h_f hours to completing husband's nll tasks, she "returns" $\phi_f(h_f)$ hours to him
- This function is increasing and concave

Introducing Time Transfers

We can rewrite the HH's constraint as follows

$$
\begin{aligned}
c_m + c_f + a' =& \frac{(\tilde{T}_m - \delta_m l_m)}{\delta_n} w_m + (\tilde{T}_f - l_f) w_f \\
&+ (1 + r)a + b(.) \\
l_m <& \frac{\tilde{T}_m}{\delta_l} \\
l_f <& \tilde{T}_f \\
\tilde{T}_f =& T - \bar{h}_f - h_f \\
\tilde{T}_m =& T - \bar{h}_m - \delta_l h_m + \phi_f(h_f) \\
a' \geq& \bar{a}
\end{aligned}
$$

Introducing Household Formation and Dissolution

We now allow for four types of households

- Courting (C)
- Single (S)
- Divorced (D)
- Married (M)

Introducing Household Formation and Dissolution

Dynamic problem for single household

$$V^S_{j,g}(X_g, a) = \max_{c,l,a'} \; u(c,l) + \beta_g \zeta_g E_j[V^S_{j,g}(X'_g, a')|X_g]$$

Dynamic problem for divorced household

$$V^D_{j,g}(X_g, a, \theta^D) = \max_{c,l,a'} \; u(c,l) + \beta_g \zeta_g E_j[V^D_{j,g}(X'_g, a', \theta^D)|X_g]$$

Subject to the constraints described before for a single household.

Introducing Household Formation and Dissolution

Conditions for sustainable marriage

$$V^M_{j,m}(a, X; \lambda^*, \theta^M) \geq V^D_{j,m}(a^D_{j,m}, X_m; \theta^D)$$
$$V^M_{j,f}(a, X; \lambda^*, \theta^M) \geq V^D_{j,f}(a^D_{j,f}, X_f; \theta^D)$$

Where θ_D is exogenous non-pecuniary utility weight associated with the divoced state.

Introducing Household Formation and Dissolution

If the previous constraint becomes binding, the couple can "renegotiate" a new λ in the following way

$$\hat{\lambda} = \underset{\lambda}{\text{argmin}} \, |\lambda - \lambda^*|$$

subject to

$$V^M_{j,m}(a, X; \hat{\lambda}, \theta^M) \geq V^D_{j,m}(a^D_{j,m}, X_m; \theta^D)$$
$$V^M_{j,f}(a, X; \hat{\lambda}, \theta^M) \geq V^D_{j,f}(a^D_{j,f}, X_f; \theta^D)$$

In other words, we choose the closest λ to λ^* for which both partners participation constraints once more hold with inequality.

Introducing Household Formation and Dissolution

Marriage

- Agent's value function during marriage, conditional on renegotiation of λ, is always equal to or greater than the value of being single, so long as the spouse also wants to remain married.

Courtship

- Both agents in courting couple must wish to marry before marriage can take place
- No breaking up in this world

Taking the Model to the Data

Calibration and preferences

- Due to time limitation – see paper for all the details!

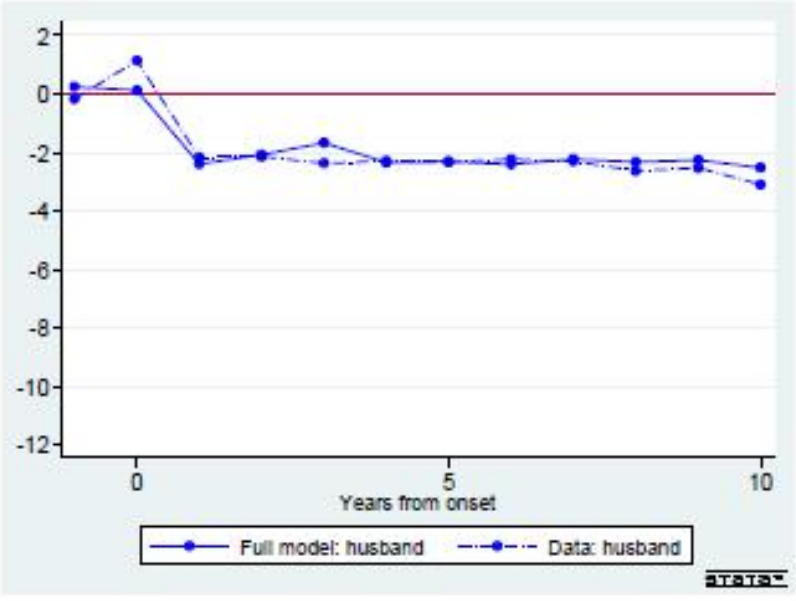
Taking the Model to the Data

Why do single men work less relative to married men after shock?
Marriage

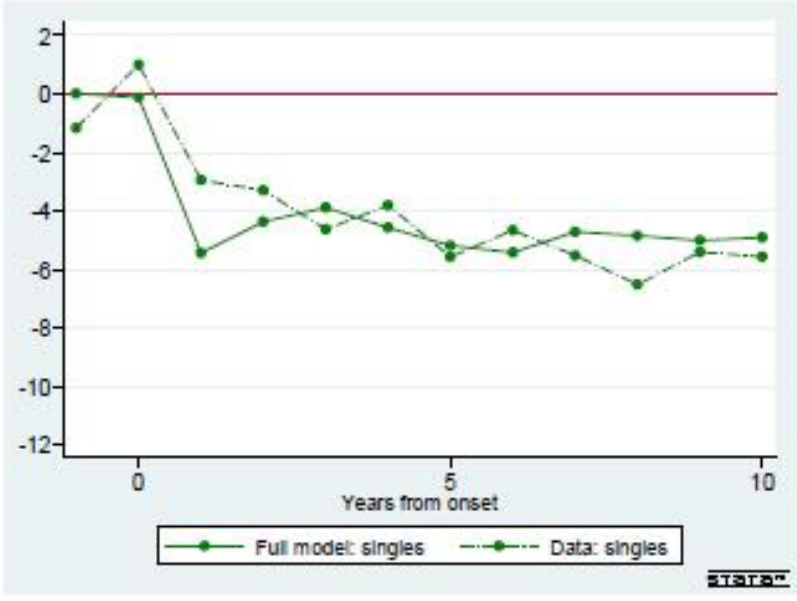
- Sorting - creates pool of singles that have a lower average returns to labor, makes it more attractive to withdraw from labor force and receive benefits in response to shock
- Renegotiating - if husband falls sick, "renegotiate" λ, which means that he has to work more than we would without divorce

Taking the Model to the Data

Figure 4: Change in Hours Worked for Men - Hours per week



(a) Husbands



(b) Single Men

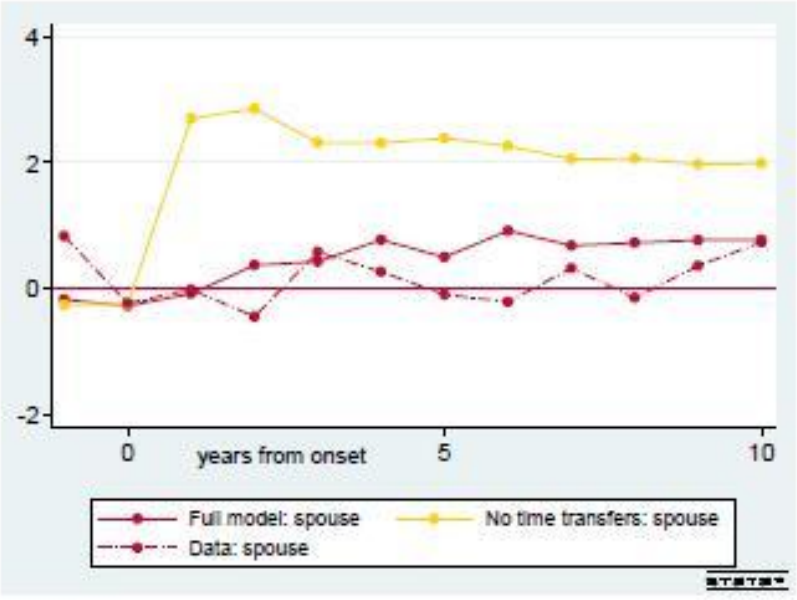
Taking the Model to the Data

Why does spousal labor supply not increase? Time transfers and Learning by Doing

- "Caring" for husband as a mechanism to smooth labor supply and achieve higher levels of human capital
- Husbands tend to transfer consumption to wives, who in exchange offer time transfers in period of need
- If we take it away, women work a lot more

Taking the Model to the Data

Figure 5: Change in Hours Worked for Spouse - House per week



(a) Spouse effects: wives of disabled husbands

Conclusion

Conclusion

- Basic model at odds with the data
- Introducing marriage and divorce, time transfers, and learning by doing can produce a model that replicates some aspects of labor supply response to idiosyncratic health shocks