Measuring the Value of Disability Insurance from Take-Up Decisions

Andreas Haller, Norwegian School of Economics
Stefan Staubli, University of Calgary

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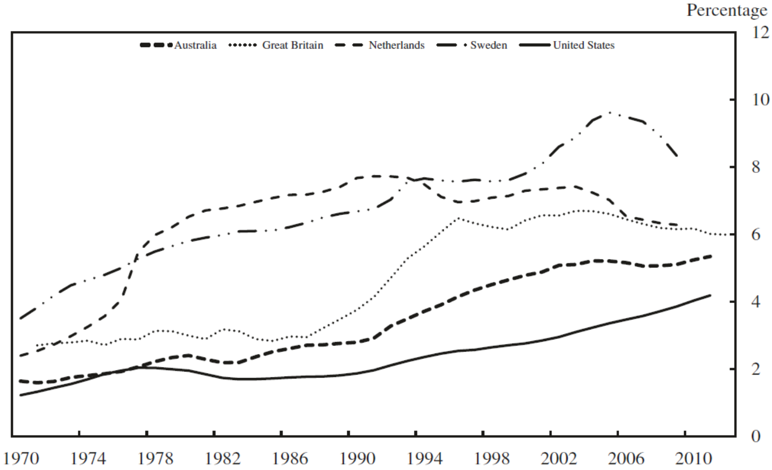
Public Disability Insurance Programs are Large & Rising

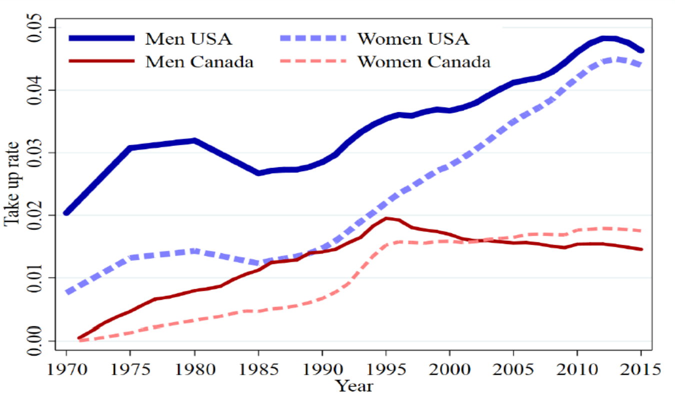
Disability Insurance Take-Up Rates (% of Working Age Population)



Burkhauser et al. (2014)

Public Disability Insurance Programs are Large & Rising

DISABILITY INSURANCE TAKE-UP RATES, AGE 30-59



SOURCE.—US data come from the Social Security Administration (numerator) and the Census Bureau (denominator). Canadian data come from Employment and Social Development Canada (numerator) and Statistics Canada (denominator). Canadian data exclude Quebec.

Milligan and Schirle (2019)

Motivation: Two Opposing Views

- Two views on the rise in DI recpiency rates (Chetty, 2012):
  1. **Incentive Cost**: Moral hazard from a generous system that leads to inefficiency
  2. **Insurance Value**: Program is now helping more needy people who have high disutilities of work
- **Optimal DI benefit level** depends on this incentive-insurance trade-off.

Motivation: What Do We Know?

- Large literature documents the **incentive effects** of DI
- Much less is known on the **insurance value** of DI
- **Main reasons**
  - Lack of data (on consumption)
  - Lack of policy variation

This Paper: Two Contributions

1. Provide a revealed preference approach to estimate the insurance value of DI benefits
   - Does not rely on consumption data
   - Compare DI take-up responses to change in DI benefits and change in wages
   - Relative response captures the insurance value of DI benefits
2. Estimate the value and cost of DI benefits in Canada

The Value of Disability Insurance

A SUFFICIENT STATISTICS APPROACH

Bailey-Chetty Formula for Optimal DI Benefits

- Maximize utilitarian welfare W w.r.t. DI benefits b (subject to government budget constraint)
- Reformulating first-order condition:

$$\frac{dW}{db} \gtrless 0 \iff \underbrace{\frac{v'(b)}{u'(w-\tau)}}_{\text{insurance value}} \gtrless \underbrace{1 + \frac{\varepsilon_{DI,b}}{1-DI}}_{\text{incentive effect}} \quad \text{where } \varepsilon_{DI,b} = \frac{dDI}{db}\frac{b}{DI}$$

- Challenge: How can we get an estimate for the LHS?

Bailey-Chetty Formula for Optimal DI Benefits

$$\frac{dW}{db} \gtreqless 0 \iff \underbrace{\frac{v'(b)}{u'(w-\tau)}}_{\text{insurance value}} \gtreqless \underbrace{1 + \frac{\varepsilon_{DI,b}}{1-DI}}_{\text{incentive effect}} \quad \text{where } \varepsilon_{DI,b} = \frac{dDI}{db}\frac{b}{DI}$$

- DI take-up response wrt b: $\frac{\partial DI}{\partial b} = f(\theta^A) \cdot p(\theta^A) \cdot v'(b)$
  - $\theta^A, p(\theta^A)$: disability level, award prob. of marginal applicant
- DI take-up wrt w: $\frac{\partial DI}{\partial w} = -f(\theta^A) \cdot p(\theta^A) \cdot u'(w-\tau)$
- Relative response: $-\frac{\partial DI}{\partial b} / \frac{\partial DI}{\partial w} = \frac{v'(b)}{u'(w-\tau)}$

Intuition and Assumptions

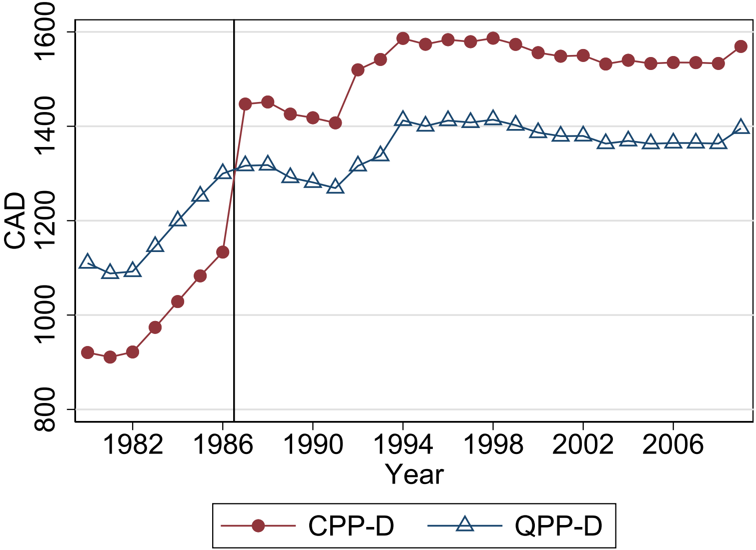
- If $-\frac{\partial DI/\partial b}{\partial DI/\partial w}$ large $\rightarrow$ high value of DI Benefits
  - Response to b: measures value of additional \$ in DI state
  - Response to w: measures value of additional \$ in non-DI state
- We identify insurance value of *marginal applicant*. Marginal applicant is representative.

MEASURING THE IMPACT OF DI BENEFITS

Canada's Public DI System

- **Two separate DI systems:**
  - Province of Quebec: QPP-D
  - Rest of Canada: CPP-D
- The program parameters are similar, but CPP-D raised lump-sum amount in 1987 to align with QPP-D

The 1987 CPP-D Reform: Monthly Max. DI Benefits



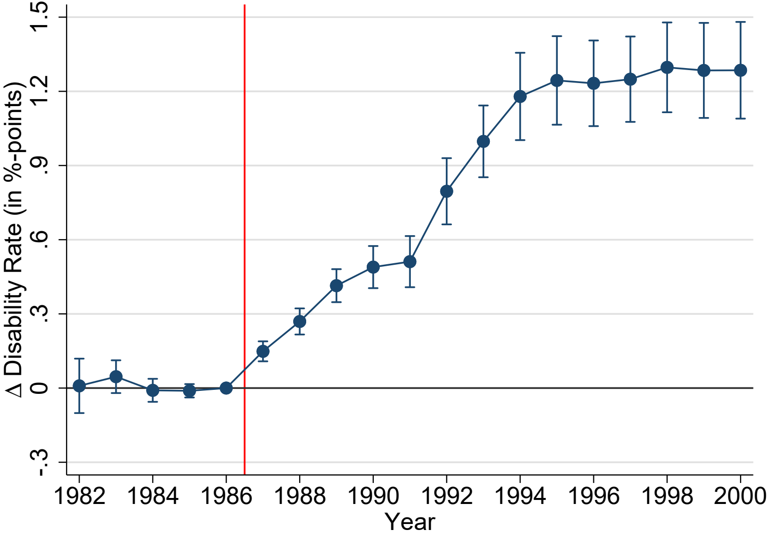
Notes: 2019 Canadian Dollars

Empirical Model: Diff-in-Diff

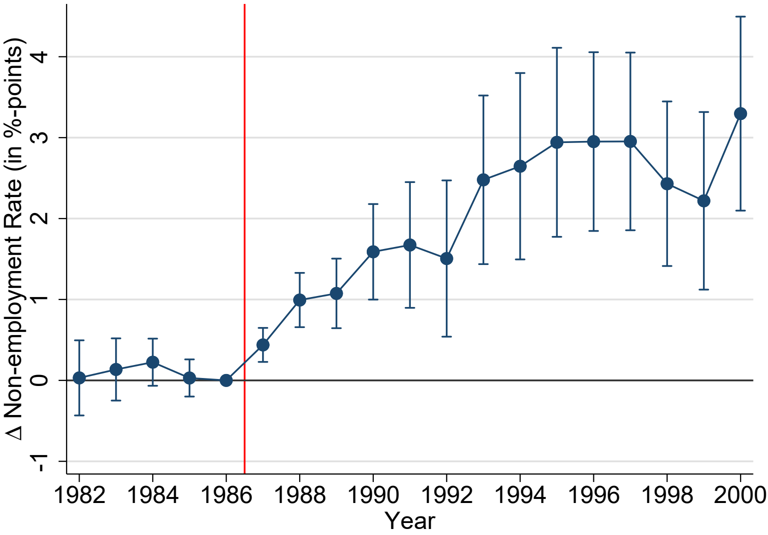
$$Y_{ipt} = \alpha + \sum_{s=1982, s\neq 1986}^{2000} \beta_s (I[p = RoC] \cdot I[s = t]) + \theta_p + \pi_t + X'_{ipt}\delta + \varepsilon_{ipt}$$

- Y_{ipt} ... **outcome variables** are
  - DI receipt: 1 if receive DI benefits
  - Non-employment: 1 if no labor income

Event Study: Impact on DI Receipt by Year



Event Study: Impact on Non-Employment by Year



Results: Effects in 1991

- DI take-up response for $1,000-increase ($\partial DI / \partial b$): 0.208
- DI take-up elasticity ($\varepsilon_{DI,b}$): 0.580

MEASURING THE IMPACT OF WAGE SHOCKS

Empirical Strategy: Main Idea

- Use local labor market shocks to estimate $\partial DI/\partial w$
  - Black et al., 2002; Autor & Duggan, 2003; Marchand, 2012; Charles and Stephens, 2018
- Labor market shocks are *temporary* and impact *job findings/losses*.
  - The right measure is impact on avg. *lifetime income*

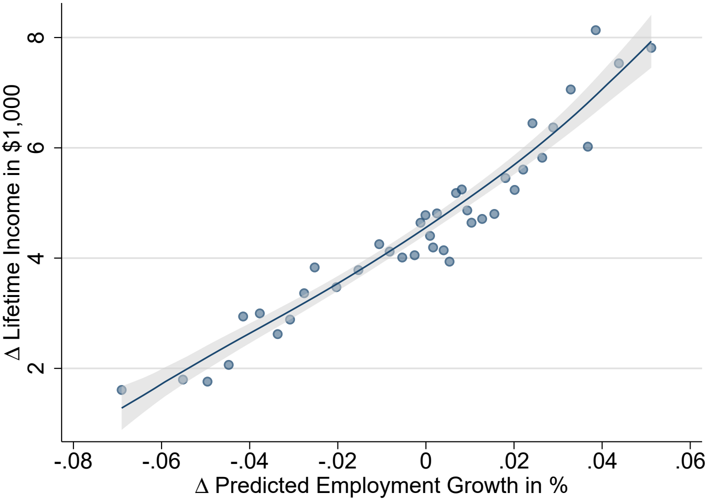
Empirical Strategy: Main Idea

- Focus on Census Divisions (CD) in Canada (~ 250)
- We want to estimate

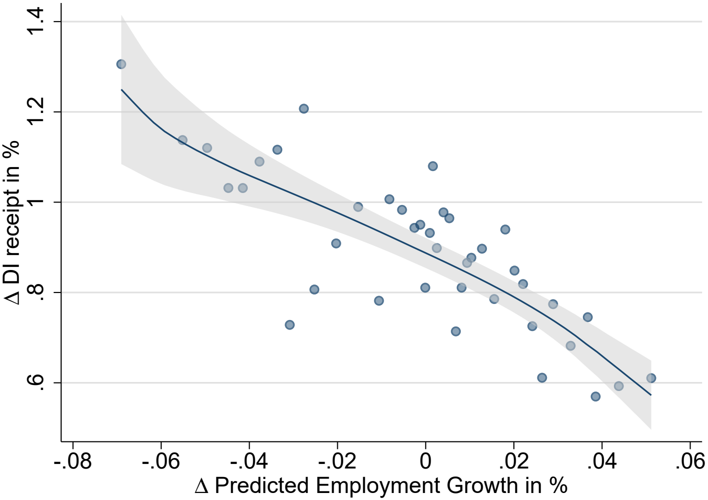
$$\Delta DI_{ict} = \alpha + \beta(\Delta LIFETIME\ INCOME_{ict}) + \lambda_t + \delta \Delta X_{ict} + \varepsilon_{ict}$$

- Instrument for $\Delta LIFETIME\ INCOME_{ict}$ using IV-approach
  - Industry shift-share design (Autor and Duggan, 2003)
  - Robustness: oil price shocks (Marchand, 2012; Charles and Stephens, 2018; Black et al., 2002)

Visual First Stage: Lifetime Income



Visual Reduced-Form: DI Receipt



Impact of $1,000 Increase in Lifetime Income: Industry

	Earnings (in $1,000)		Current income ($1,000) (in $1,000)		Lifetime income (in $1,000)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Δ DI enrollment	-0.004*** (0.001)	-0.044*** (0.008)	-0.007*** (0.002)	-0.044*** (0.008)	-0.015*** (0.003)	-0.096*** (0.018)
1st-stage coefficient		117.0*** (15.6)		116.0*** (15.6)		53.0*** (7.7)
Effective F-statistic		55.9		55.2		47.3
Obs.	18,829,205		18,829,205		18,829,205	

Impact of $1,000 Increase in Lifetime Income: Oil

	Earnings ($1,000)	Current income ($1,000)	Lifetime income ($1,000)
A. Oil employment			
Δ DI enrollment	-0.033***	-0.034***	-0.061***
	(0.009)	(0.009)	(0.015)
F-statistic	145.9	145.3	156.3
B. Oil price			
Δ DI enrollment	-0.022***	-0.023***	-0.072***
	(0.002)	(0.002)	(0.007)
F-statistic	22.5	22.5	27.7
Obs.	18,829,205	18,829,205	18,829,205

CANADA IMPLEMENTATION:

WELFARE EFFECTS

Welfare Calculation: $\frac{dW}{db} \gtreqless 0 \Leftrightarrow -\frac{\partial DI/\partial b}{\partial DI/\partial w} \gtreqless 1 + \frac{\varepsilon_{DI,b}}{1-DI}$

A. Δ DI enrollment per $1,000 (in %-points)

	DI benefits ($\partial DI/\partial b$)	Lifetime income ($\partial DI/\partial w$)		
		Industry share	Oil employment	Oil price
Coeff. estimate	0.208***	-0.096***	-0.061***	-0.072***
	(0.024)	(0.018)	(0.015)	(0.007)

B. Welfare impacts (in $)

	Multiplier $\left(1 + \frac{\varepsilon_{DI,b}}{1-DI}\right)$	Insurance value $\left(-\frac{\partial DI/\partial b}{\partial DI/\partial w}\right)$		
		Industry share	Oil employment	Oil price
Estimate	1.591***	2.166***	3.421***	2.885***
	(0.069)	(0.476)	(0.923)	(0.438)
P-value: multiplier = ins. value		0.195	0.041	0.001

Conclusions

- Provide a revealed preference approach to estimate value of DI benefits that relies on DI take-up decisions.
- Implement the approach for Canada, exploiting exogenous variation in DI benefits and wages.
- Response 2-2.5 times larger for benefit relative to wage change.
- Estimates imply
  1. large insurance value of DI benefits
  2. DI benefits in Canada are not too generous

Thank you!

What if insurance value depends on θ?

- θ can enter insurance value in two ways:
  1. Differences in income/consumption between different θs
  2. Marginal utility can depend on θ itself

$$\frac{v'(c^D(\theta);\theta)}{u'(c^W(\theta);\theta)}$$

- What we want is insurance value (value of transfer between DI and non DI state):

$$\frac{E\left[v'(c^D(\theta);\theta)|\text{on DI}\right]}{E\left[u'(c^W(\theta);\theta)|\text{not on DI}\right]}$$

  our approach identifies value of transfer between DI and non DI state for marginal applicant

$$\frac{E\left[v'(c^D(\theta);\theta)|\theta^A\right]}{E\left[u'(c^W(\theta);\theta)|\theta^A\right]}$$

back

What if insurance value depends on θ?

- @1. Reasonable to expect $c^D(\theta^A) \geq E\left[c^D(\theta)|\text{on DI}\right]$ and $c^W(\theta^A) \leq E\left[c^W(\theta)|\text{not on DI}\right]$. Then

$$\frac{E\left[v'(c^D(\theta))|\theta^A\right]}{E\left[u'(c^W(\theta))|\theta^A\right]} \leq \frac{E\left[v'(c^D(\theta))|\text{on DI}\right]}{E\left[u'(c^W(\theta))|\text{not on DI}\right]}$$

  with concave utility functions. Hence, our estimate is a lower bound for the insurance value.

- @2. Crucial how θ affects marginal utility of consumption.

back

What if insurance value depends on θ?

- @2.Reasonable to assume $E[\theta|\text{not on DI}] \leq \theta^A \leq E[\theta|\text{on DI}]$. Two cases:
- @2A. Marginal utility of consumption is higher for more disabled. Then $v'(b;\theta^A) \leq E[v'(b;\theta)|\text{on DI}]$ and $u'(w;\theta^A) \geq E[u'(w;\theta)|\text{not on DI}]$ and hence,

$$\frac{E\left[v'(b;\theta)|\theta^A\right]}{E[u'(w;\theta)|\theta^A]} \leq \frac{E[v'(b;\theta)|\text{on DI}]}{E[u'(w;\theta)|\text{not on DI}]}.$$

  Pistaferri and Low (2015) assume this case, i.e. that marginal utility of consumption is higher for more disabled.
- @2B. Marginal utility of consumption is lower for more disabled. Then $v'(B;\theta^A) \geq E[v'(B;\theta)|\text{on DI}]$ and $u'(W;\theta^A) \leq E[u'(W;\theta)|\text{not on DI}]$ and hence

$$\frac{E\left[v'(B;\theta)|\theta^A\right]}{E[u'(w;\theta)|\theta^A]} \geq \frac{E[v'(B;\theta)|\text{on DI}]}{E[u'(w;\theta)|\text{not on DI}]}.$$

back

What is reasonable?

- Implications are then that under 1 and 2A, our approach estimates a lower bound of the insurance value.
- It is not obvious how marginal utility of consumption depends on disability severity. However, one impliciation if marginal utility of consumption declines in disability severity would be that DI benefits should optimally be falling in disability severity. Strange policy implication.

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Bartik Shock: Wages and Employment

- Exogenous macroeconomic conditions Ω and search effort e

$$\max_e s(e;\Omega) \cdot u(w(e;\Omega)) + (1 - s(e;\Omega)) \cdot v(z) - \psi(e;\theta) \quad (1)$$

- The marginal applicant θ^A is determined by

$$\Theta \equiv s(e;\Omega) \cdot u(w) + (1 - s(e;\Omega)) \cdot v(z) - \psi(e;\theta^A) - v(b) = 0. \quad (2)$$

back

Bartik Shock: Wages and Employment

- A negative economic shock:

$$\frac{\frac{\partial \theta^A}{\partial b}}{-\frac{\partial \theta^A}{\partial \Omega}} = \frac{v'(b)}{\left[\frac{\partial s(e;\Omega)}{\partial \Omega}\left[u(w)-v(z)\right]+s\cdot u'(w)\cdot\frac{\partial w(e;\Omega)}{\partial \Omega}\right]} \quad (3)$$

$$\leq \frac{v'(b)}{u'(w)\left[\frac{\partial s(e;\Omega)}{\partial \Omega}\left[w-z\right]+s\cdot\frac{\partial w(e;\Omega)}{\partial \Omega}\right]} \quad (4)$$

- if $u'(w)(w-z) \leq u(w)-v(z)$. That is, the monetized utility loss associated with job loss, $(u(w)-v(z))/u'(w)$, is at least as large as the income loss associated with job loss, $(w-z)$.
- If the utility function is not state-dependent, i.e., $u(\cdot)=v(\cdot)$, and the replacement rate of other benefits is less than a 100 percent, $w \geq z$, the condition holds for concave utility functions (falling marginal utility of consumption).

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