Labor Supply Responses and Adjustment Frictions:
A Tax-Free Year in Iceland

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Frisch elasticity: Elasticity of intertemporal substitution in labor supply

How does labor supply respond to temporary wage changes?

Frisch elasticity: Elasticity of intertemporal substitution in labor supply

Wide range of views on the size

- **Macro** models of employment **require large elasticity**
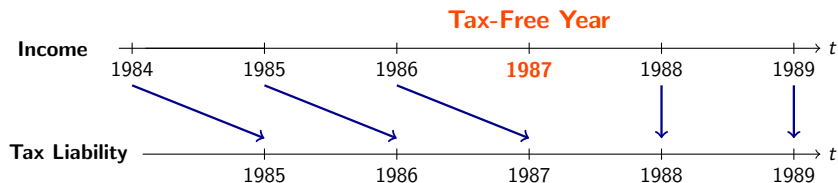- **Micro** estimates not conclusive, often **small or insignificant**

Notoriously Difficult to Measure Frisch Elasticity

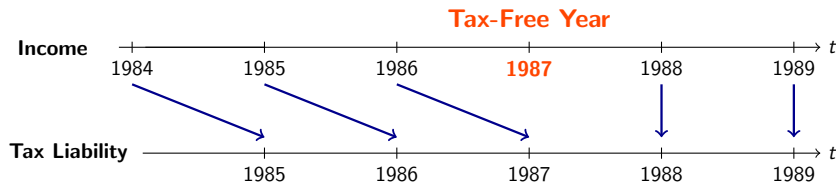Requires **exogenous** and **transitory** wage changes

Labor supply responses attenuated by

- **Adjustment frictions**, unless wage changes are **large** (Chetty, 2012)
- **Inattentiveness**, unless wage changes are **salient** (Chetty et al., 2009)

A Tax-Free Year on Iceland

A Tax-Free Year on Iceland

Ideal Natural Experiment:

Salient, **simple** and **large** incentive to work more for a **single year**

My Contribution

1. **Create new data**: Digitized administrative records

2. **Two identification strategies**

3. Estimate **Frisch elasticities**

4. Study the **anatomy of labor supply responses**

My Contribution

1. **Create new data**: Digitized administrative records

2. **Two identification strategies**

3. Estimate **Frisch elasticities**

4. Study the **anatomy of labor supply responses**

Important episode: Bianchi et al. (2001) document more work in 1987 relative to the year before and after among a small sample of workers

- One of few data points on Frisch elasticity cited in Chetty et al. (2013)

- **Detailed pop data** and **empirical approach** distinguish my study from theirs

- As well as new insights into the **anatomy** of labor supply responses

Adjustment Margins

	Intensive	**Extensive**
Tax-Bracket DD	Labor supply elasticity | Adjustment frictions	Labor supply elasticity | Adjustment frictions
Life-Cycle DD		

Research Designs

Empirical Strategy

Adjustment Margins

	Intensive	**Extensive**
Tax-Bracket DD	Labor supply elasticity | Adjustment frictions No estimate for bottom income group	Labor supply elasticity | Adjustment frictions Cannot estimate entry responses
Life-Cycle DD		

Research Designs

Adjustment Margins

	Intensive	**Extensive**
Tax-Bracket DD	Labor supply elasticity | Adjustment frictions	Labor supply elasticity | Adjustment frictions
Life-Cycle DD	Labor supply elasticity | Adjustment frictions ± Equilibrium effects Whole population	Labor supply elasticity | Adjustment frictions ± Equilibrium effects Entry and exit responses

Research Designs

Empirical Strategy

Adjustment Margins

Research Designs

Tax-Bracket DD

Triple-Diff
Combined design

Life-Cycle DD

	Intensive	Extensive
	Labor supply elasticity | Adjustment frictions	Labor supply elasticity | Adjustment frictions
	Labor supply elasticity | Adjustment frictions ± Equilibrium effects	Labor supply elasticity | Adjustment frictions ± Equilibrium effects

Data

I construct a new dataset from admin records for the working-age population
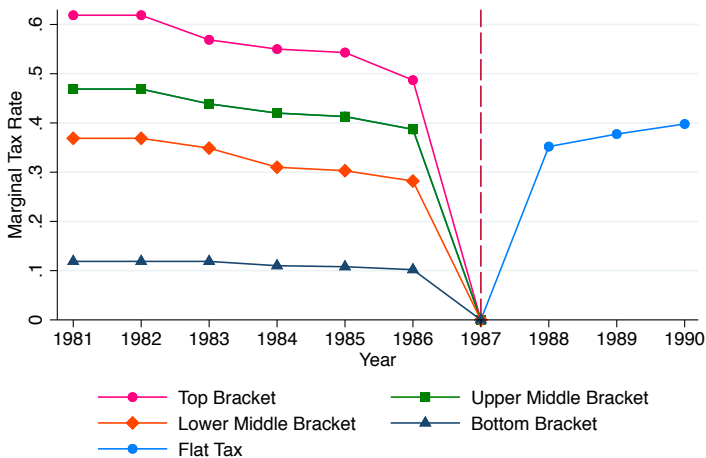
1. Employer-employee data
   - **Digitized payslips** for all workers & jobs
   - **Pay**: Wage earnings, contractor pay, bonuses etc.
   - **Working time** in weeks – 1 week: 40 hours
     - Full-time job (40 hours): 52 weeks
     - Part-time job (20 hours): 26 weeks
   - Other details on jobs and firms

2. **Individual tax records**
   - Income (labor, capital), taxes and transfers, household balance sheets

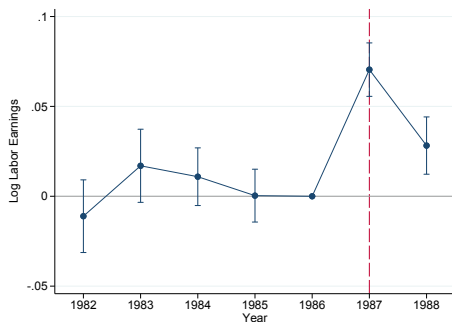# Tax-Bracket Difference-in-Differences

Difference in Treatment Intensity

Difference in Treatment Intensity

Assigning treatment status

- Tax bracket in year t is endogenous to income in t
    - Assign treatment status based on bracket in $t-1$ (Feldstein 1995; Gruber-Saez 2002)
    - Treatment intensity: bottom bracket as main control group

Reduced-Form: Earnings and Weeks

(a) Labor Earnings

(b) Weeks Worked

$$y_{it} = bracket_{i,t-1} + \delta_t + \sum_{t \neq 1986} \eta_t \cdot (B_{i,t-1} \times \delta_t) + \boldsymbol{X}'_{it}\gamma + \mu_{it}$$

Graphical evidence - Earnings   Graphical evidence - Weeks

Labor Supply Responses

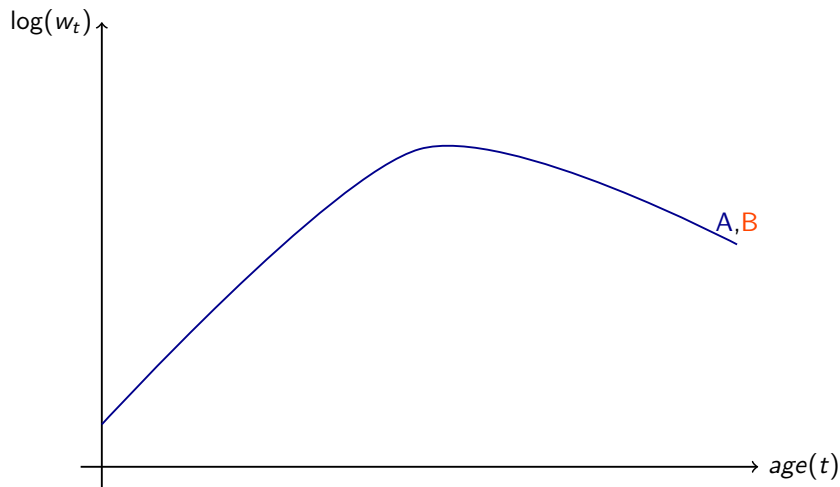|	**Earnings**	Weeks Worked	Employment
2SLS DD estimate	**0.374*****	4.926***	-0.033
	(0.024)	(0.784)	(0.024)
Reduced form estimate	0.077***	1.023***	-0.004
	(0.005)	(0.162)	(0.003)
First stage estimate	0.207***	0.207***	0.127***
	(0.001)	(0.001)	(0.001)
Mean of outcome variable	–	48.43	0.914
Observations	526,955	520,438	530,397

Notes: Estimating equation:

$$y_{it} = bracket_{i,t-1} + \delta_t + \varepsilon \cdot \log(1 - \tau_{it}) + \boldsymbol{X}_{it}'\gamma + \nu_{it}$$

where $\log(1 - \tau_{it})$ is instrumented with $B_{i,t-1} \times \delta_{t=1987}$. Controls are dummies for gender, age, education, marital status, location, number of children at age 0-18. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Summary · Earnings · Weeks · Employment · Earnings growth distribution · Persistent brackets · Robustness tests · Heterogeneity

Labor Supply Responses

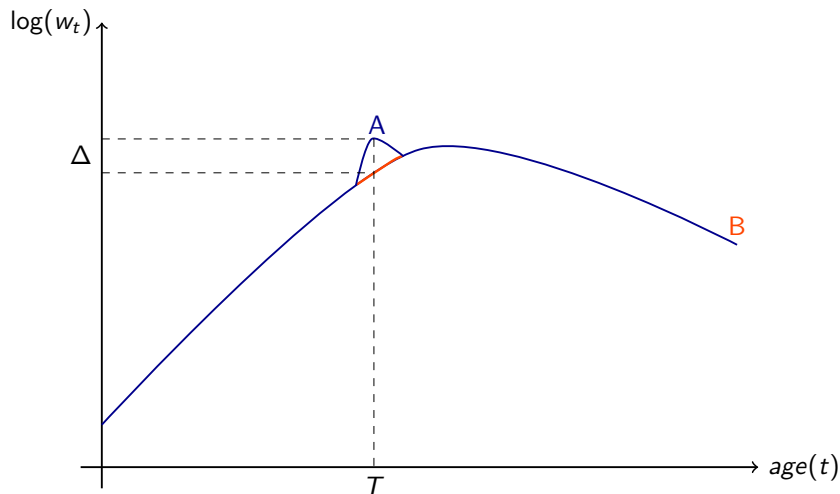|	Earnings	**Weeks Worked**	Employment
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Elasticity of weeks worked: 0.10 (4.9/48.4)

Summary   Earnings   Weeks   Employment   Earnings growth distribution   Persistent brackets   Robustness tests   Heterogeneity

Labor Supply Responses

	Earnings	Weeks Worked	**Employment**
2SLS DD estimate	0.374***	4.926***	**-0.033**
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Employment: earnings $\geq$ *base income* (More)

(Summary) (Earnings) (Weeks) (Employment) (Earnings growth distribution) (Persistent brackets) (Robustness tests) (Heterogeneity)

Life-Cycle Difference-in-Differences
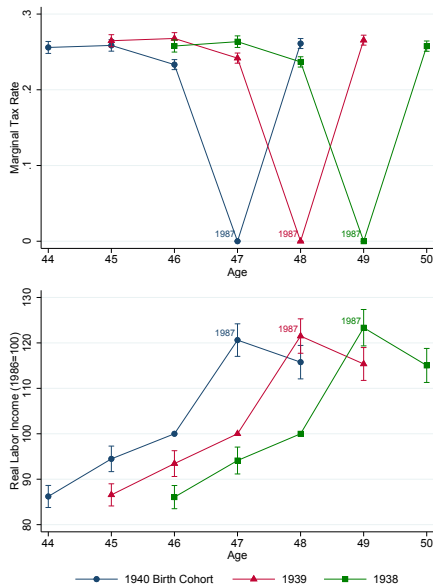
MaCurdy (1981)

MaCurdy (1981)

My Setting

At age T, **A** is **treated** and **B** is a good **counter-factual**

Matched Difference-in-Differences

Compare **similar individuals** in adjacent birth cohorts when they are of **same age**
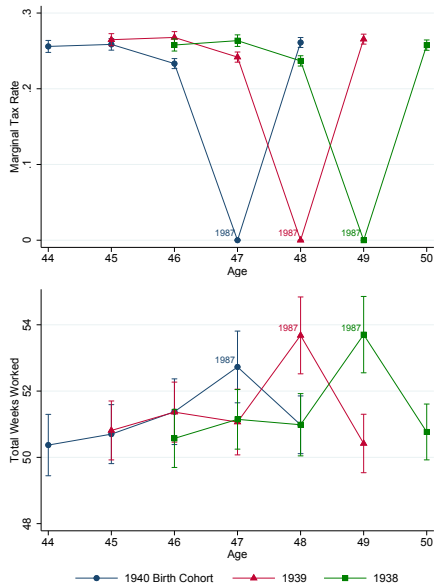
- Tax-free year was an **exogenous and unpredictable** event
- **Exact matching** on characteristics that correlate with trends in labor supply
    - Gender, marital status, # children, education, location, income decile

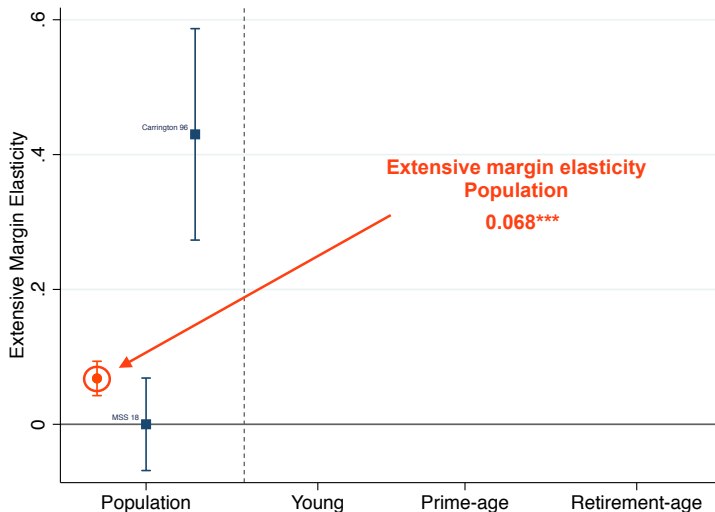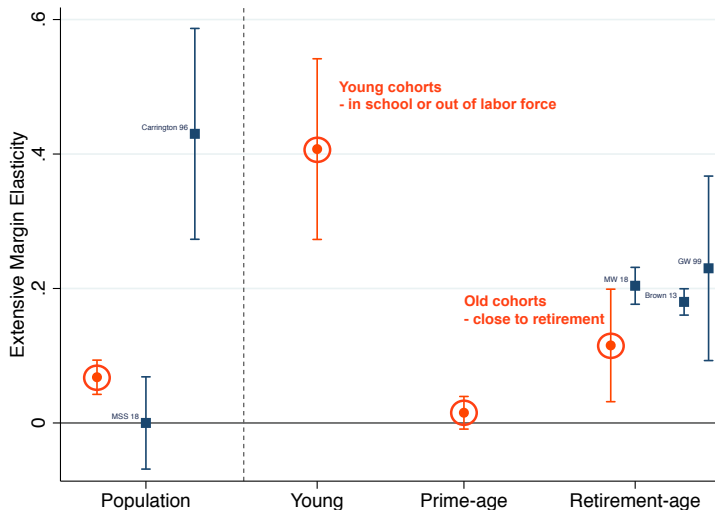# Graphical Evidence — Labor Earnings

More

Extensive Margin

Extensive Margin

Ongoing work: Students delay schooling, some **drop out permanently** `More`

Summary of Frisch Elasticity Estimates

	Intensive	Extensive
Tax-Bracket DD		-0.033 (0.024)
Life-Cycle DD		0.068*** (0.013)

Difference between estimates: aggregate/equilibrium effects

- ↓ Labor demand not perfectly elastic → Reduction in wage rates
  - Little evidence of reduction in wages More
- ↑ Longer hours → Demand for child-care, restaurant service, home cleaning ...
  - Strong responses in those occupations/sectors

Summary of Frisch Elasticity Estimates

	Intensive	**Extensive**
Tax-Bracket DD	0.374*** (0.024)	-0.033 (0.024)
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Difference between estimates: aggregate/equilibrium effects

- ↓ Labor demand not perfectly elastic → Reduction in wage rates
  - Little evidence of reduction in wages `More`
- ↑ Longer hours → Demand for child-care, restaurant service, home cleaning ...
  - Strong responses in those occupations/sectors `Estimates`

Summary of Frisch Elasticity Estimates

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Triple-Diff
Combined design

Triple-Diff intensive-margin: **0.431*****

$\Rightarrow$ Aggregate/Equilibrium effects: ≈ 0.10

Hicks, Marshallian and IES

Labor Supply – Not Just a Reporting Phenomenon

1. **Self-employed**: Flexibility in hours, but possibly also flexibility in reporting
   - Larger responses in earnings but similarly larger in working time `Table`

2. Not explained by **income shifting through discretionary payments** `Table`
   - Wage earnings explain 94% of effect; Commission, bonuses etc less than 1%

3. **Capital income** not tax free in 1987
   - Small and *positive* effect on capital income `Table`

4. Circumstantial **evidence of more work** in 1987
   - Drop in hours of sick-leave `Figure`

Anatomy of Labor Supply Responses

Anatomy of Labor Supply Responses

Adjustment frictions & heterogeneity – responses don't reflect structural parameters

⇒ Important to understand the **anatomy of labor supply responses**

Anatomy of Labor Supply Responses

Adjustment frictions & heterogeneity – responses don't reflect structural parameters
  ⇒ Important to understand the **anatomy of labor supply responses**

1. Labor-market attachment

- Individuals with low labor-market attachment very responsive

2. Flexibility of employment arrangement

- Workers in flexible jobs much more responsive than constrained workers More

- Constrained workers take up secondary-jobs Figure

- Explains $1/3$ of effect on weeks and $1/10$ of total earnings effect Figure

3. Family ties and coordination

- Married women more responsive than their husbands Figure

- Husbands have a negative cross-elasticity to their wife's tax-cut More

Conclusion

People do respond to temporary incentives to work

- Work more weeks & hours – earn more income
- Young cohorts enter labor market, older cohorts delay retirement

Size of responses likely to differ across settings
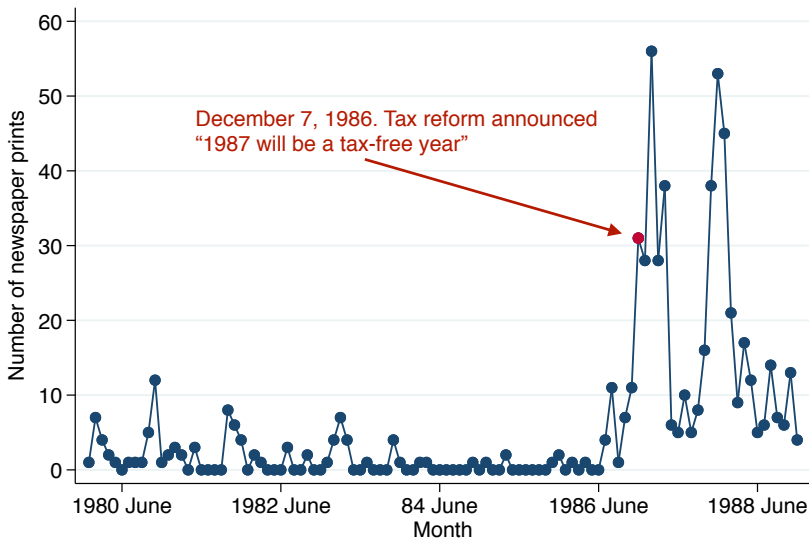
- Demographic and labor-market structure

Going forward

1. Students delay schooling and some drop out permanently
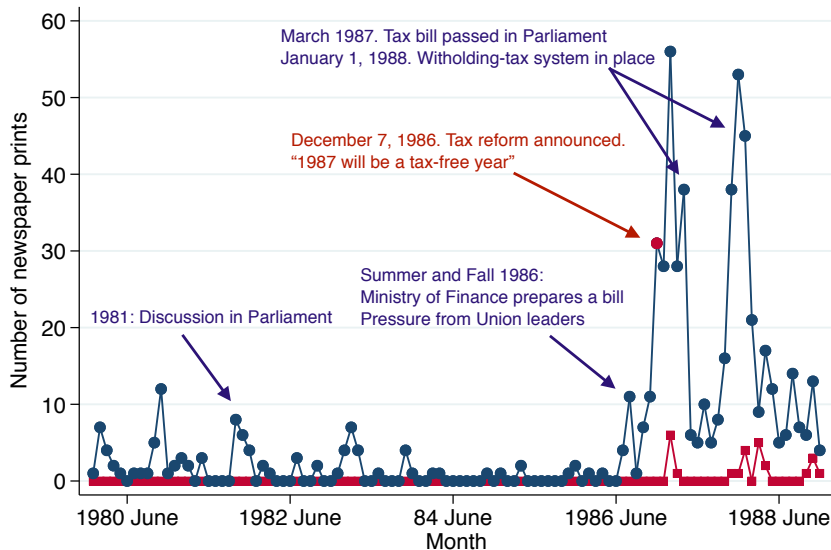2. Consumption and savings out of transitory increase in earnings
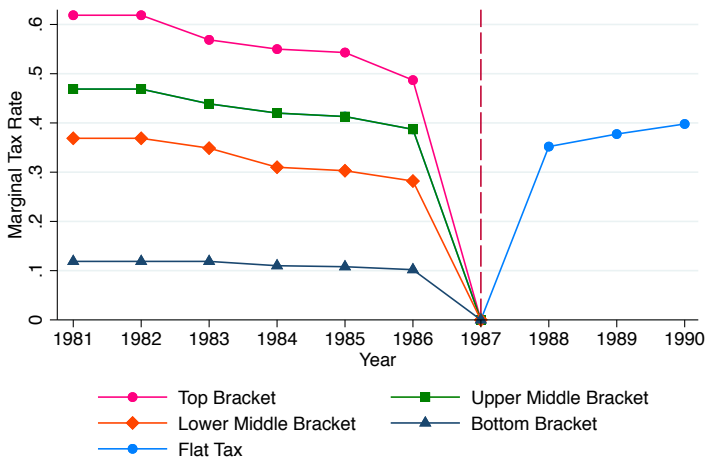
Thank you

Appendix

December 7, 1986. Tax reform announced
"1987 will be a tax-free year"

Time-Line of Events

(c) "Road to Tax Freedom"

(d) Flyer with guidelines

Bracket Thresholds as Percentile of Taxable Income
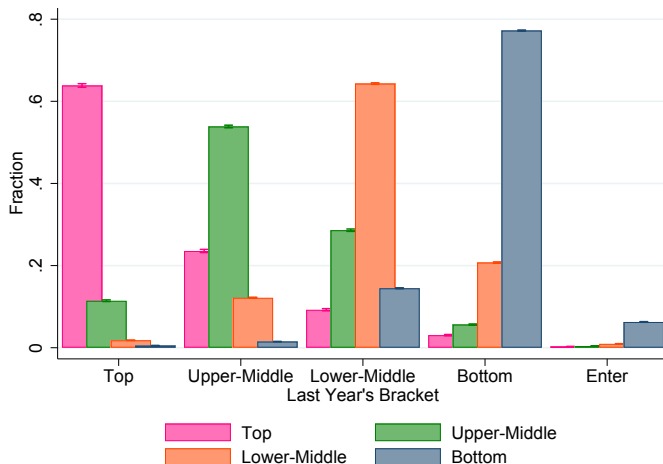
Back

Persistence of Tax Bracket Position

Figure 1: Tax Bracket Transitions – 1981-1986 Averages   Back

Graphical Reduced-From Evidence: Labor Earnings
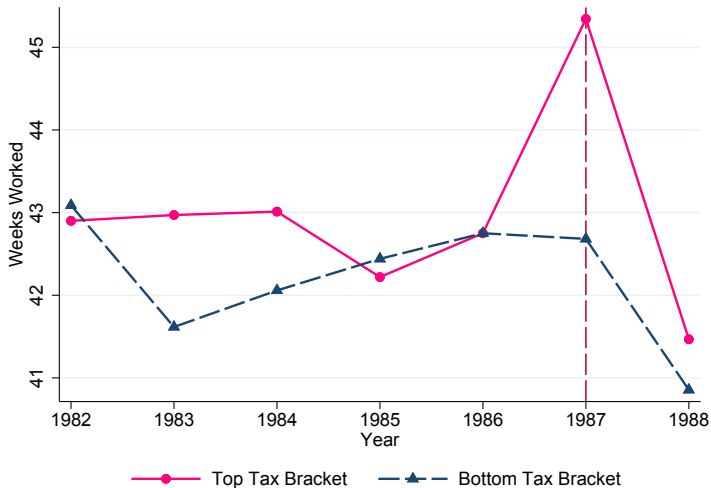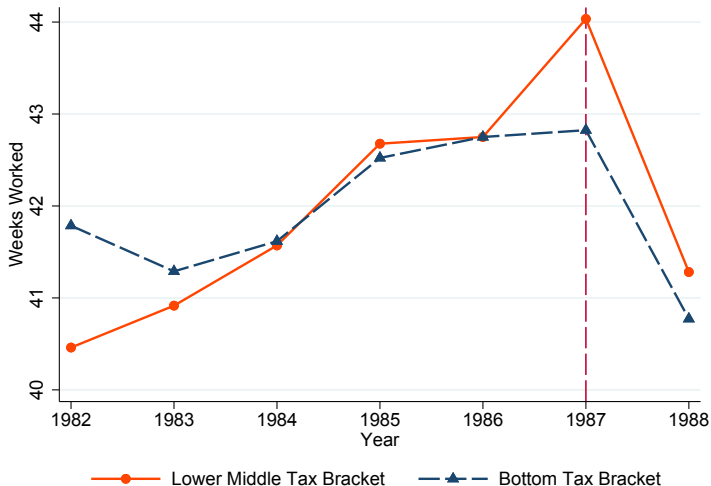
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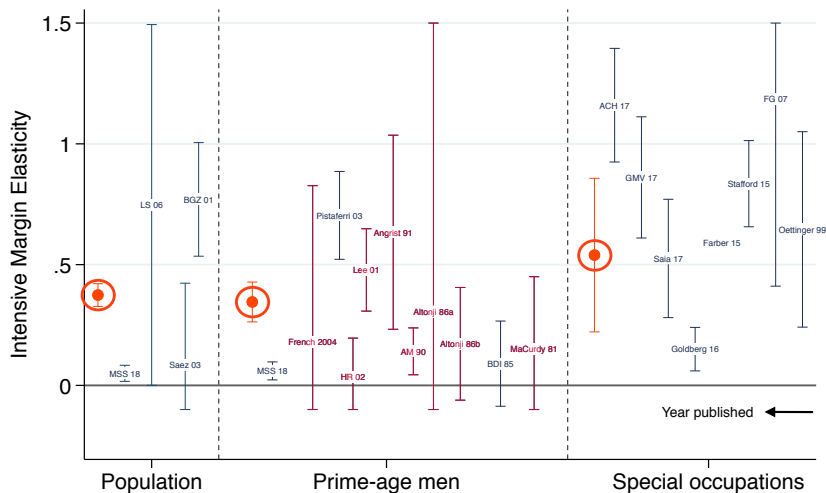
Graphical Reduced-From Evidence: Weeks worked

Graphical Reduced-From Evidence: Weeks worked

Back

Graphical Reduced-From Evidence: Weeks worked

Back

Intensive Margin

Elasticity of Labor Earnings

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.374***	0.330***	0.401***
	(0.024)	(0.024)	(0.032)
Reduced form estimate ($d \log y$)	0.077***	0.069***	0.077***
	(0.005)	(0.005)	(0.006)
First stage estimate ($d \log(1 - \tau)$)	0.207***	0.208***	0.193***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	526,955	526,955	526,458

Notes: Controls are gender, age, education, marital status, whether living in the capital area or not, number of children at age 0-18. "Matching" refers to a weighted regressions after coarsened exact matching on age and pre-treatment marital status, number of children and education. Robust standard errors clustered by individual in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Elasticity of Weeks Worked

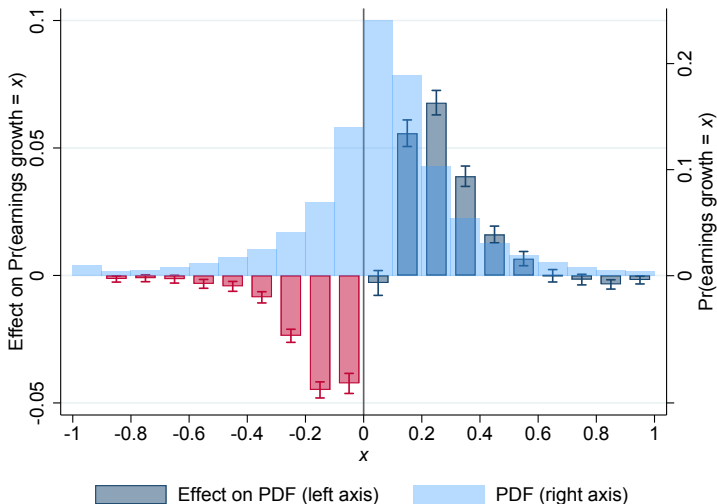|	(1)	(2)	(3)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	4.926***	4.818***	6.549***
	(0.784)	(0.765)	(1.074)
Reduced form estimate (dy)	1.023***	1.006***	1.267***
	(0.162)	(0.159)	(0.207)
First stage estimate ($d\log(1-\tau)$)	0.207***	0.208***	0.193***
	(0.001)	(0.001)	(0.001)
Mean of outcome variable	48.43	48.43	48.43
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	520,438	520,438	519,941

Notes: Controls are gender, age, education, marital status, whether living in the capital area or not, number of children at age 0-18. "Matching" refers to a weighted regressions after coarsened exact matching on age and pre-treatment marital status, number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Back

Employment Elasticity

	(1)	(2)
2SLS DD estimate ($\frac{dP}{d\log(1-\tau)}$)	-0.033	0.030
	(0.024)	(0.030)
Reduced form estimate (dP)	-0.004	0.004
	(0.003)	(0.002)
First stage estimate ($d\log(1-\tau^a)$)	0.127***	0.119***
	(0.001)	(0.001)
Mean of outcome variable	0.914	0.914
Controls	Yes	Yes
Matching	No	Yes
Observations	530,900	530,397

Notes: Dependent variable is an indicator for labor earnings $\geq$ *base income*. Controls are gender, age, education, marital status, whether living in the capital area or not, number of children at age 0-18. τ^a is average tax rate, computed as tax payments divided by tax-base. "Matching" refers to a weighted regressions after coarsened exact matching on age and pre-treatment marital status, number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Back

Earnings Effects Across the Earnings Growth Distribution

Back

Elasticity of Labor Earnings: Persistent Tax Brackets

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.397***	0.401***	0.393***
	(0.027)	(0.027)	(0.026)
Reduced form estimate ($d \log y$)	0.081***	0.081***	0.078***
	(0.005)	(0.005)	(0.006)
First stage estimate ($d \log(1-\tau)$)	0.206***	0.205***	0.203***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	311,736	310,982	311,673

Current tax-bracket position predicted using 3 lags of brackets, percentile of income (distance from thresholds), and individual characteristics (gender, age, education, marital status, location, number of children).

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Weeks Worked: Predicted Tax Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	6.710***	6.023***	6.467***
	(0.887)	(0.828)	(1.019)
Reduced form estimate (dy)	1.367***	1.224***	1.292***
	(0.179)	(0.167)	(0.203)
First stage estimate ($d\log(1-\tau)$)	0.206***	0.205***	0.203***
	(0.001)	(0.001)	(0.001)
Mean dependent variable	48.64	48.64	48.64
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	307,108	304,465	307,045

Current tax-bracket position predicted using 3 lags of brackets, percentile of income (distance from thresholds), and individual characteristics (gender, age, education, marital status, location, number of children).

Robustness to 1988 tax changes

Some workers receive a permanent change in taxes in 1988, positive or negative

- Changes not as salient as **"tax-free year"**
- **Complicated**: Combination of changes in tax rates and tax base

Robustness tests: Evaluate effects on Frisch elasticity estimates

1. Sophisticated workers anticipate changes in 1988
   - Control for difference in tax rates between 1986 and 1988 Table 1 Table 2
2. U-middle and L-middle brackets similar to flat tax
   - Estimate DD for U-middle vs. L-middle bracket Table
   - Estimate life-cycle DD for only U-middle and L-middle bracket Table
3. Control group in life-cycle DD experiences neither tax-free year nor anticipation of permanent reform

Back

Labor Earnings TB DD, Controls for 1988 Tax Rates

	(1)	(2)	(3)	(4)
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.374***	0.373***	0.307***	0.378***
	(0.024)	(0.022)	(0.023)	(0.022)
$\tau_{1986} - \tau_{1988}$	No	Yes	No	Yes
$\tau_{1986}^{average} - \tau_{1988}^{average}$	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	526,955	526,955	526,955	526,955

Notes: $\tau_{1986} - \tau_{1988}$ denote the difference between marginal tax rates in 1986 and 1988. The difference between average tax rates in 1986 and 1988 are denoted with $\tau_{1986}^{average} - \tau_{1988}^{average}$. Controls are gender, age, education, marital status, whether living in the capital area or not, number of children at age 0-18. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Back

	(1)	(2)	(3)	(4)
2SLS DD estimate ($\frac{dy}{d\log(1-\tau)}$)	4.926***	7.088***	4.470***	7.171***
	(0.784)	(0.719)	(0.749)	(0.719)
$\tau_{1986} - \tau_{1988}$	No	Yes	No	Yes
$\tau_{1986}^{average} - \tau_{1988}^{average}$	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Mean of outcome variable	48.43	48.43	48.43	48.43
Observations	520,438	520,438	520,438	520,438

Notes: $\tau_{1986} - \tau_{1988}$ denote the difference between marginal tax rates in 1986 and 1988. The difference between average tax rates in 1986 and 1988 are denoted with $\tau_{1986}^{average} - \tau_{1988}^{average}$. Controls are gender, age, education, marital status, whether living in the capital area or not, number of children at age 0-18. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Back

Labor Earnings TB DD, U-Middle vs. L-Middle Bracket

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.325***	0.386***	0.337***
	(0.048)	(0.048)	(0.058)
Reduced form estimate ($d \log y$)	0.036***	0.042***	0.033***
	(0.005)	(0.005)	(0.006)
First stage estimate ($d \log(1 - \tau)$)	0.111***	0.110***	0.099***
	(0.001)	(0.001)	(0.001)
Controls	Yes	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	380,253	380,253	379,783

Notes: Controls are gender, age, education, marital status, whether living in the capital area or not, number of children at age 0-18. "Matching" refers to a weighted regressions after coarsened exact matching on age and pre-treatment marital status, number of children and education. Robust standard errors clustered by individual in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Back

Labor Earnings LC DD, U-Middle and L-Middle Brackets

	(1)	(2)	(3)
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.493***	0.490***	0.426***
	(0.001)	(0.001)	(0.001)
Reduced form estimate ($d \log y$)	0.150***	0.149***	0.136***
	(0.003)	(0.003)	(0.003)
First stage estimate ($d \log(1-\tau)$)	0.303***	0.303***	0.317***
	(0.001)	(0.001)	(0.001)
Match-strata Fixed Effects	Yes	Yes	No
Individual Fixed Effects	No	No	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Number of observations	250,762	250,762	232,264

Notes: All regressions include match-strata fixed effects, which refers to group effects where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, number of children, education, location indicator and decile of income. Robust standard errors clustered at the match-strata level are in parentheses.

*** $p<0.01$, ** $p<0.05$, * $p<0.1$ Back

Heterogeneity Across Tax Brackets

	Lower-Middle	Upper-Middle	Top
2SLS DD estimate	0.484***	0.286***	0.236***
	(0.037)	(0.020)	(0.016)
Reduced form estimate	0.069***	0.083***	0.111***
	(0.005)	(0.006)	(0.007)
First stage estimate	0.142***	0.293***	0.467***
	(0.001)	(0.001)	(0.001)
Observations	368,645	202,600	146,702

Notes: Controls are gender, age, education, marital status, whether living in the capital area or not, and the number of children at age 0-18. Occupation and sector fixed effects are group dummies for occupation and sector groups. Robust standard errors clustered by individual in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Back

Self-Employed Are More Responsive — More Flexibility

	Wage earners		Self-employed	
	Earnings	Weeks	Earnings	Weeks
	(1)	(2)	(3)	(4)
2SLS DD estimate	0.373***	2.337***	0.484***	10.127***
	(0.027)	(0.787)	(0.057)	(2.180)
Reduced form estimate	0.076***	0.480***	0.103***	2.161***
	(0.005)	(0.161)	(0.012)	(0.464)
First stage estimate	0.205***	0.205***	0.191***	0.191***
	(0.001)	(0.001)	(0.003)	(0.003)
Mean of outcome variable	–	46.62	–	58.61
Observations	448,592	441,961	78,363	78,477

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Effect on Earnings and Employment-Related Income
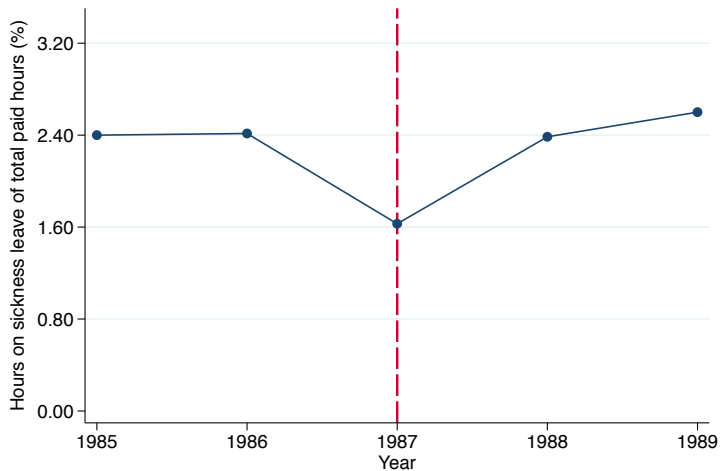
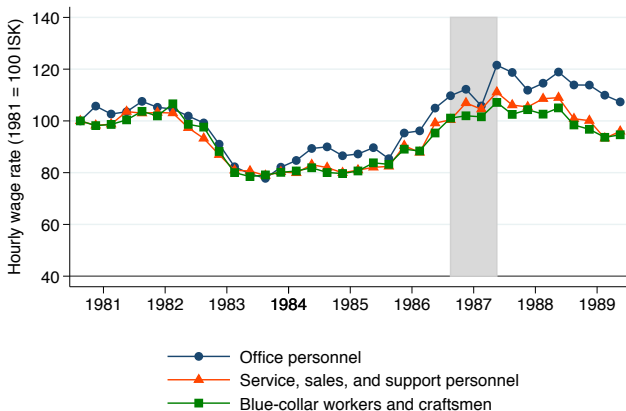|	
Wages and salaries	93.7%
Fringe benefits, travel allowances etc	2.6%
Drivers payments	0.7%
Gifts from employer	0.1%
Pension payment from employer	0.3%
Bonuses, sales commission etc.	0.7%
Board remuneration	2.0%
Sum	100.0%

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Effect on Capital Income

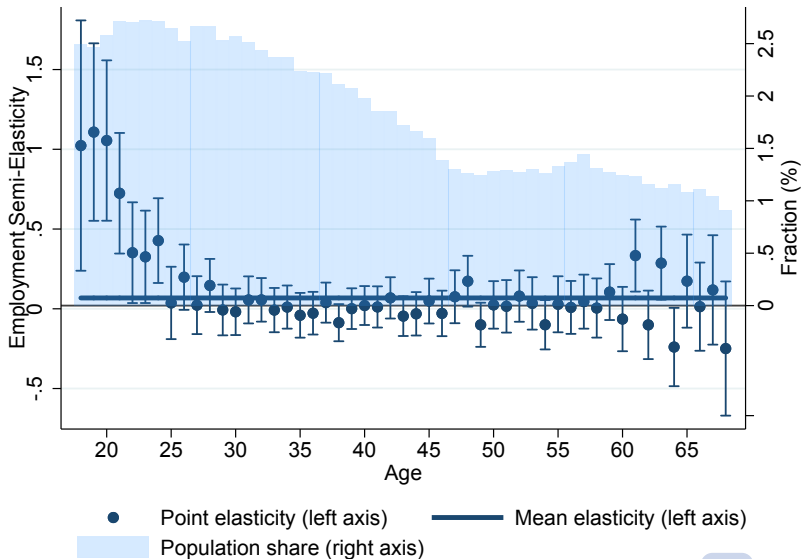|	(1)	(2)	(3)
2SLS DD estimate	310***	291***	272**
	(118)	(109)	(131)
Reduced form estimate	64***	61***	53**
	(24)	(23)	(25)
First stage estimate	0.207***	0.208***	0.193***
	(0.001)	(0.001)	(0.001)
Mean of outcome variable	72.34	72.34	72.34
Share of treatment effect on labor earnings	0.021	0.021	0.018
Controls	No	Yes	Yes
Occupation Fixed Effects	No	Yes	No
Sector Fixed Effects	No	Yes	No
Matching	No	No	Yes
Observations	530,900	530,900	530,900

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Hours on Sickness Leave

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Hourly Wage Rate

Notes: The figure plots the average hourly wage rate, normalized to 100 Icelandic krona (ISK) in first quarter of 1981, in three broad occupation groups corresponding to office personnel, service- sales-, and support personnel. The shaded area corresponds to the period of first to fourth quarter of 1987. Data on wages are drawn from a survey on paid hourly wage rate collected by the Wage Research Committee (*Kjararannsóknanefnd*) on wages in the private sector.

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Employment and Unemployment

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Employment Elasticity by Age

Labor Earnings Elasticity by Age

Labor Earnings Elasticity

	Employed Pre-Reform	Full Sample
2SLS DD estimate ($\frac{d \log y}{d \log(1-\tau)}$)	0.529***	0.654***
	(0.010)	(0.016)
Reduced form estimate ($d \log y$)	0.150***	0.145***
	(0.003)	(0.003)
First stage estimate ($d \log(1 - \tau)$)	0.282***	0.209***
	(0.002)	(0.002)
Number of observations	356,968	546,434

Notes: Estimating equation:

$$\log(y_{ik}) = \alpha_c + \delta_k + \varepsilon \cdot \log(1 - \tau_{ik}) + \boldsymbol{X}'_i \gamma + \nu_{ik}$$

where α_c and δ_k are, respectively, birth cohort and event-time fixed effects. All regressions include match-strata fixed effects, which refers to group fixed effects where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, number of children, education, location indicator and decile of income. Robust standard errors clustered at the match-strata level are in parentheses.

*** p<0.01, ** p<0.05, * p<0.1 Back

Employment Elasticity

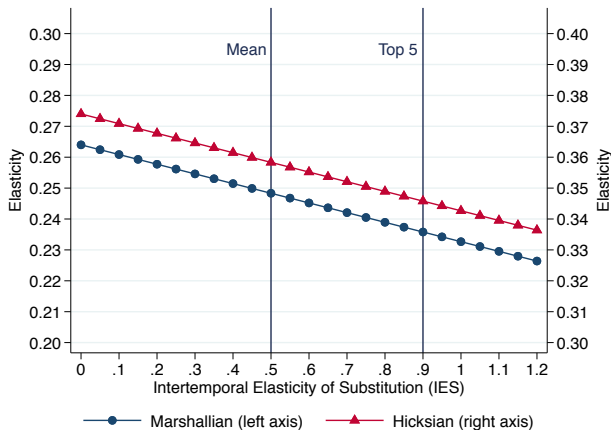|	(1)	(2)
2SLS DD estimate ($\frac{dP}{d\log(1-\tau)}$)	0.068***	0.058***
	(0.013)	(0.014)
Reduced form estimate (dP)	0.008***	0.006***
	(0.001)	(0.001)
First stage estimate ($d\log(1-\tau^a)$)	0.110***	0.110***
	(0.001)	(0.001)
Mean dependent variable	0.672	0.672
Individual Fixed Effects	No	Yes
Number of observations	587,332	586,321

Notes: Estimating equation:

$$P(emp_{ik}) = \alpha_c + \delta_k + \varepsilon \cdot \log(1 - \tau_{ik}) + \boldsymbol{X}_i'\gamma + \nu_{ik}$$

where α_c and δ_k are, respectively, birth cohort and event-time fixed effects. "Match-strata Fixed Effects" refers to group fixed effects, where each group is a cell used in coarsened exact matching on age, gender and pre-treatment marital status, number of children, education, location indicator and percentile of income. τ^a) is the average tax rate. Robust standard errors clustered at the match-strata level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1 Back
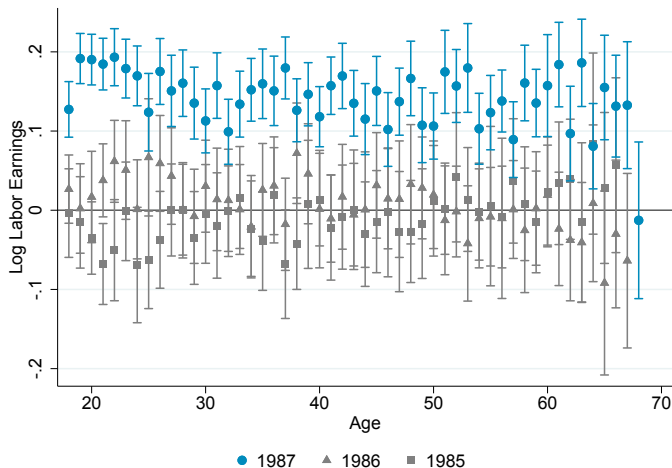
Hicks, Marshallian and IES

$$\varepsilon_{\text{Frisch}} = \varepsilon_{\text{Hicks}} + \rho \cdot mpe^2 \frac{A}{wh}$$

$mpe = 0.11$ (Imbens, Rubin and Sacerdote, 2001), $\frac{A}{wh} = 2.59$, $\varepsilon_{\text{Hicks}} = 0.33$ (Chetty 2012) $^{\text{Back}}$

Placebo Tax-Free Years

Temporal Flexibility

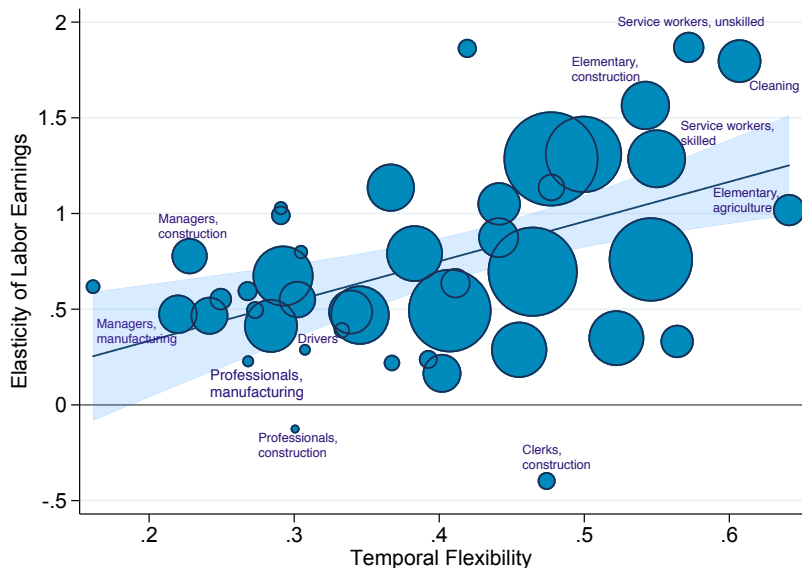Measure: **Working time dispersion within occupation** in pre-reform years

Large dispersion in working time:

- Easy to switch between part-time & full-time – Pharmacists (Katz-Goldin, 2016)
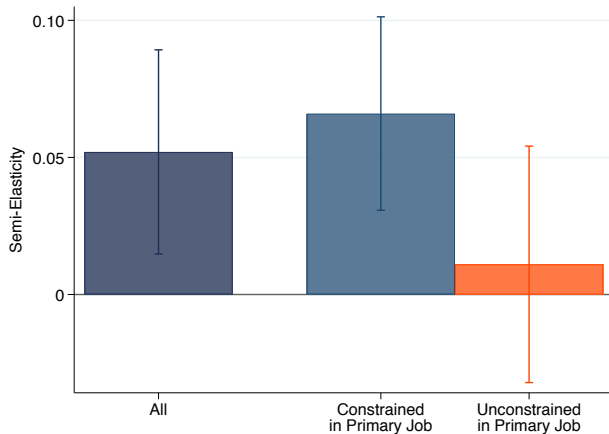- Easy to take on additional shifts – Uber drivers (Hall and Krueger, 2018)

$$\text{Coefficient of variation:} \quad CV(weeks_{ot}) = \frac{\sigma_{ot}}{\mu_{ot}}$$

- **Most flexible**: Service workers (e.g. restaurants), cleaning, elem. agriculture
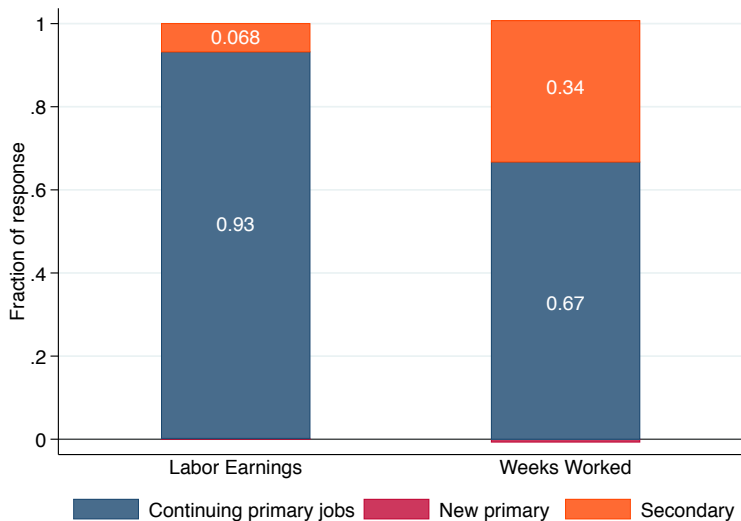- **Most rigid**: Managers (manufacturing, construction) More Back
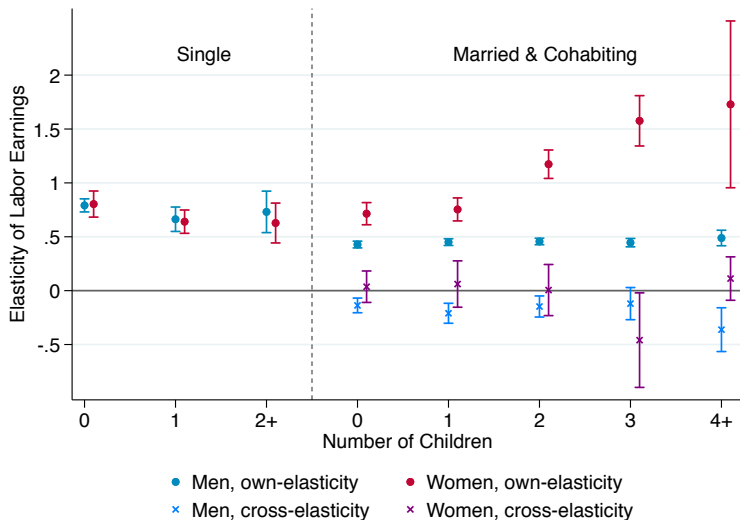
Temporal Flexibility

Secondary-Job Holding

- Constrained in Primary Job: Working 52 weeks in primary job pre-reform

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Decomposition of Labor Supply Responses

Marital Status and Number of Children
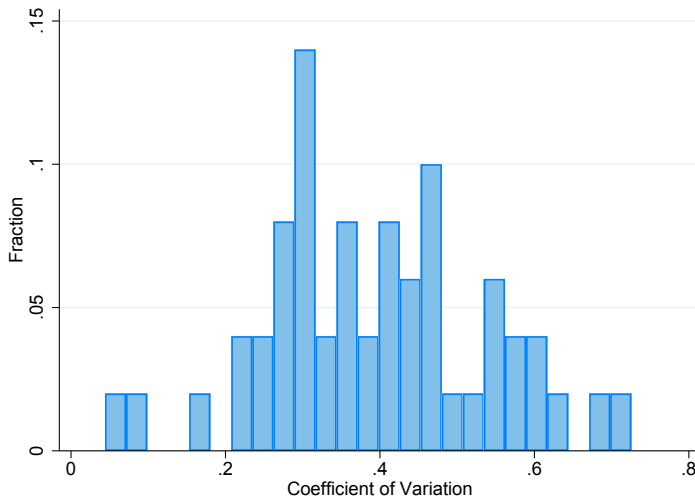
Measuring Temporal Flexibility of Occupations

I measure the temporal flexibility of occupation o in year t the coefficient of variation (CV) of weeks worked:

$$CV(W_{ot}) = \frac{\sigma_{ot}}{\mu_{ot}}, \quad \sigma_{ot} = \left[\frac{1}{N_{ot} - 1} \sum_{i=1}^{N_{ot}} (W_{iot} - \mu_{ot})^2 \right]^{\frac{1}{2}}, \quad \mu_{ot} = \frac{1}{N_{ot}} \sum_{i=1}^{N_{ot}} W_{iot}$$

where W_{iot} is number of weeks worked by individual i in occupation o in year t, N_{ot} are number of jobs in occupation o in year t, and μ_{ot}, σ_{ot} are, respectively, the average and standard deviation of weeks worked in occupation o in year t.

I calculate $CV(W_{ot})$ separately for $t = 1984, 1985, 1986$ and then use the average in my analysis (Back)

Histogram of Temporal Flexibility Measure

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Decomposition of Labor Supply Responses

Decompose total labor supply response, E_T, into subcomponents

$$E_T = E_p + E_s$$
$$= E_p^{\text{Cont}} + \gamma \cdot (E_p^{\text{New}} - E_p^{\text{Cont}}) + E_s$$

- E_p^{Cont}: Continuing primary job
- E_p^{New}: New primary jobs; γ propensity of job change
- E_s: Secondary jobs

The total effect of the tax reform ($d\tau$) can then be decomposed into three components

$$dE_T = \underbrace{dE_p^{Cont}}_{\text{Cont. primary job}} + \underbrace{\gamma \cdot (dE_p^{\text{New}} - dE_p^{\text{Cont}}) + d\gamma \cdot (E_p^{\text{New}} - E_p^{\text{Cont}})}_{\text{Primary job change}} + \underbrace{dE_s}_{\text{Secondary jobs}}$$

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