Adjustment Costs, Firm Responses, and Labor Supply Elasticities: Evidence from Danish Tax Records

Raj Chetty, Harvard University and NBER

John N. Friedman, Harvard University and NBER
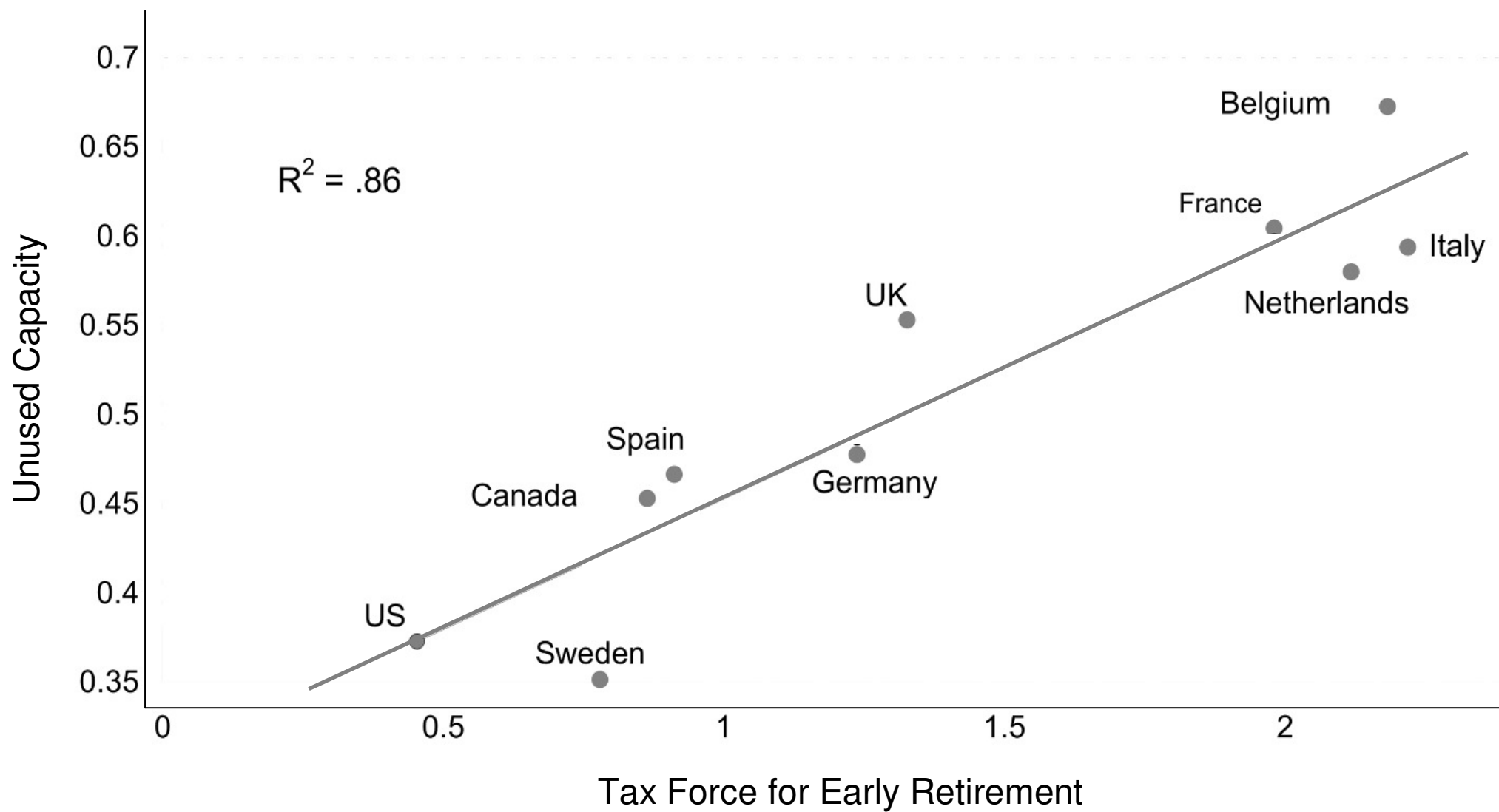
Tore Olsen, Harvard University and CAM

Luigi Pistaferri, Stanford University and NBER

July 2010

Introduction

- Tax elasticities are key in the optimal design of social security

    - Micro studies find intensive margin elasticities near zero (Heckman 1993, Blundell and MaCurdy 1999, Saez et al 2009)

    - Macro cross-country estimates hint at far larger responsiveness (i.e., Gruber and Wise 1999)

Tax Incentives for Early Retirement and Actual Early Retirement Rates

$R^2 = .86$

Belgium

France

Italy

Netherlands

UK

Spain

Canada

Germany

US

Sweden

Unused Capacity
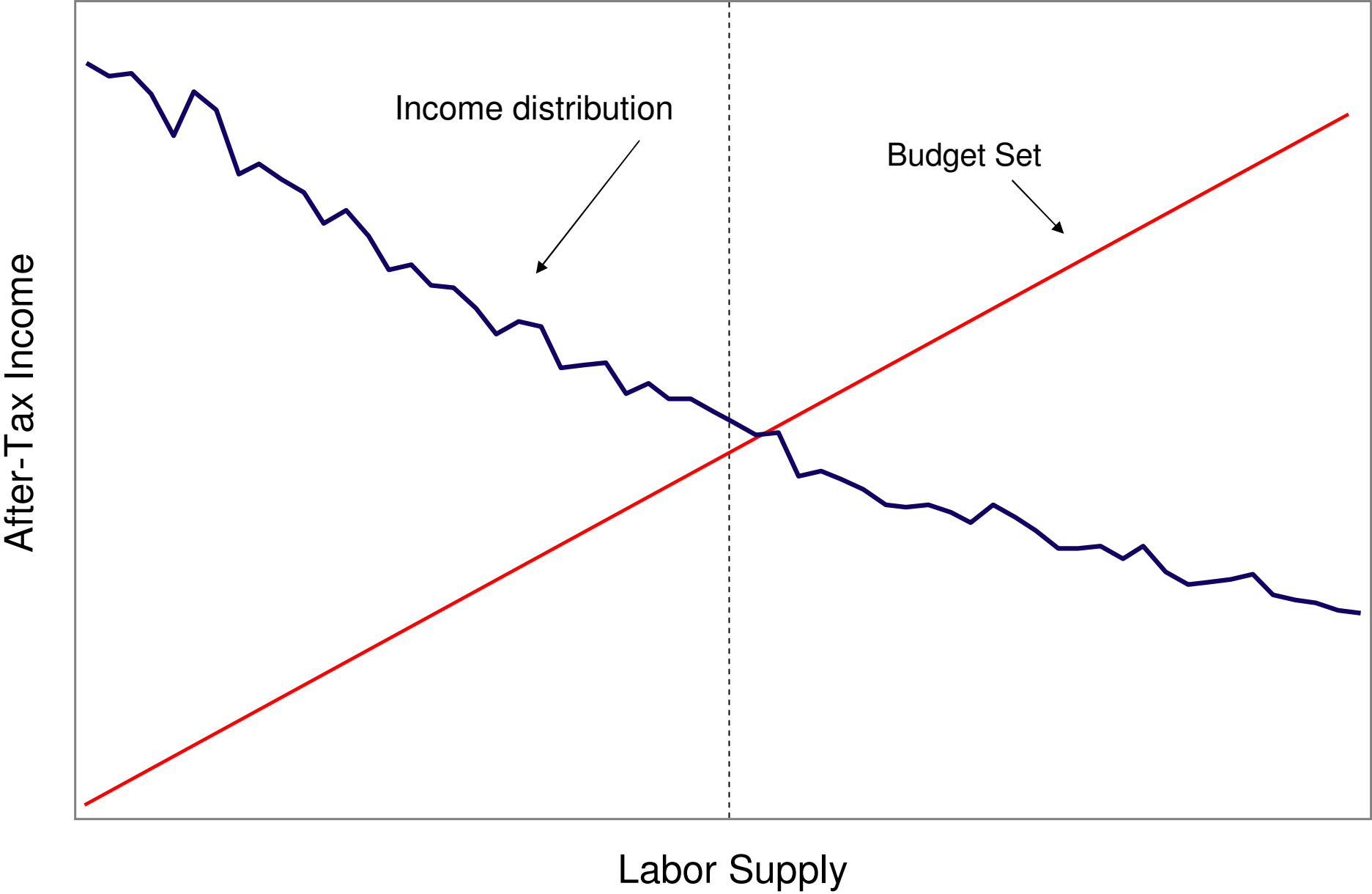
Tax Force for Early Retirement

Introduction

- Tax elasticities are key in the optimal design of social security

    - Micro studies find intensive margin elasticities near zero (Heckman 1993, Blundell and MaCurdy 1999, Saez et al 2009)

    - Macro cross-country estimates hint at far larger responsiveness (i.e., Gruber and Wise 1999)

- Literature assumes workers may freely choose labor supply

    - But two types of frictions may inhibit response to taxes:

        1. Search costs in finding optimal job

        2. Constraints imposed by firms (i.e. 40-hour week)

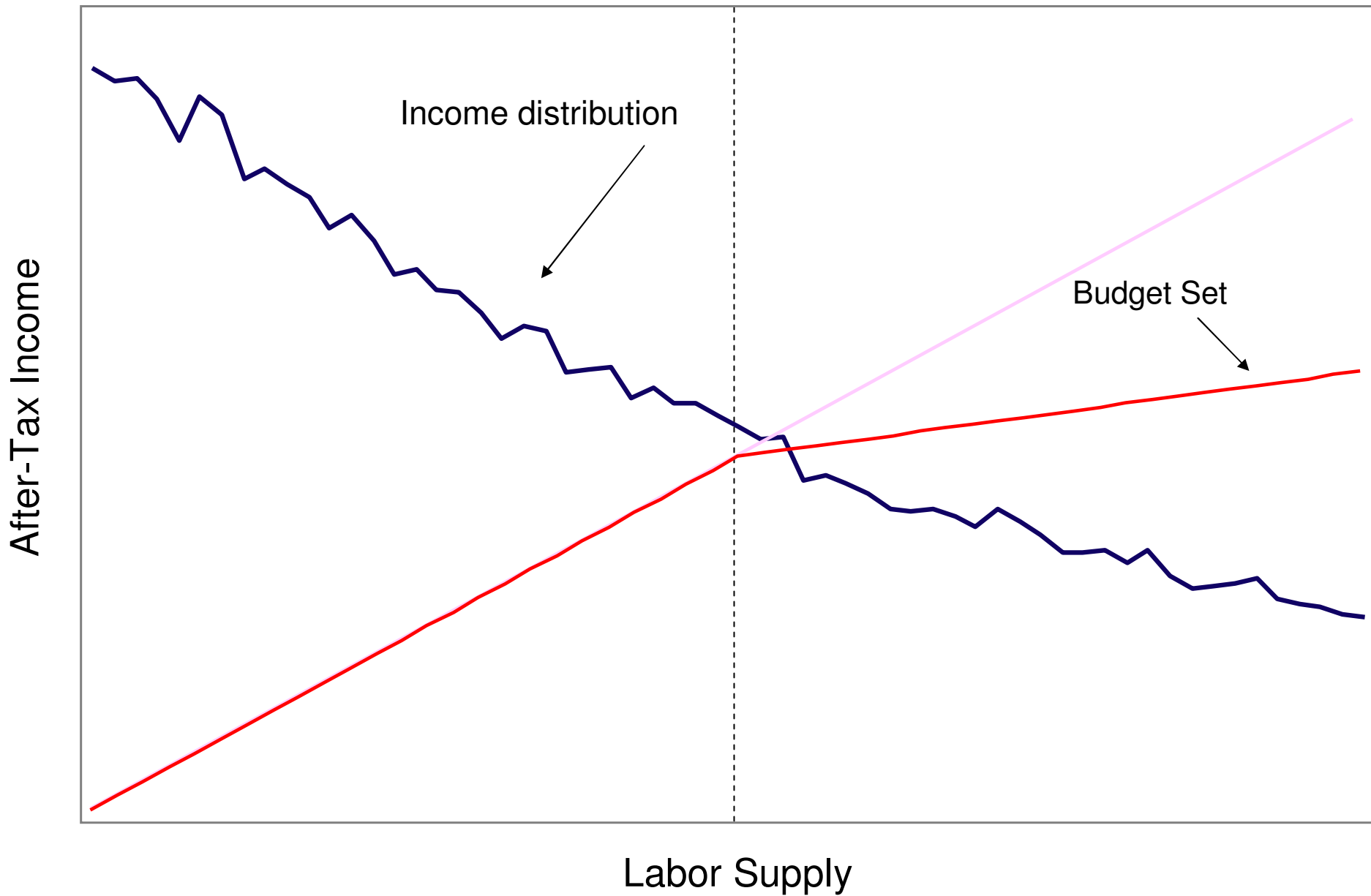- We show that these frictions substantially attenuate micro estimates of tax elasticities

Estimating Elasticities: Benchmark Frictionless Model

- In the literature, there are two standard micro methods of identifying structural elasticity:

    1. Variation in tax rates over time.

        - Do individuals work less after tax rate increase?

    2. Variation in rates across tax brackets.

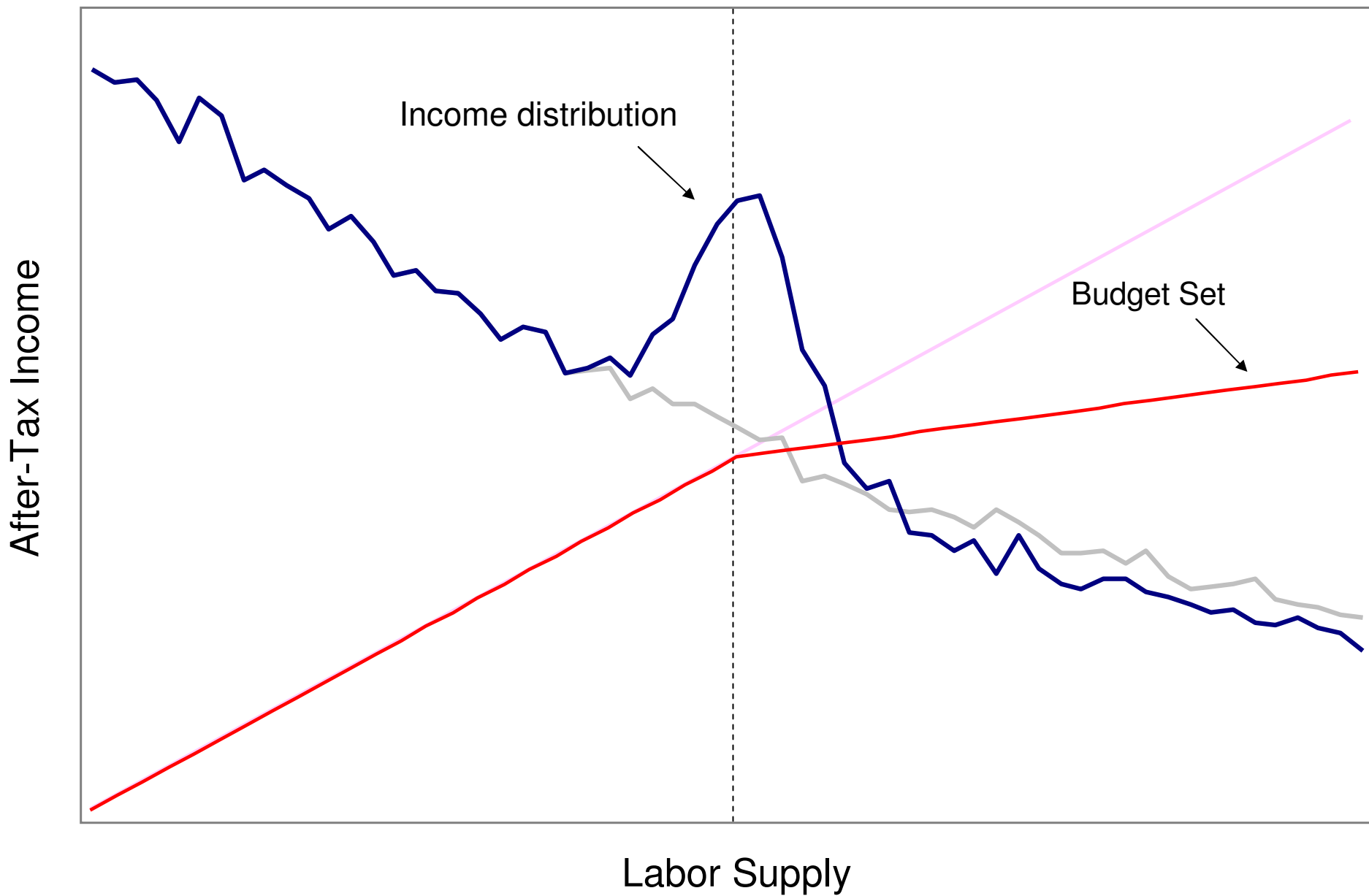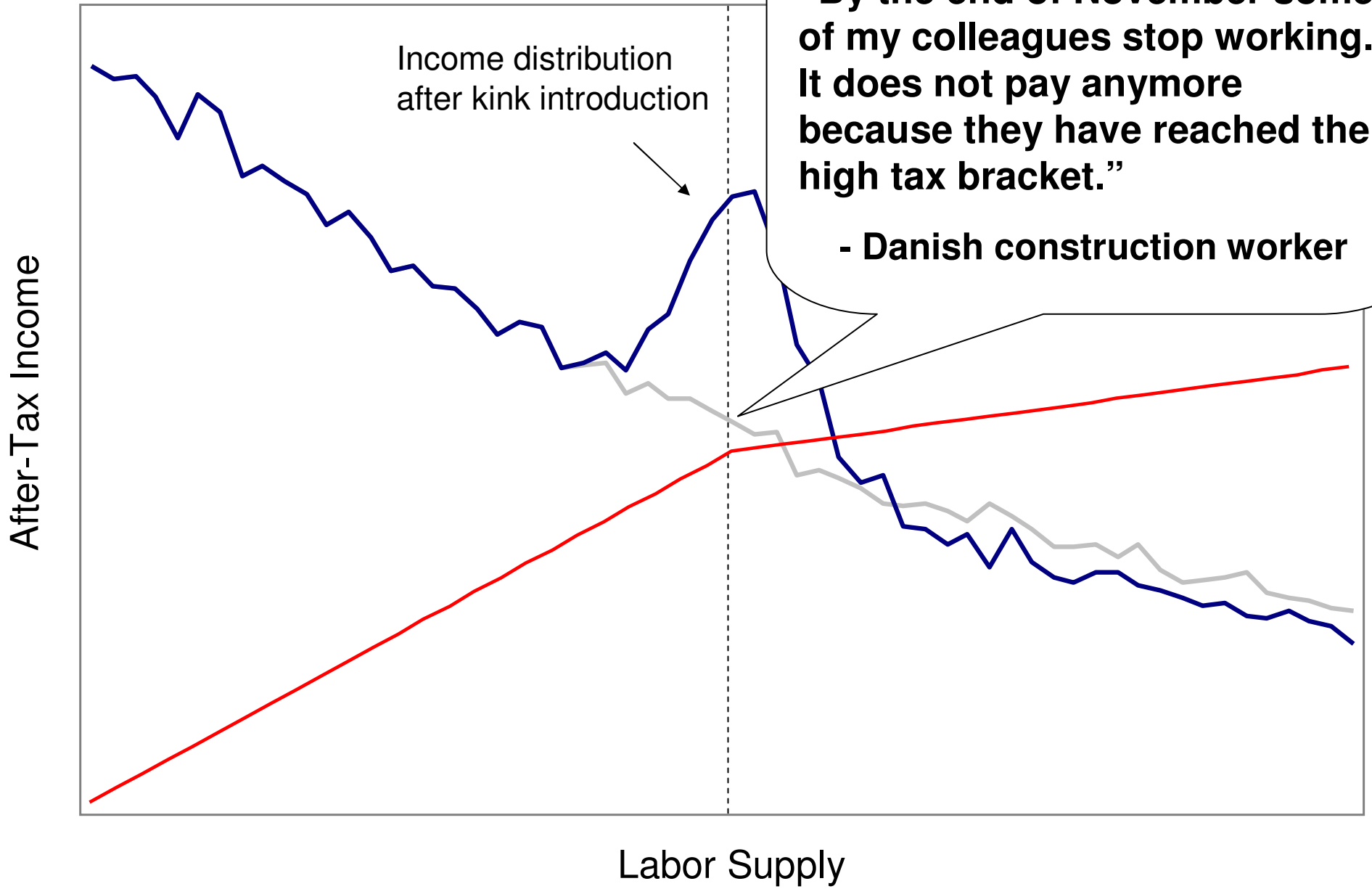   - Do individuals "bunch" at kinkpoints?

Bunching at Kink Points

Income distribution

Budget Set

After-Tax Income

Labor Supply

Bunching at Kink Points

Income distribution

Budget Set

After-Tax Income

Labor Supply

Bunching at Kink Points

Income distribution

Budget Set

After-Tax Income

Labor Supply

Consumption — Before Kink Introduction — After Kink Introduction

Bunching at Kink Points

Bunching at Kink Points

Saez (2009):

Larger Bunch
↓
Larger Elasticity

After-Tax Income

Labor Supply

—— Consumption   —— Before Kink Introduction   —— After Kink Introduction
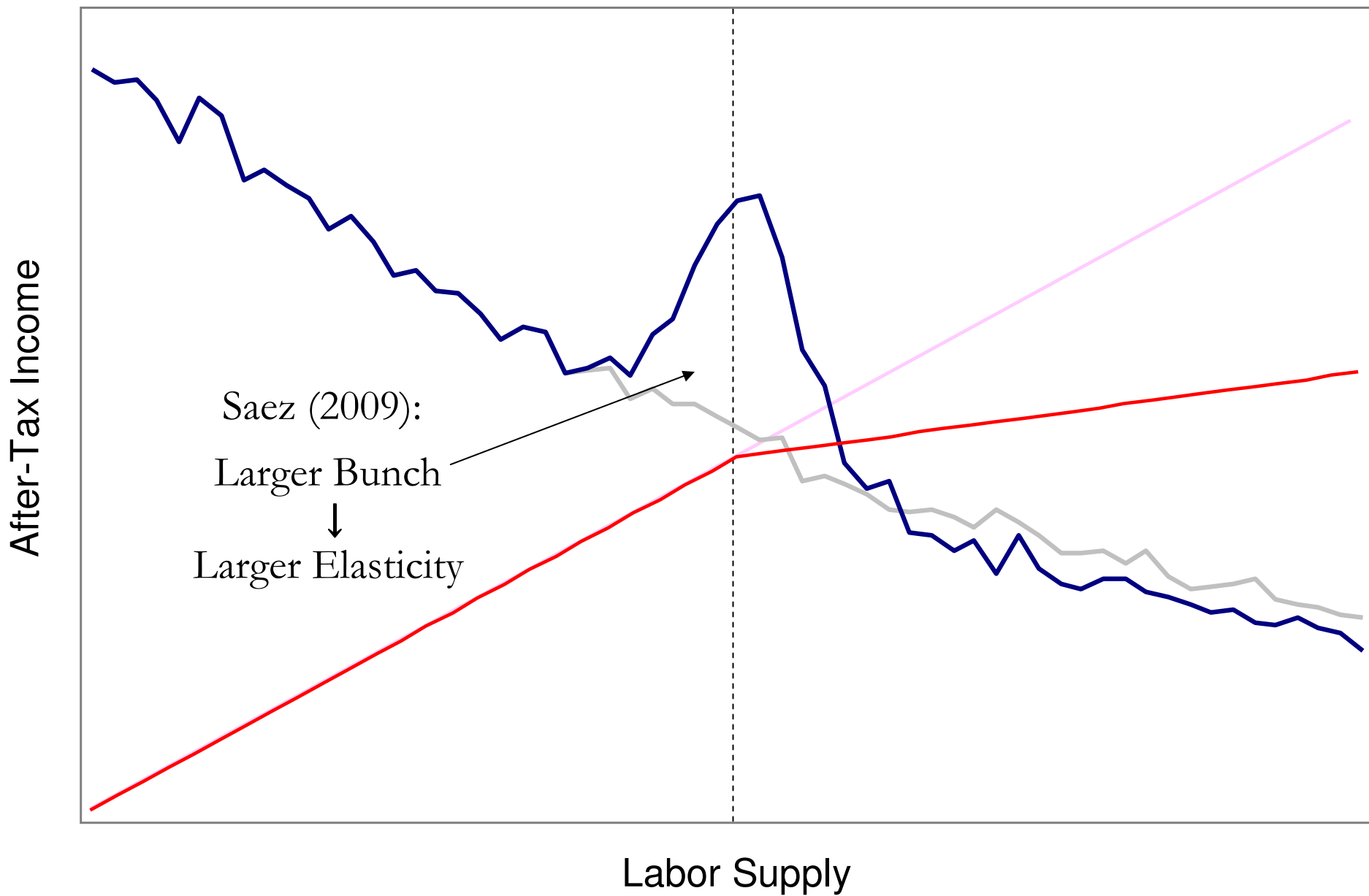
Bunching with Search Frictions

- **How do frictions affect bunching at kinkpoints?**

- With hour constraints, there are two ways to locate at the kink

    1. *Individual Bunching*: Workers search for a job at the kink

    2. *Aggregate Bunching*: Draw job at kink to begin with

        - Signature of aggregate bunching: Even workers who **do not face** a kink bunch there

- Three predictions about observed elasticity measured from bunching at kink

Effects of Frictions on Observed Elasticities

- Three empirical predictions:

1. [**Size**] Larger kinks generate larger observed elasticities

  - Large kinks are more likely to induce workers to pay search costs and relocate to the kink

Effects of Frictions on Observed Elasticities

- Three empirical predictions:

1. [**Size**] Larger kinks generate larger observed elasticities

  - Large kinks are more likely to induce workers to pay search costs and relocate to the kink

2. [**Scope**] Kinks that affect a larger group of workers generate larger observed elasticities

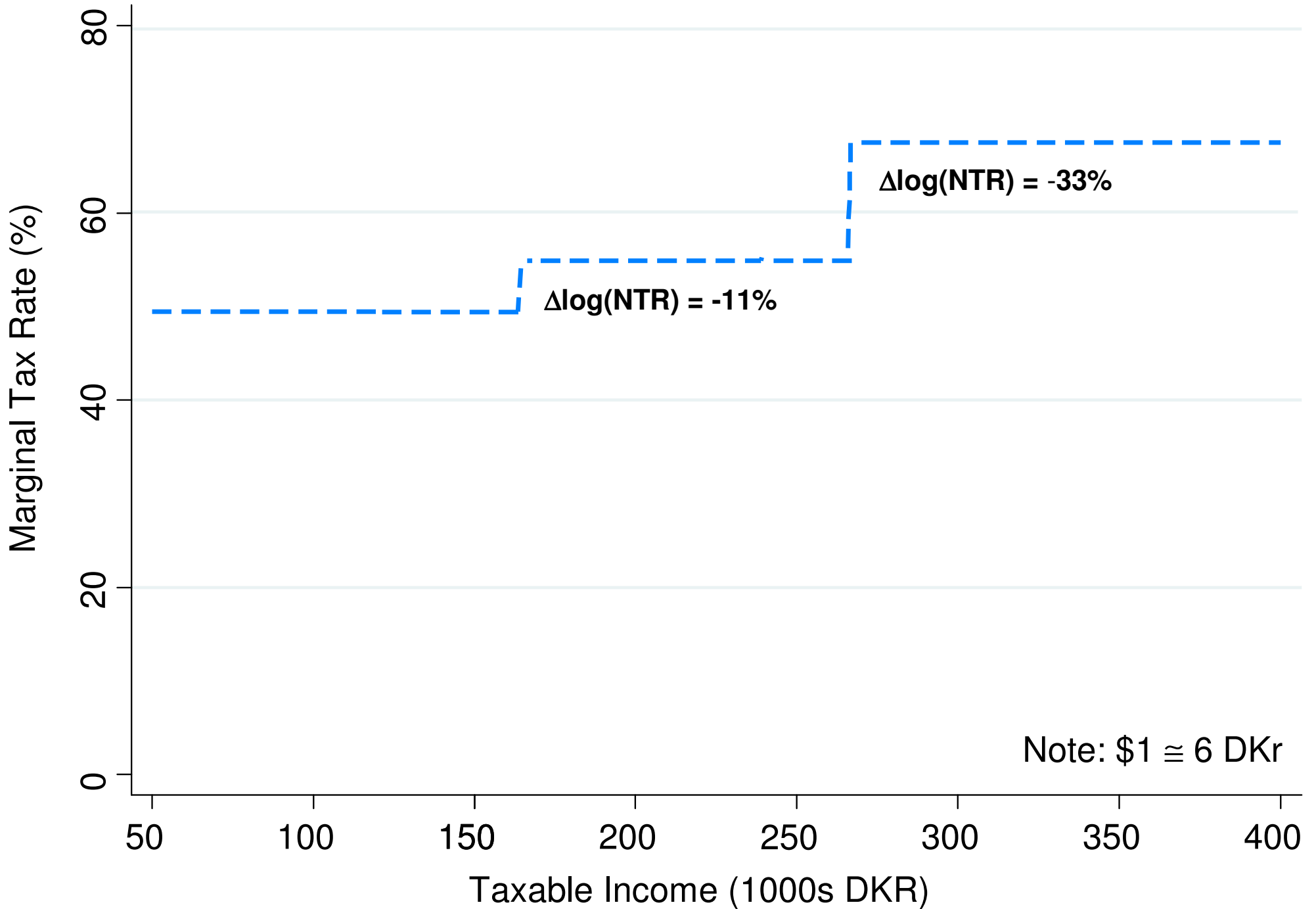 - Firms tailor jobs to *aggregate* preferences → more aggregate bunching at common kinks

Effects of Frictions on Observed Elasticities

- Three empirical predictions:

1. [**Size**] Larger kinks generate larger observed elasticities

  - Large kinks are more likely to induce workers to pay search costs and relocate to the kink

2. [**Scope**] Kinks that affect a larger group of workers generate larger observed elasticities

  - Firms tailor jobs to *aggregate* preferences → more aggregate bunching at common kinks

3. [**Correlation**] More aggregate bunching in sectors with greater individual bunching

  - In sectors of the economy where workers are more elastic, firms offer more jobs at the kink.
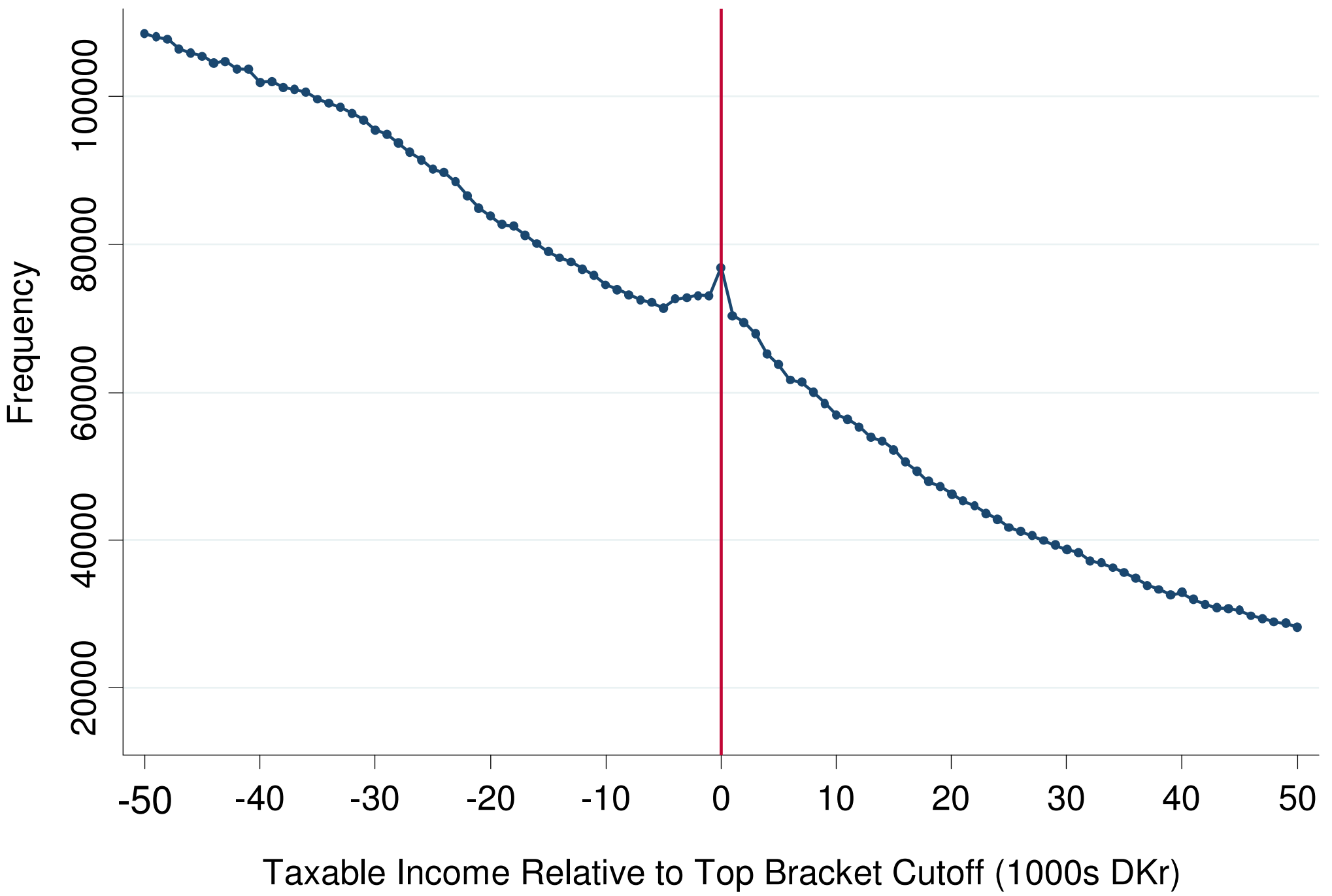
DATA AND INSTITUTIONAL BACKGROUND

- Matched employee-employer dataset for population of Denmark

  - Sample restriction: Wage earners, ages 15-70, in 1994-2001

  - Approximately 2.4 million obs. per year

- Primarily individual tax system

- Taxable income = wage earnings + net deductions

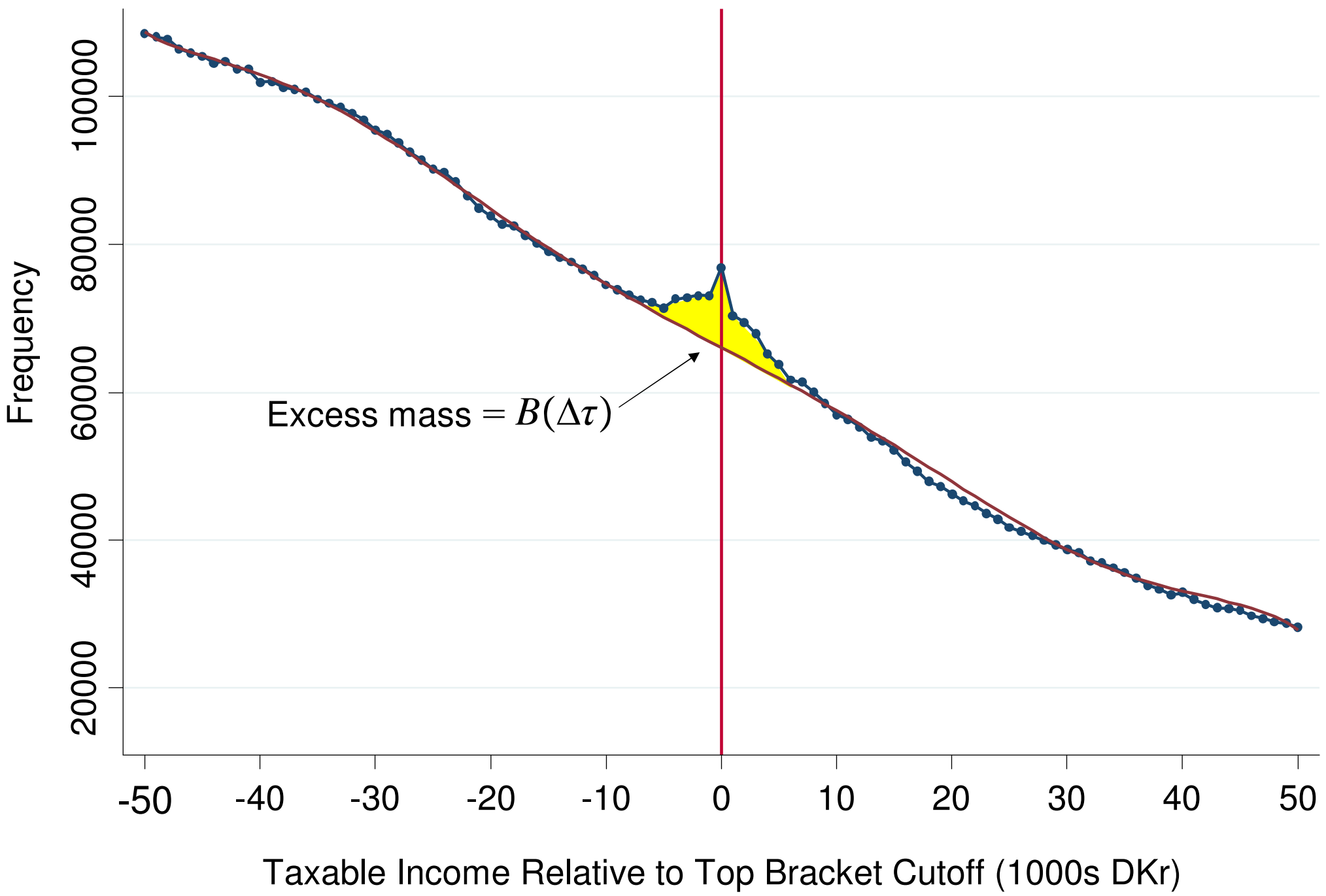 - Net Deductions = Pension Contributions – Non-Wage Income
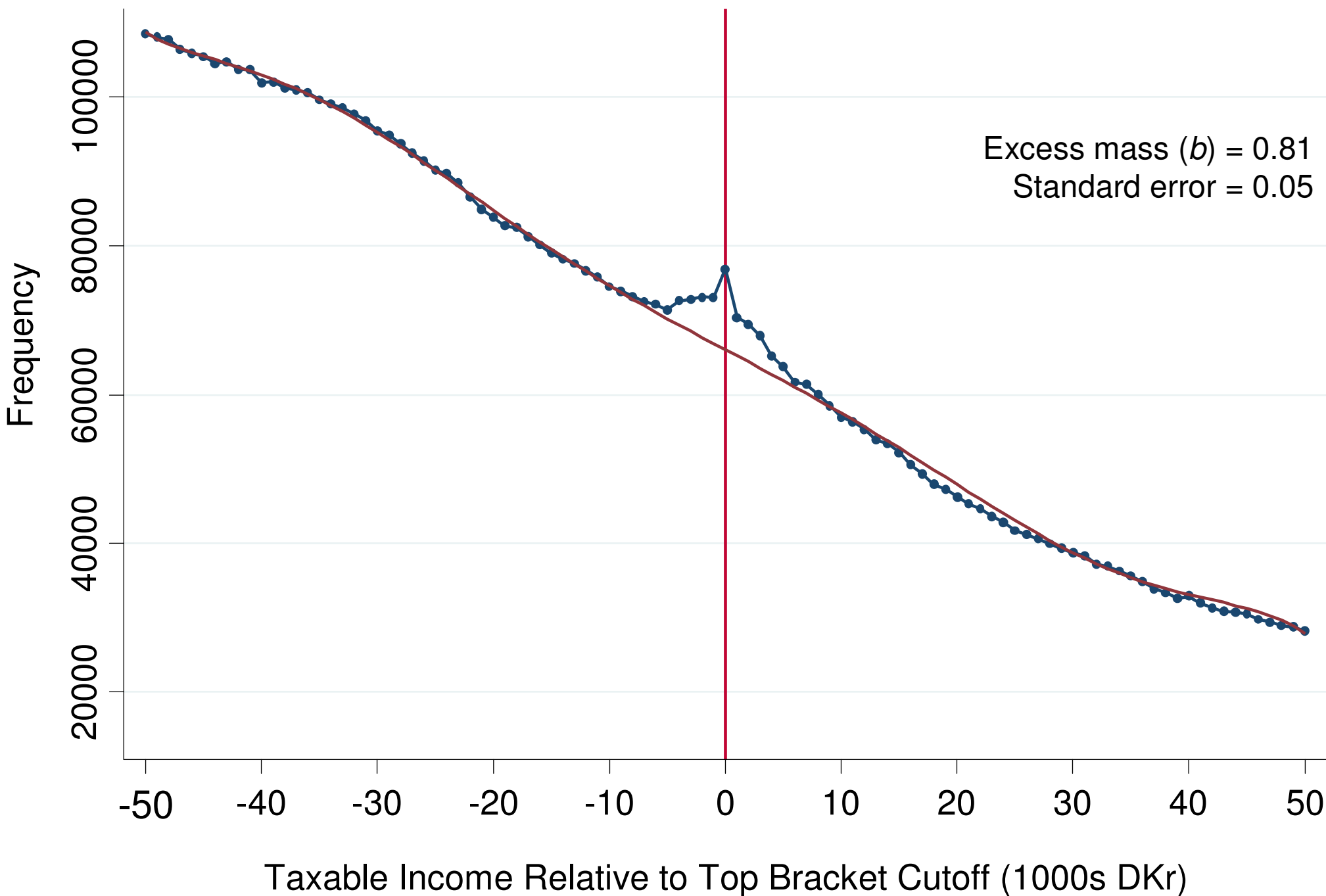
Marginal Tax Rates in Denmark in 2000

Δlog(NTR) = -33%

Δlog(NTR) = -11%

Note: $1 ≅ 6 DKr

Marginal Tax Rate (%)

Taxable Income (1000s DKR)

Income Distribution for Wage Earners Around Top Kink (1994-2001)

Taxable Income Relative to Top Bracket Cutoff (1000s DKr)

Income Distribution for Wage Earners Around Top Kink (1994-2001)

Excess mass $= B(\Delta\tau)$

Frequency

Taxable Income Relative to Top Bracket Cutoff (1000s DKr)

Income Distribution for Wage Earners Around Top Kink (1994-2001)

Excess mass (b) = 0.81
Standard error = 0.05

Frequency

Taxable Income Relative to Top Bracket Cutoff (1000s DKr)

(a) Married Women vs. Single Men

Married Women
Excess mass (*b*)= 1.79
Standard error = 0.10

Single Men
Excess mass (*b*) = 0.25
Standard error = 0.04

Frequency (married women)

Frequency (single men)

Taxable Income Relative to Top Bracket Cutoff (1000s DKr)

(b) Teachers vs. Military

Teachers
Excess mass (b) = 3.54
Standard error = 0.25

Military
Excess mass (b) = -0.12
Standard error = 0.21

Frequency (teachers)
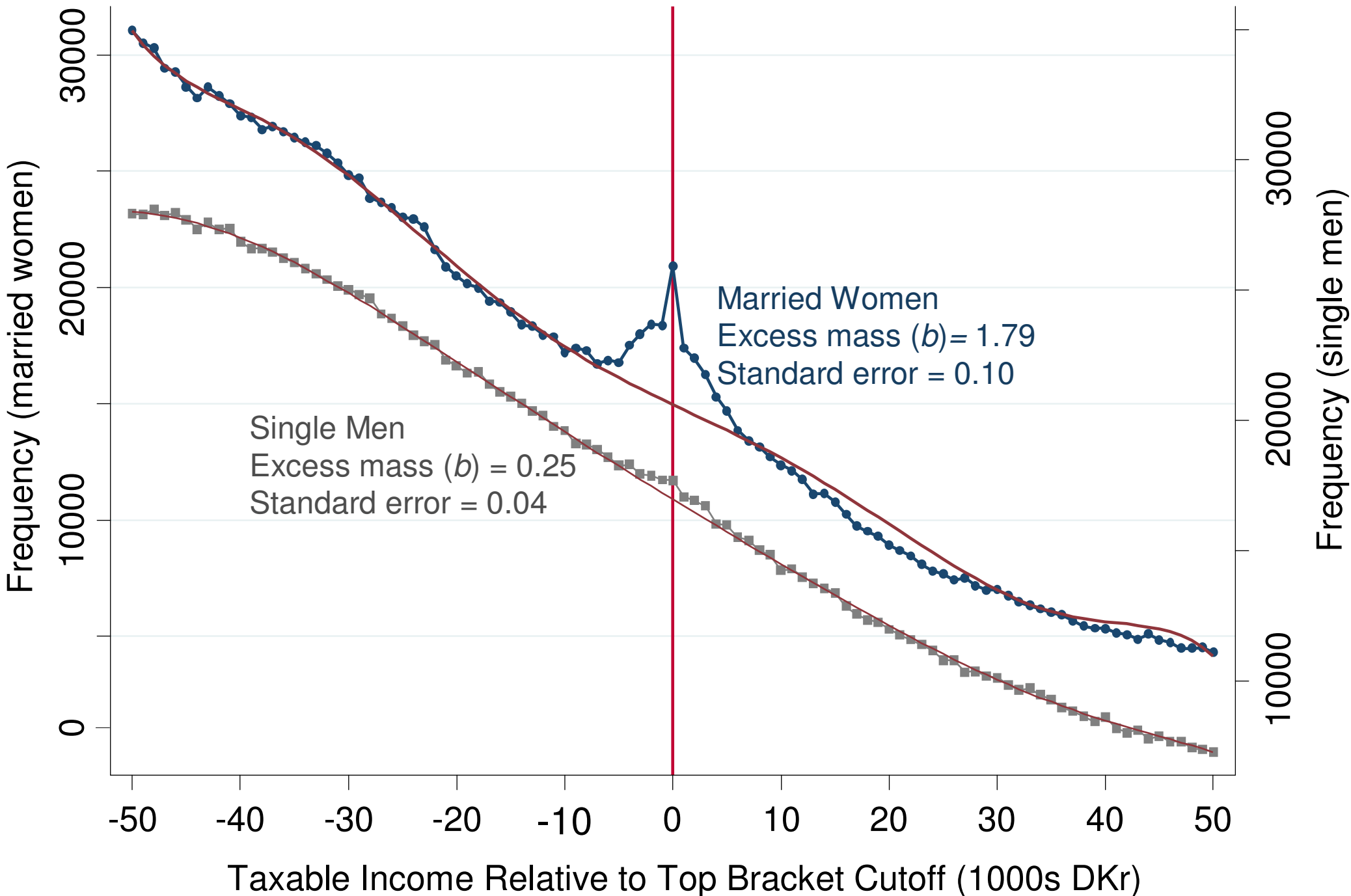
Frequency (military)

Taxable Income Relative to Top Bracket Cutoff (1000s DKr)
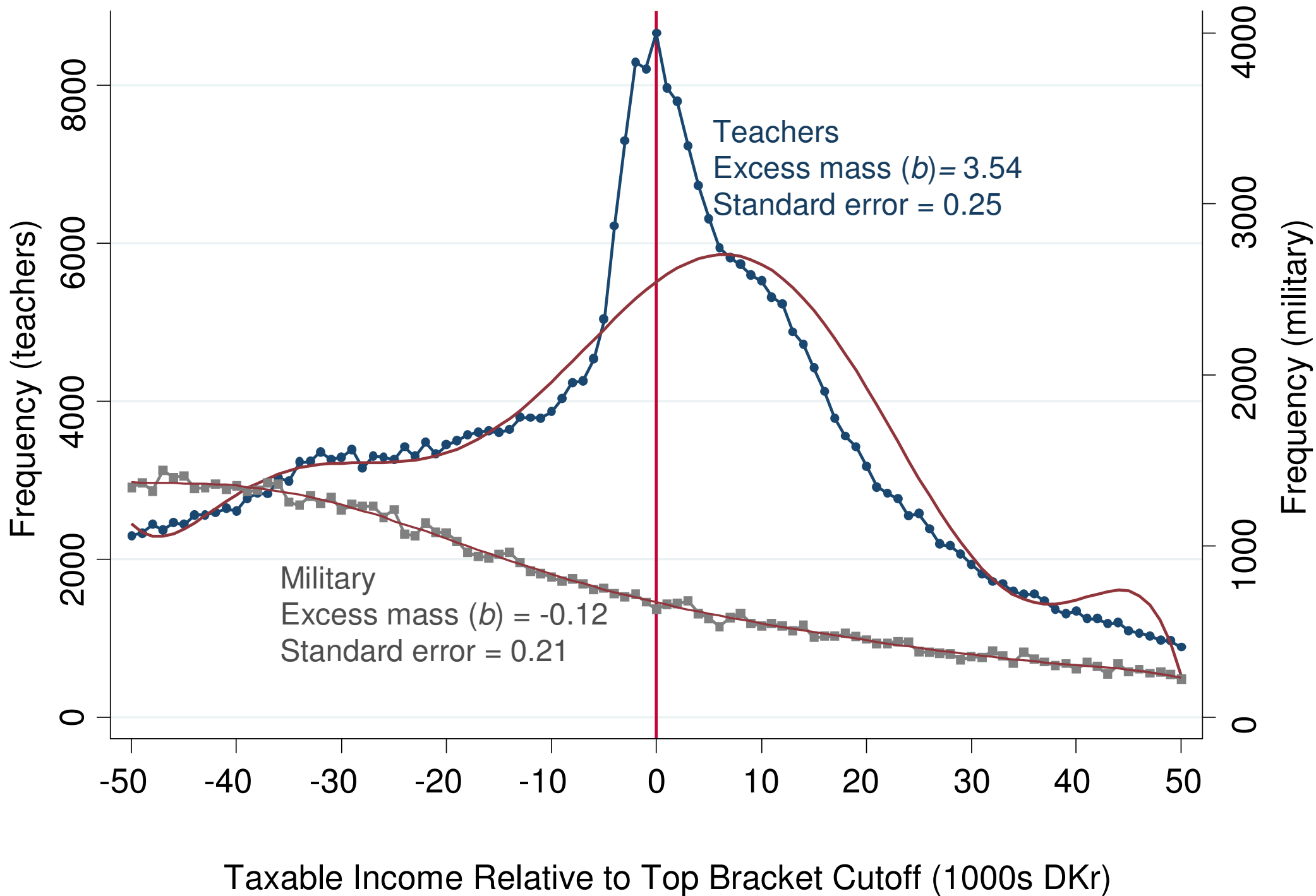
Taxable Income Distributions in 1994

Married Women

All Wage Earners

Frequency (all wage earners)

Frequency (married women)

Taxable Income (1000s DKR)
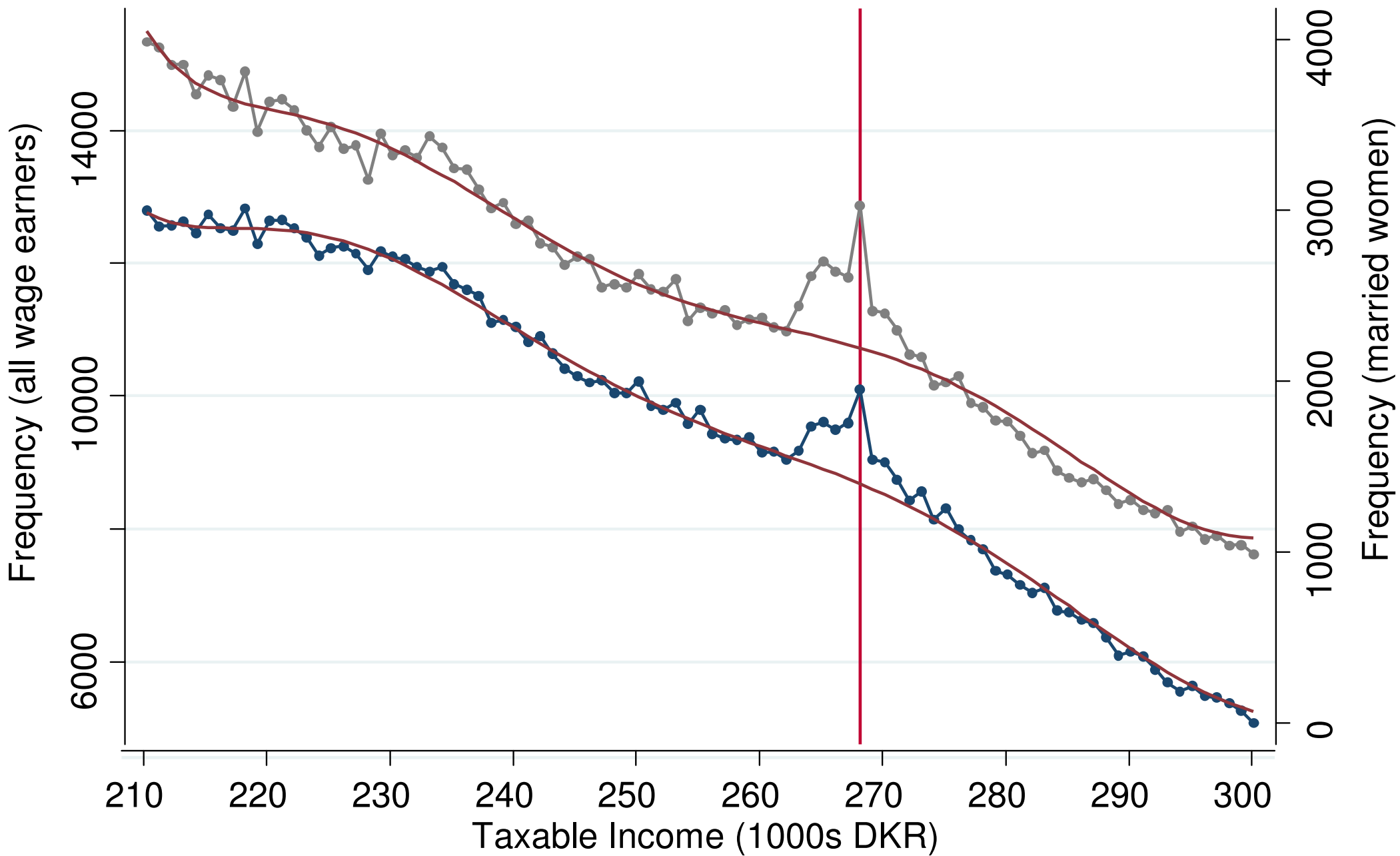
1995
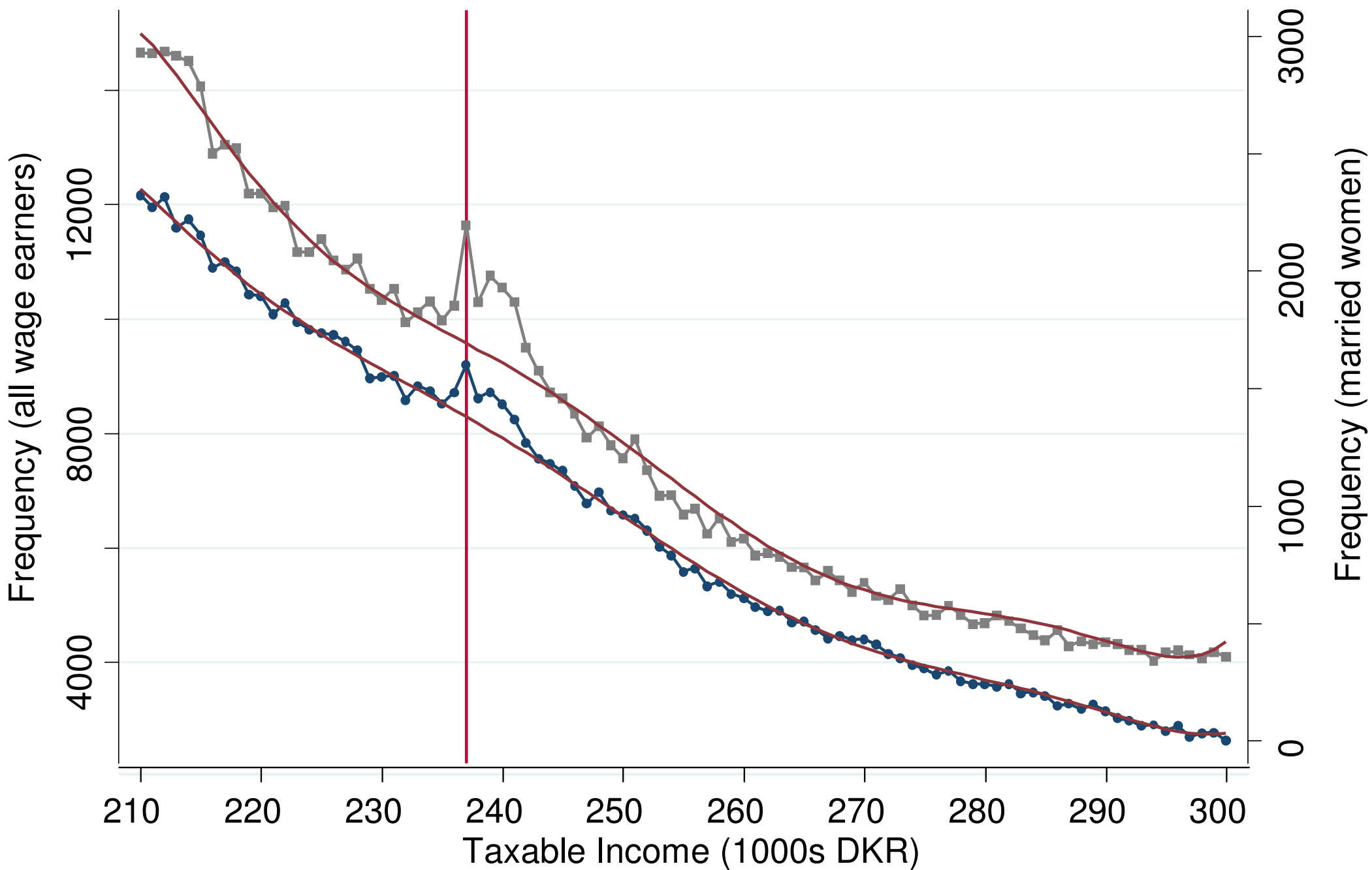
1996
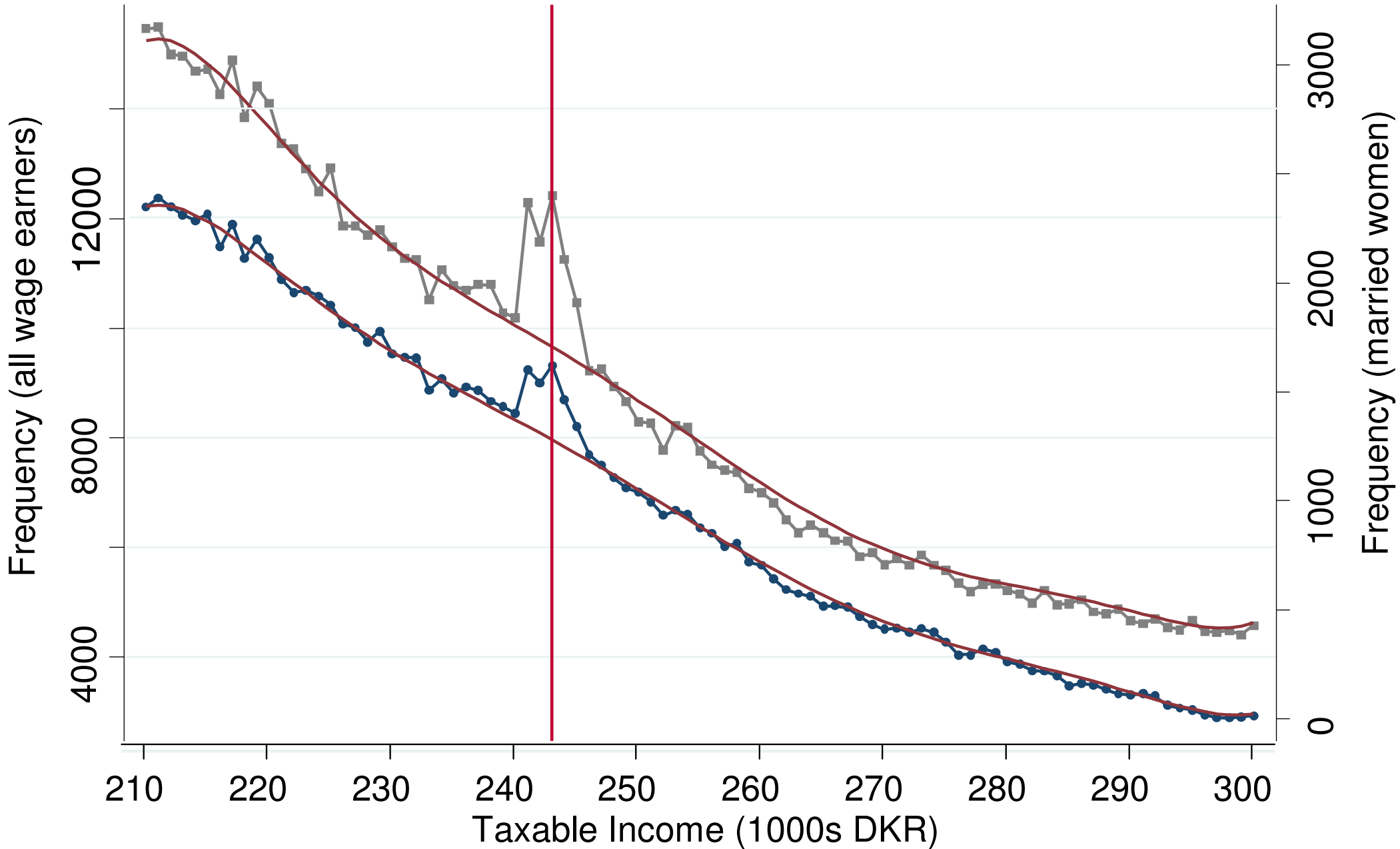
1997
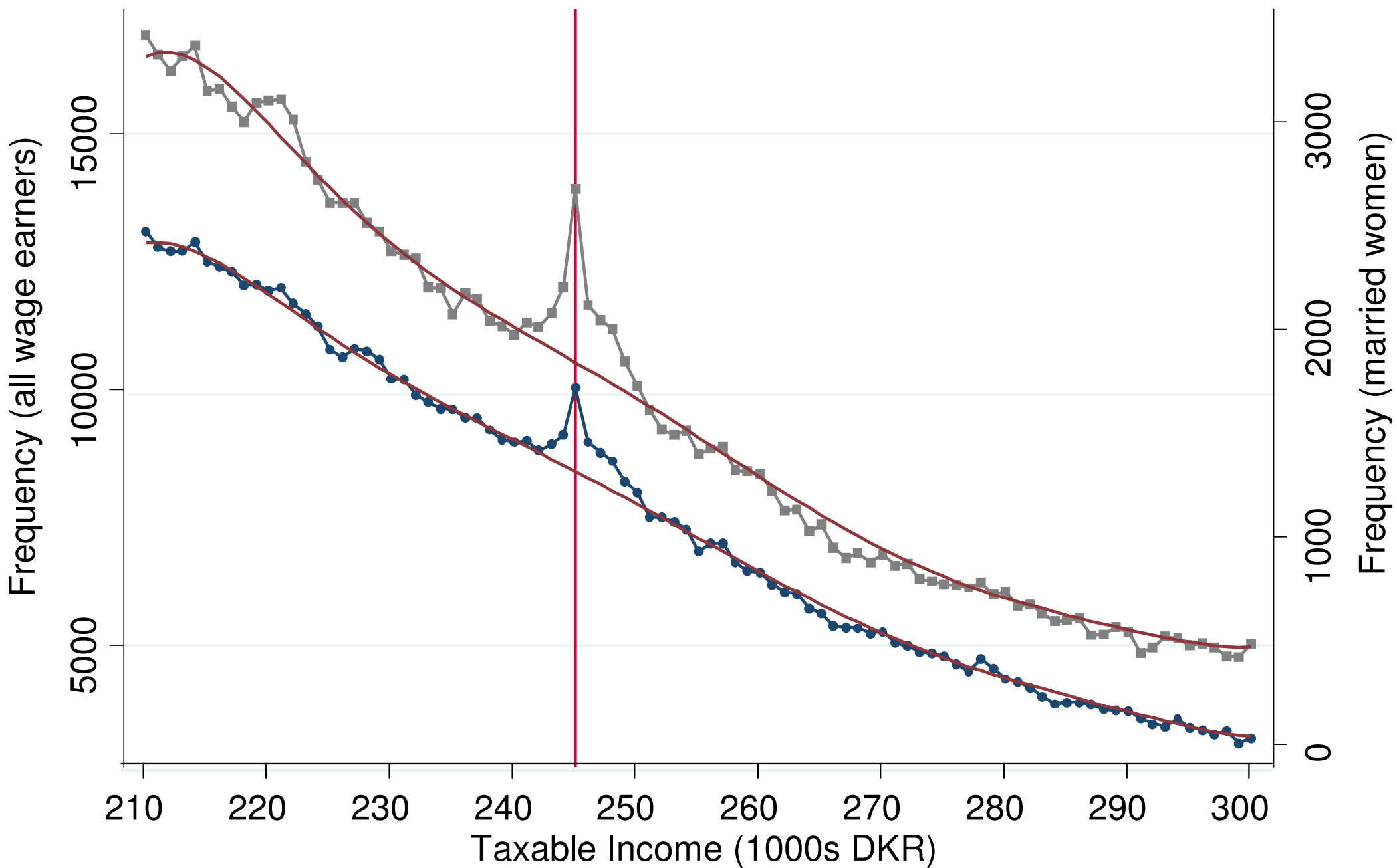
1998
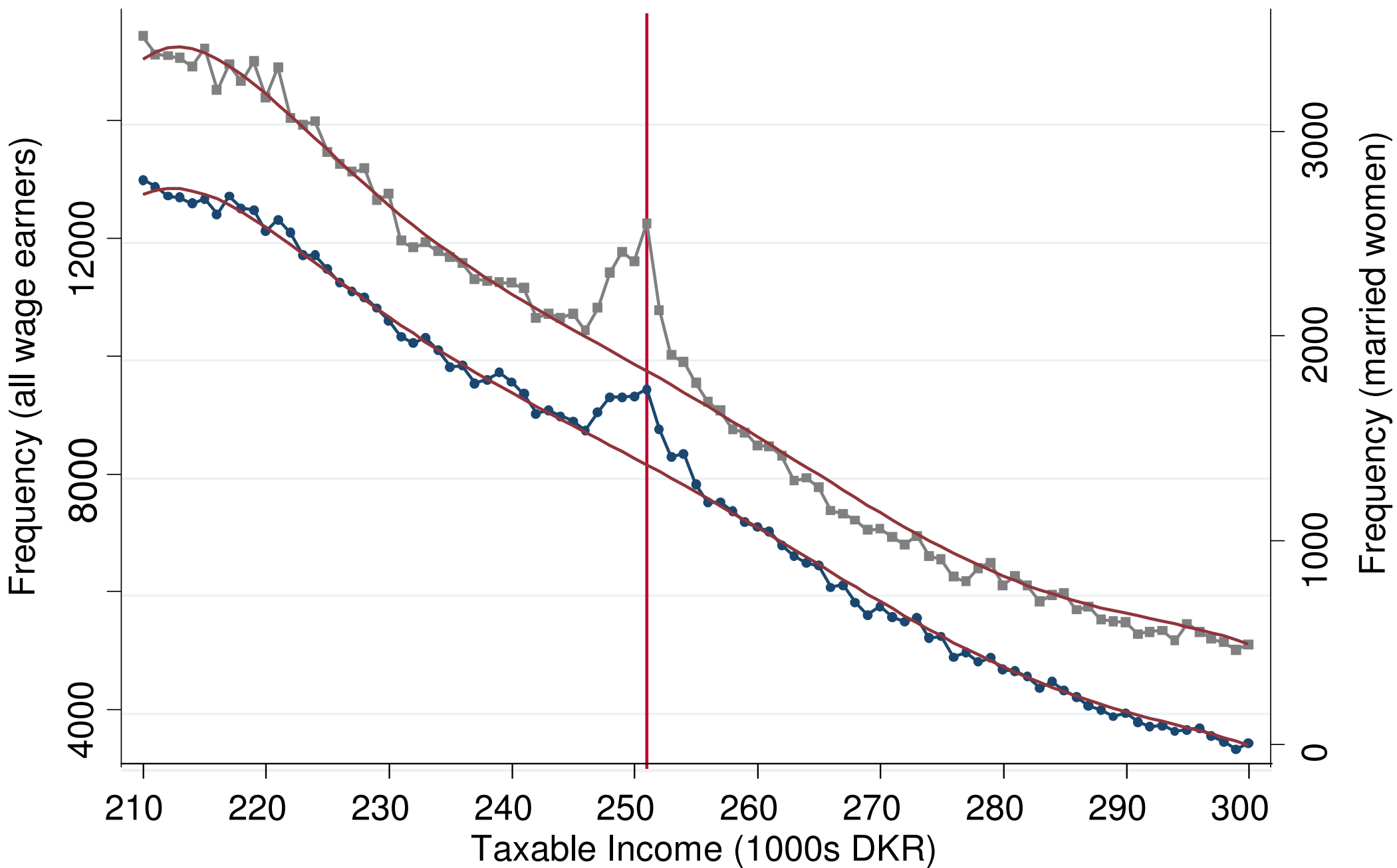
1999
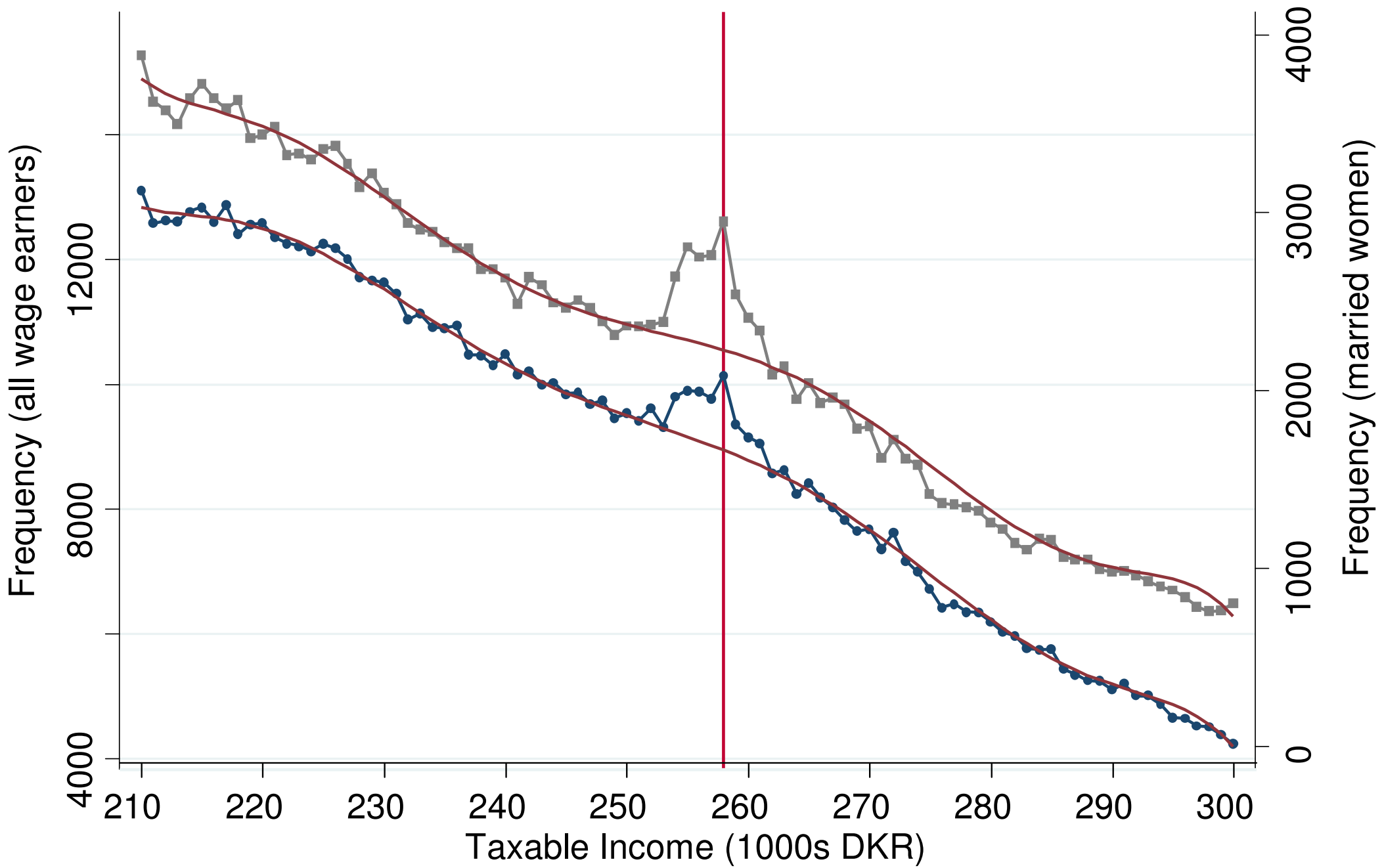
2000

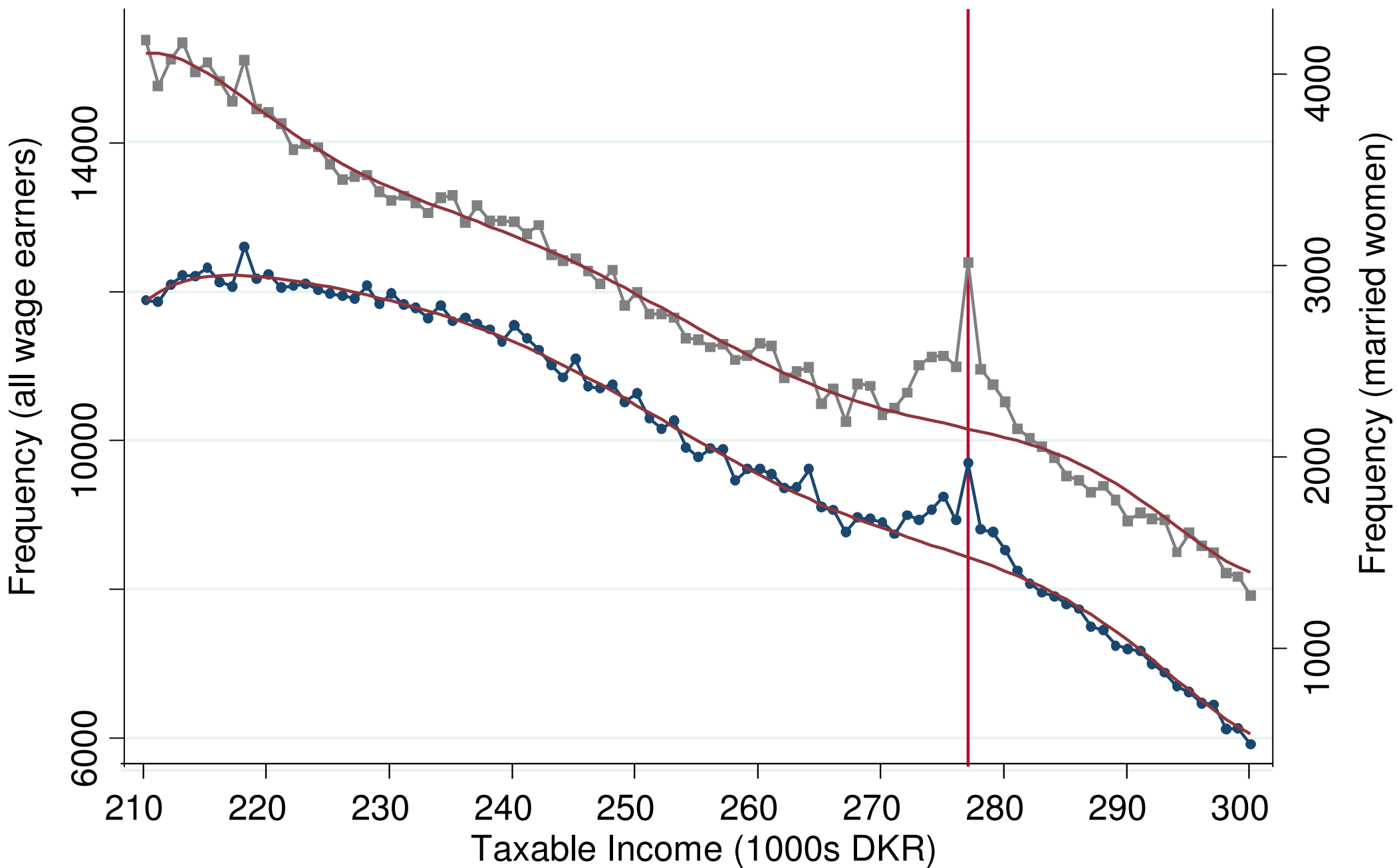**2001**

INCOME SHIFTING AND INDEXATION

- In the paper, we address three potential biases:

    1. Demonstrate most of response through labor earnings

        - Very little shifting into retirement savings or non-wage income

        - No evasion in our primary wage earnings measure from audit study (Kleven et al. 2010)

    2. Bunching across years not driven by inflation indexing or aggregate wage growth patterns

    3. Position of the kink determined *before* earnings decisions

        - Not driven by reverse causality

PREDICTION 1: Small vs. Large Tax Changes

- We have already examined the larger, top tax kink

  - Top Bracket Cutoff: $\Delta \log(NTR) \approx 30\%$

- Two sources of smaller tax variation:

  - Middle Bracket Cutoffs: $\Delta \log(NTR) \approx 10\%$

  - Small Tax Reforms

- Now estimate observed elasticities from bunching at smaller kinks and small tax reforms

Middle Tax Kink: All Wage Earners, Taxable Income Distribution

Excess mass (*b*) = 0.06
Standard error = 0.03

Predicted excess mass = 0.16
Standard error = 0.01

Taxable Income Relative to Middle Bracket Cutoff

Frequency
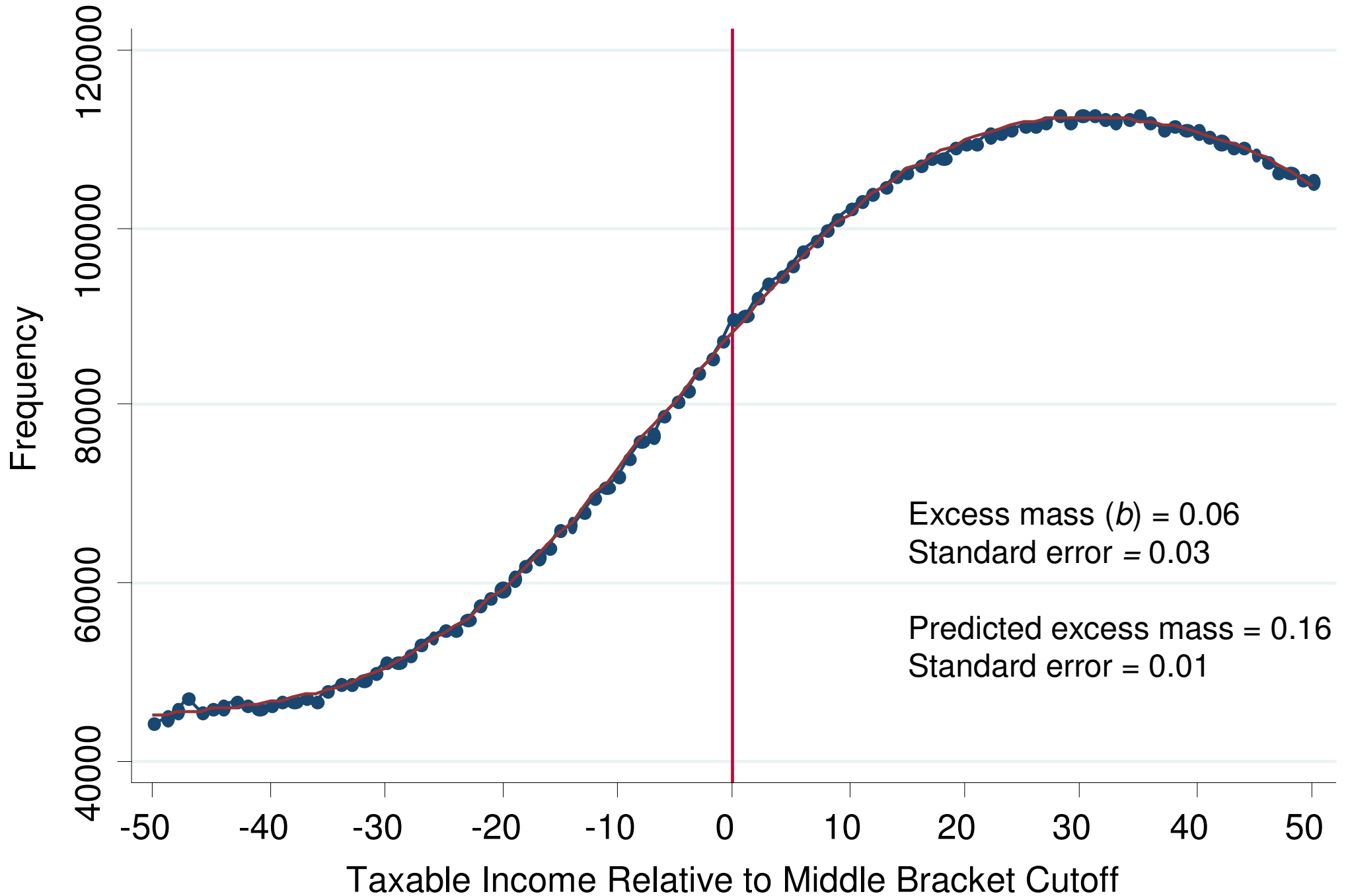
Middle Tax Kink: Married Women, Taxable Income Distribution

Frequency (y-axis): 10000, 20000, 30000, 40000

Taxable Income Relative to Middle Bracket Cutoff (x-axis): -50, -40, -30, -20, -10, 0, 10, 20, 30, 40, 50

Excess mass (*b*) = 0.06
Standard error = 0.03

Predicted excess mass = 0.35
Standard error = 0.02
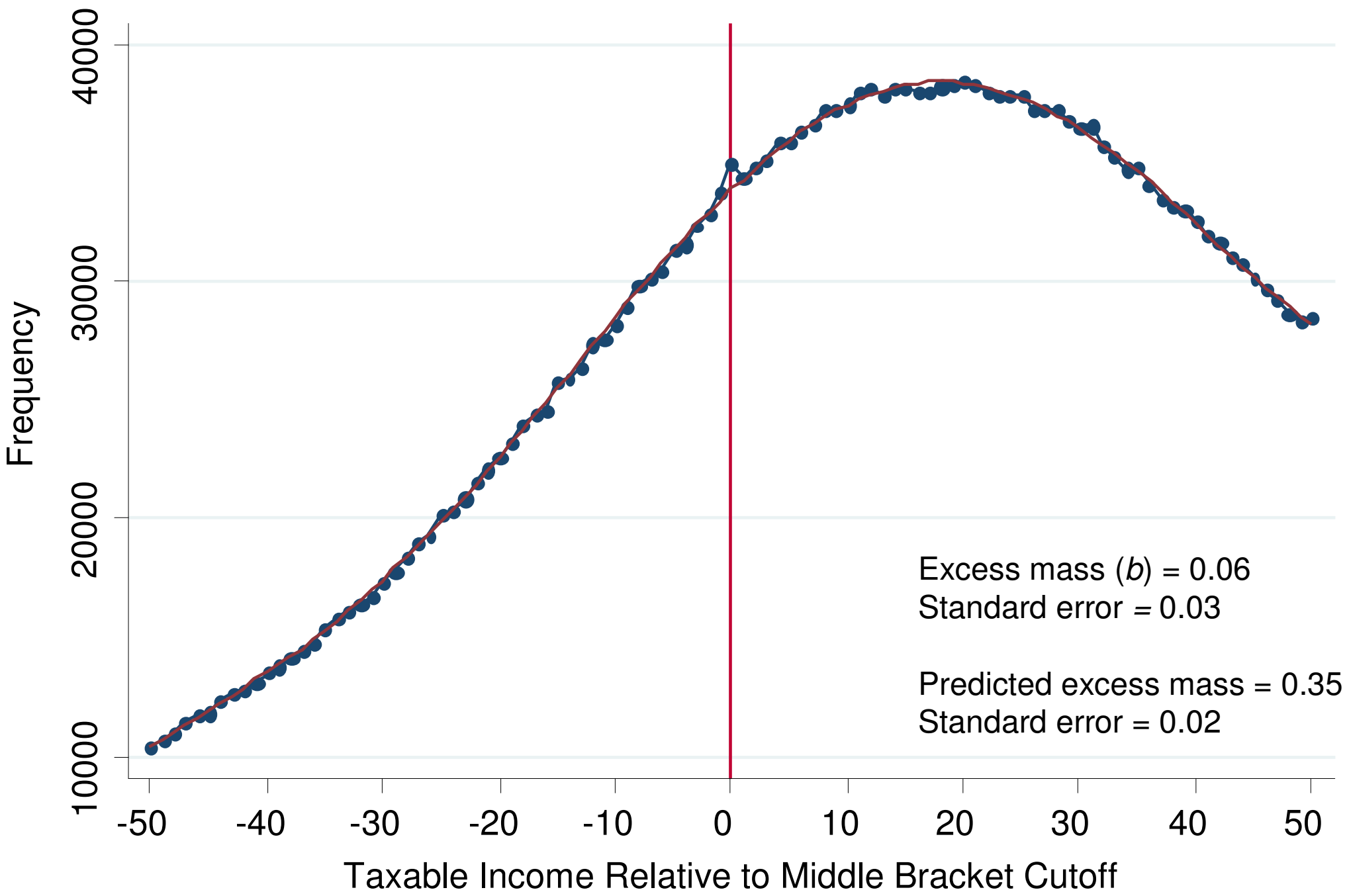
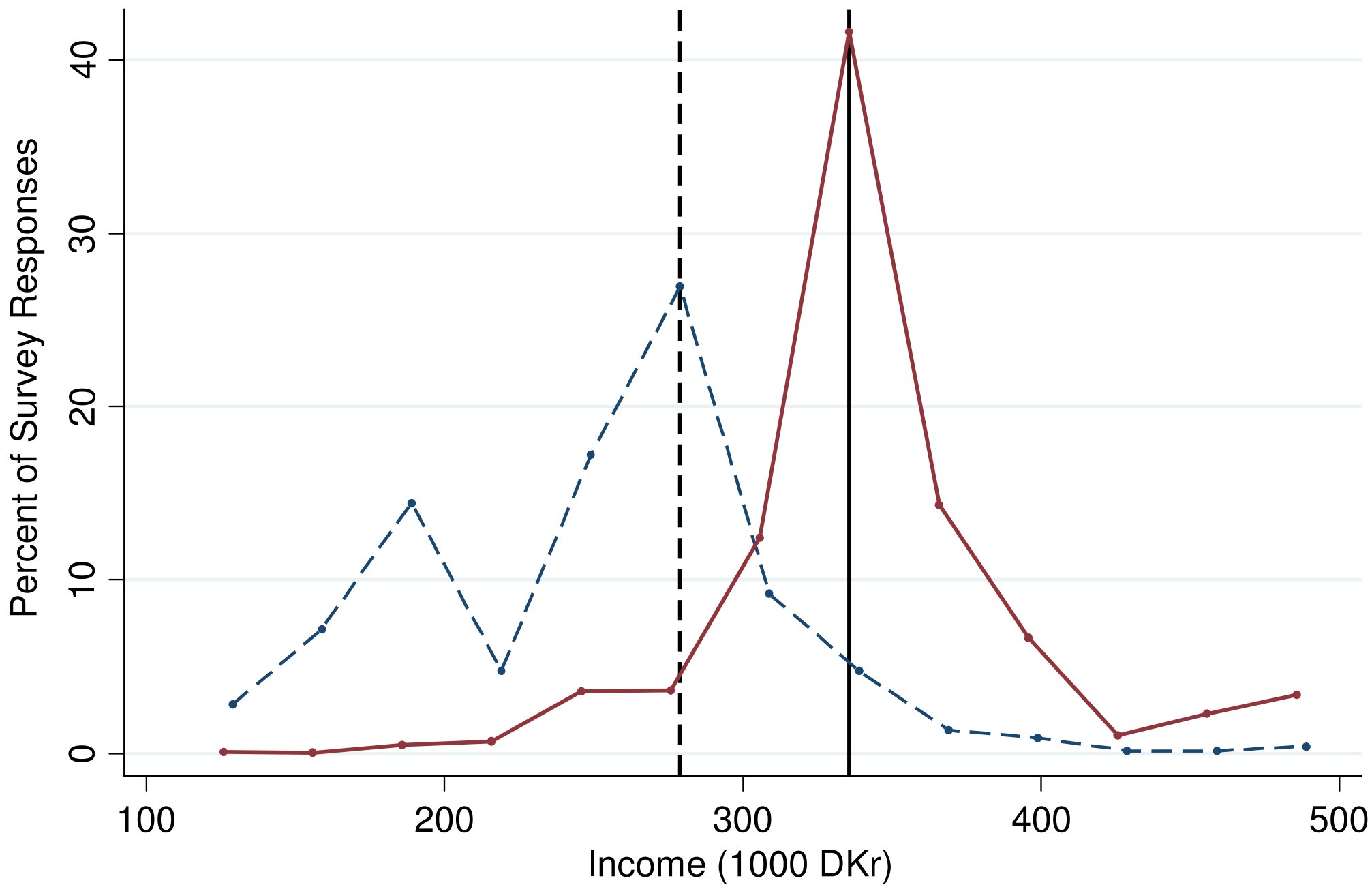# Observed Elasticity Estimates Using Small Tax Reforms

Dependent Variable: % Change in Labor Income:

Variable:	Subgroup: All Wage Earners (1)	(2)	Married Females (3)	Married Fem. Professionals w/ High Exp. (4)	Wage Earners > 200K (5)
% Change in NTR	-0.005 (0.003)	-0.007 (0.004)	0.002 (0.005)	0.001 (0.011)	-0.001 (0.003)
Labor Income Spline	x	x	x	x	x
Total Income Spline	x	x	x	x	x
Year Fixed Effects	x	x	x	x	x
Age Fixed Effects	x	x	x	x	x
Region Fixed Effects		x			
Occupation Fixed Effs.		x			
Gender/Married FE		x			
Sample Size	11,512,625	8,189,920	3,136,894	156,527	7,480,900

Observed Elasticity vs. Size of Tax Change

Observed Elasticities

Log Change in Net-of-Tax Rate
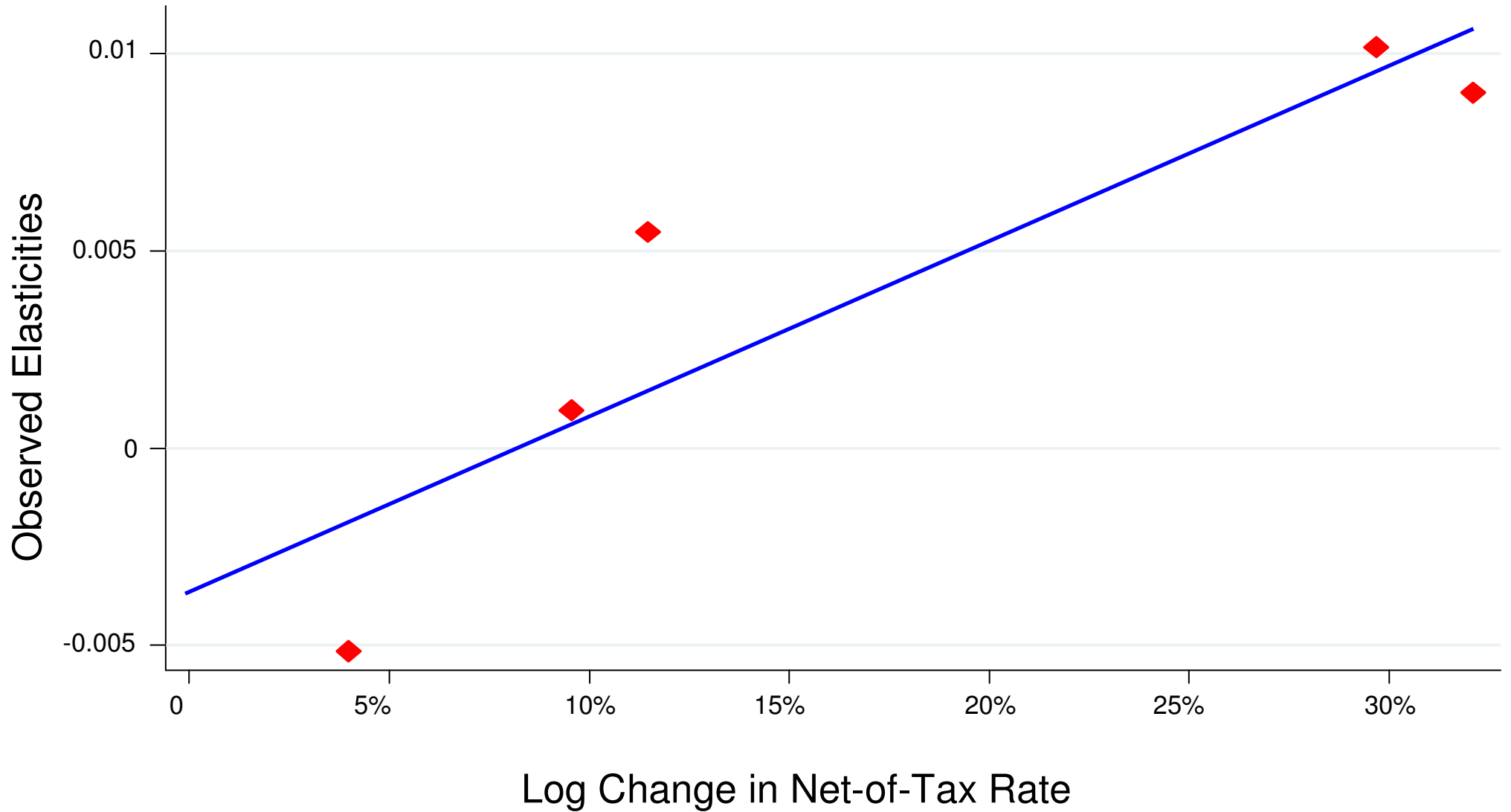
Survey Evidence on Knowledge About Middle and Top Tax Cutoffs

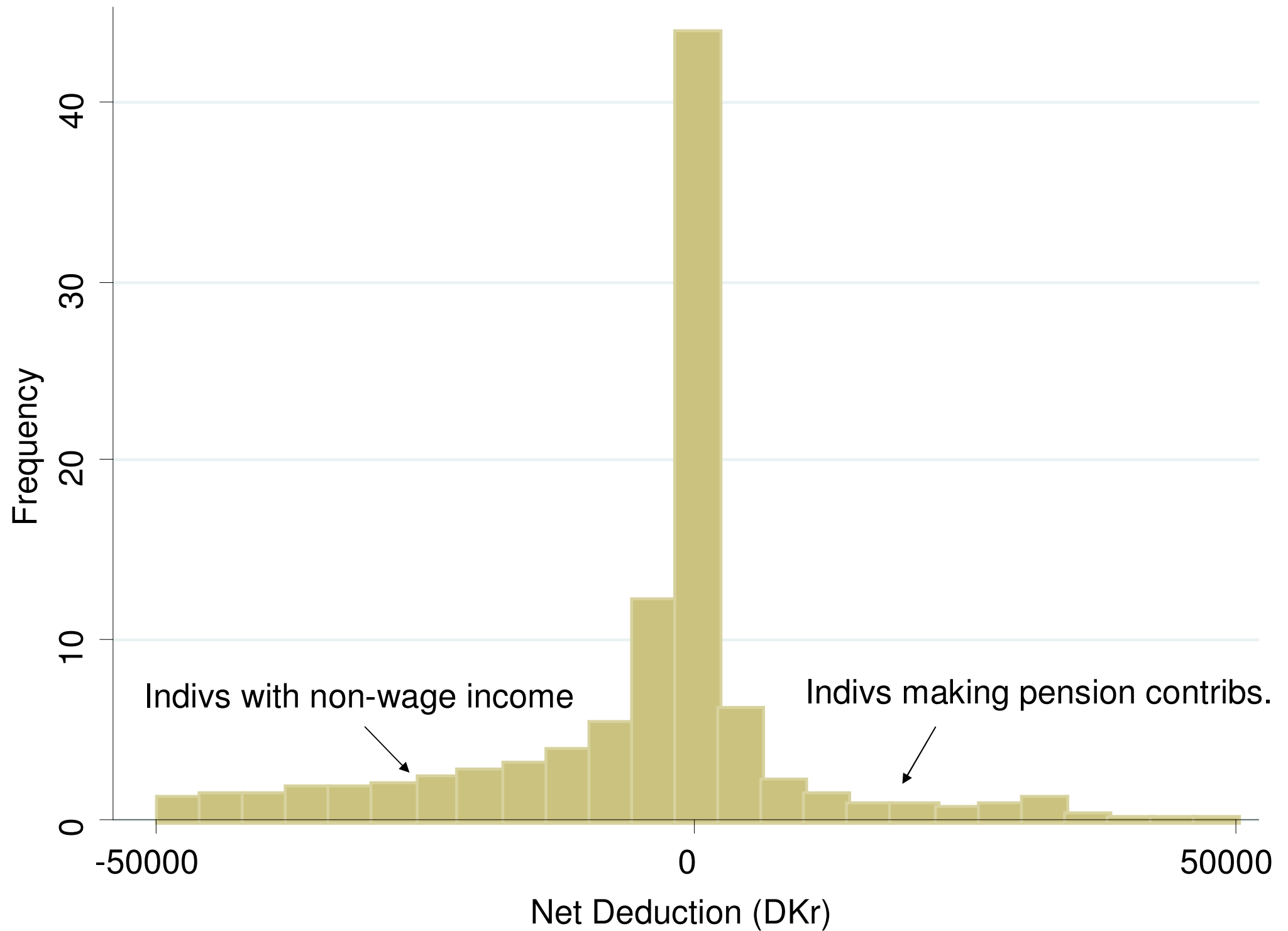Y-axis: Percent of Survey Responses

X-axis: Income (1000 DKr)

Legend:
- Perceived Middle Tax Cutoff
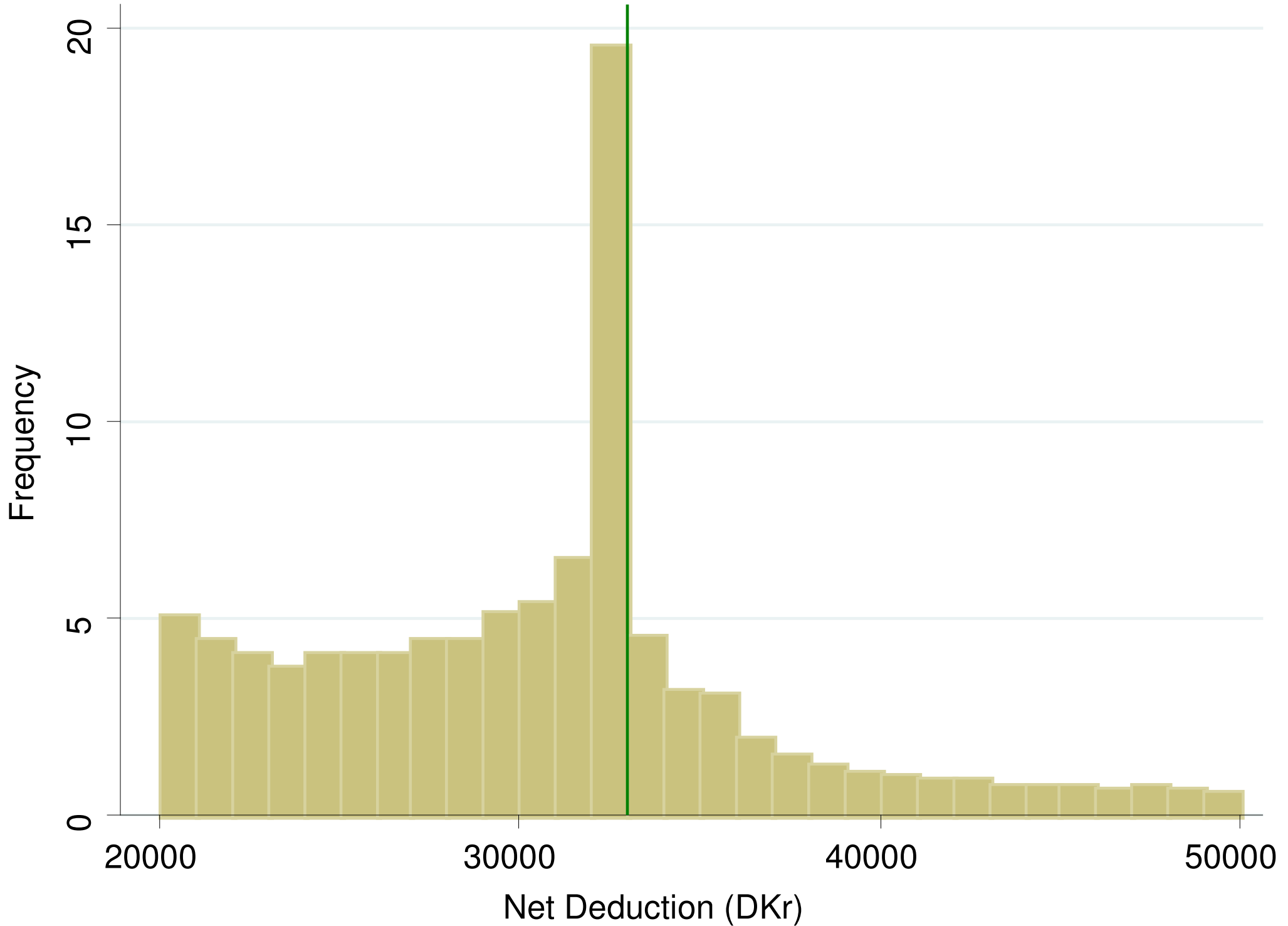- Perceived Top Tax Cutoff

PREDICTION 2: Firm Responses and Scope of Kinks

- Do tax incentives that affect a larger group of workers generate larger elasticities?

- Need variation in size of group affected by a tax change

    - Exploit variation in deductions and non-wage income across workers

    - Creates variation in effective location of top bracket cutoff (the labor income required to be just at the top bracket)

- We focus on two kinks:

    - Statutory top tax kink, faced by 60% of population

    - "Pension" kink, faced by 2.5% of population

Distribution of Net Deductions

Frequency (y-axis)

Net Deduction (DKr) (x-axis): -50000 to 50000

Indivs with non-wage income
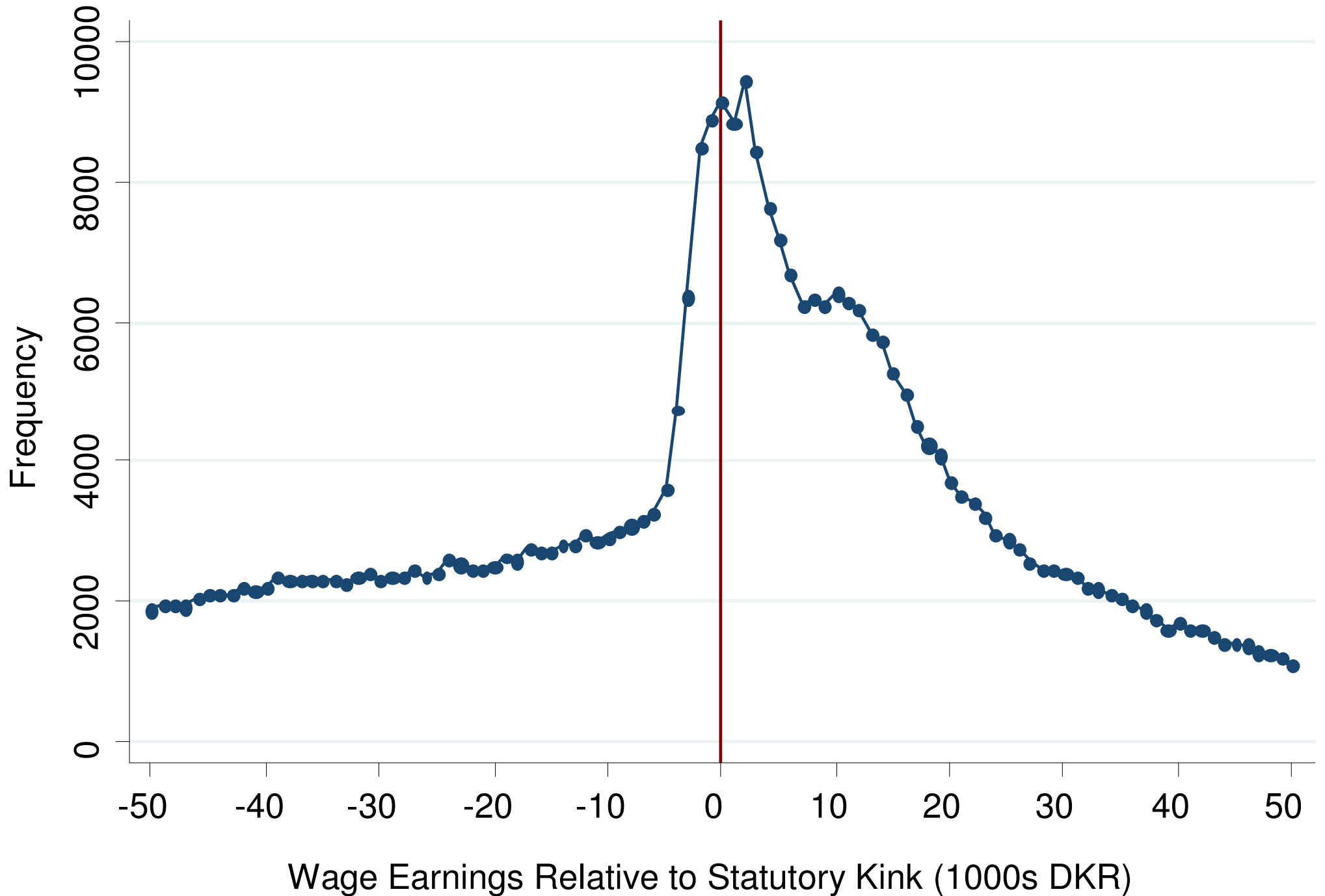
Indivs making pension contribs.

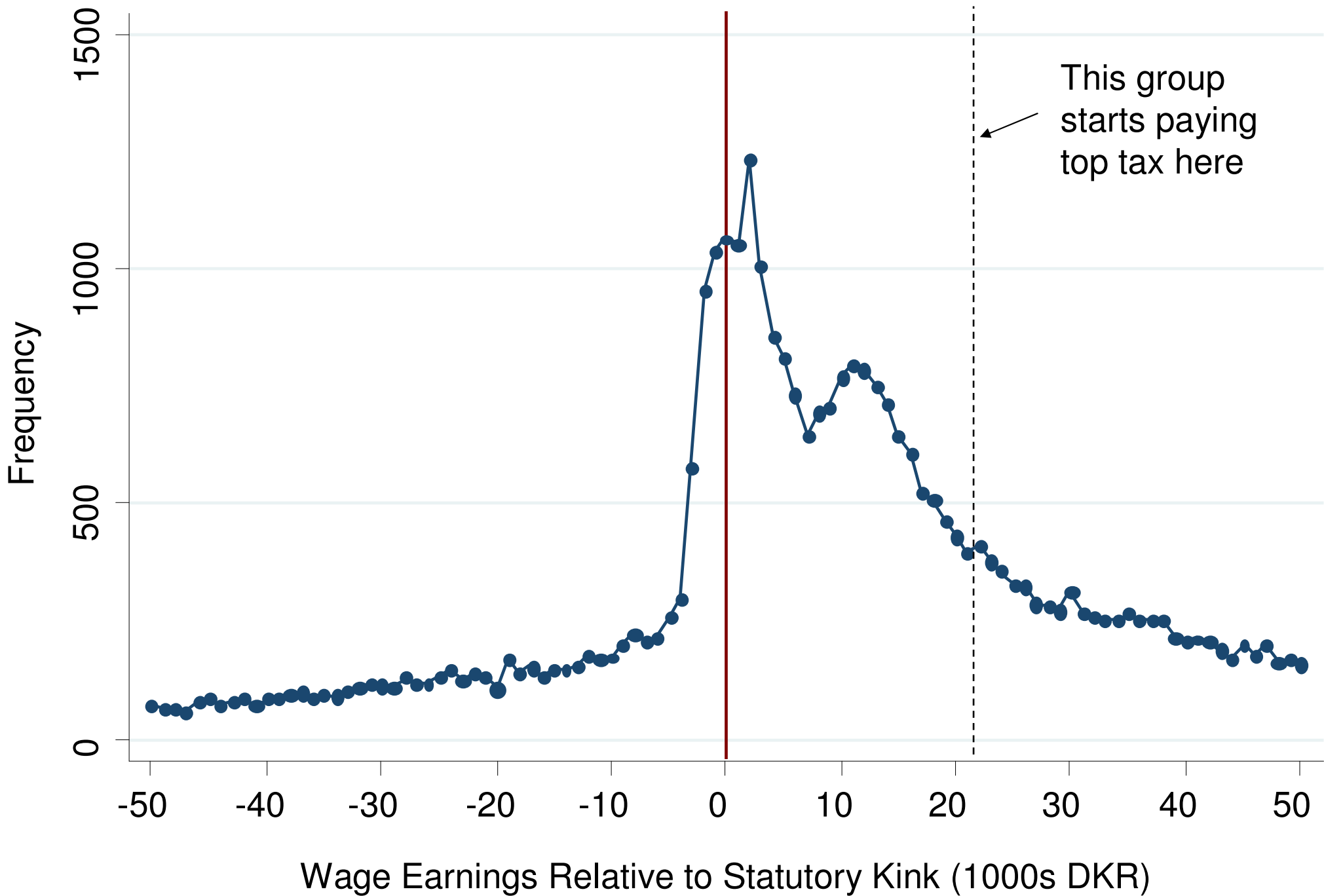Distribution of Net Deductions Given Deductions > DKr 20,000

PREDICTION 2: Firm Responses and Small vs. Large Groups

- Prediction 2.1: Aggregate bunching at common "statutory top kink"

  - Firms should have excess propensity to structure jobs so that salaries are close to *statutory* top bracket cutoff because 60% of workers face that cutoff

  - Signature of aggregate bunching: bunching among people who do not face a given change in tax incentives

- Examine wage earnings distribution at occupation level because of prevalence of collective wage bargaining in Denmark

- Start with case study of one of the largest occupations: teachers

Wage Earnings Distribution: Teachers

Frequency (y-axis): 0, 2000, 4000, 6000, 8000, 10000

Wage Earnings Relative to Statutory Kink (1000s DKR) (x-axis): -50, -40, -30, -20, -10, 0, 10, 20, 30, 40, 50

Wage Earnings Distribution: Teachers with Deductions > DKr 20,000

This group starts paying top tax here

Modes of Occupation-Level Wage Earnings Distributions
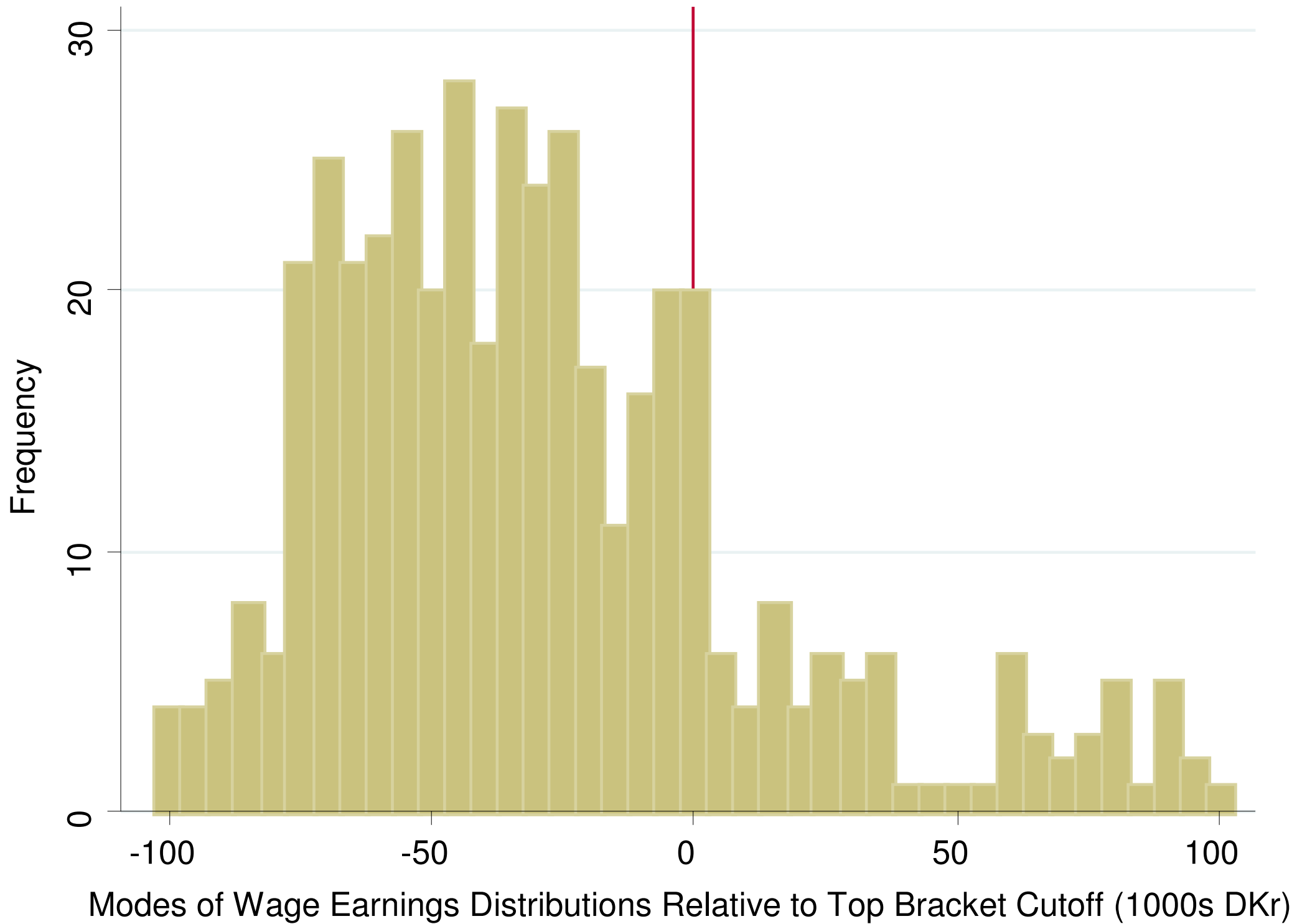
Frequency

30

20

10

0

-100   -50   0   50   100

Modes of Wage Earnings Distributions Relative to Top Bracket Cutoff (1000s DKr)

PREDICTION 2: Firm Responses and Small vs. Large Groups

- Prediction 2.1: Aggregate bunching at common "statutory kink"

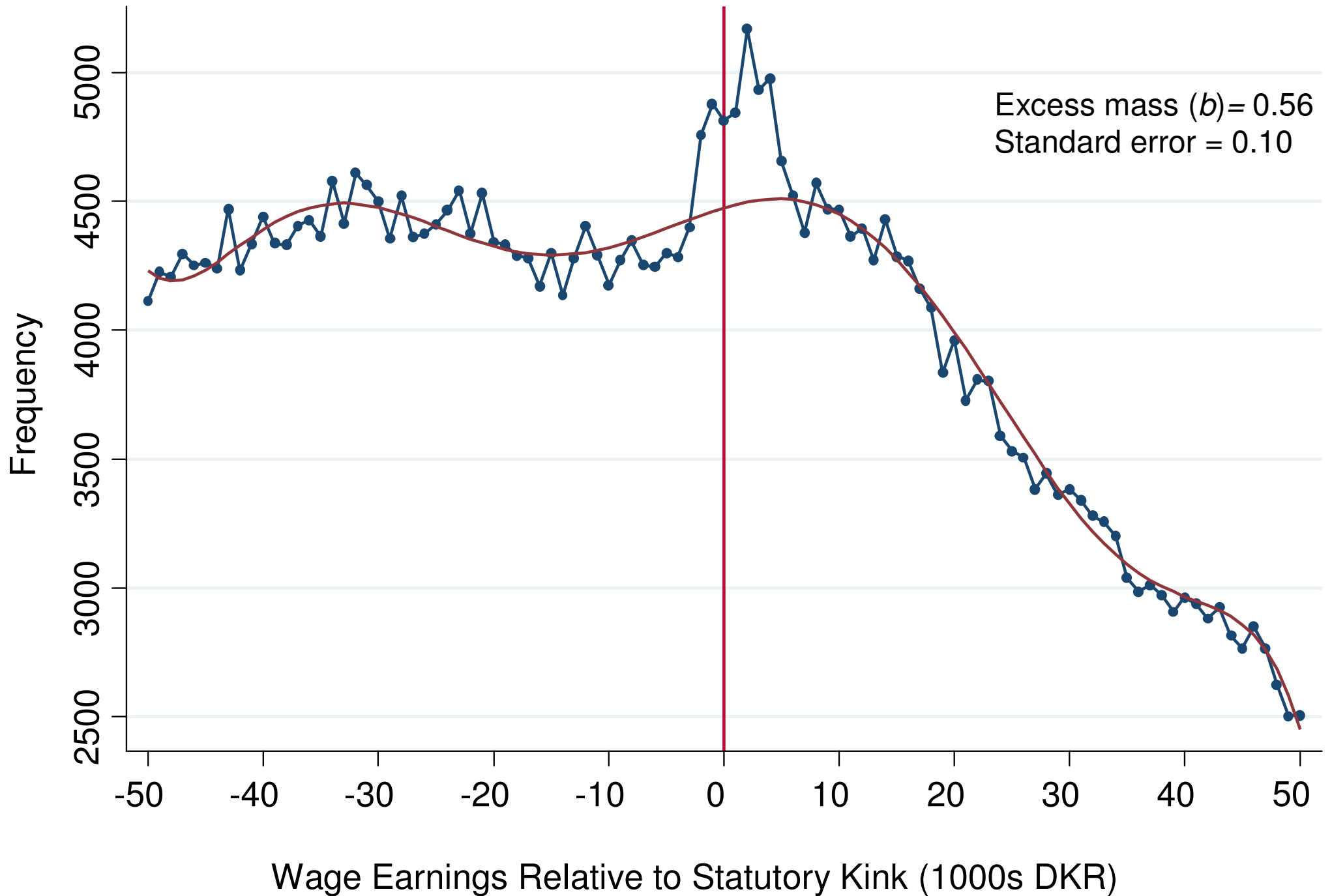- Prediction 2.2: Individual bunching but no aggregate bunching at the uncommon "pension kink"

Wage Earnings Around Pension Kink: Deductions > 20,000

Excess mass (b) = 0.70
Standard error = 0.20

Frequency

Wage Earnings Relative to Pension Kink (1000s DKR)

Wage Earnings Around Pension Kink: Deductions Between 7,500 and 25,000

Excess mass (*b*)= -0.01
Standard error = 0.15

Frequency

Wage Earnings Relative to Pension Kink (1000s DKR)

Wage Earnings Around Statutory Kink: Deductions Between 7,500 and 25,000

Excess mass (b) = 0.56
Standard error = 0.10

Frequency

Wage Earnings Relative to Statutory Kink (1000s DKR)

PREDICTION 2: Firm Responses and Small vs. Large Groups

- Prediction 2.1: Aggregate bunching at common "statutory kink"

- Prediction 2.2: No aggregate bunching at uncommon "pension kink"

- Prediction 2.3: More bunching for individuals with small deducs.

  - Use a grouping instrument to isolate exogenous variation in deductions

    - Split pop. into gender-age-married-year groups

    - Calculate fraction of each group with |net ded.| < 7500

    - Use this group average as a proxy for how "common" an individual's deductions are

  - Estimate observed elasticity from bunching for each group and test if groups with smaller deductions bunch more

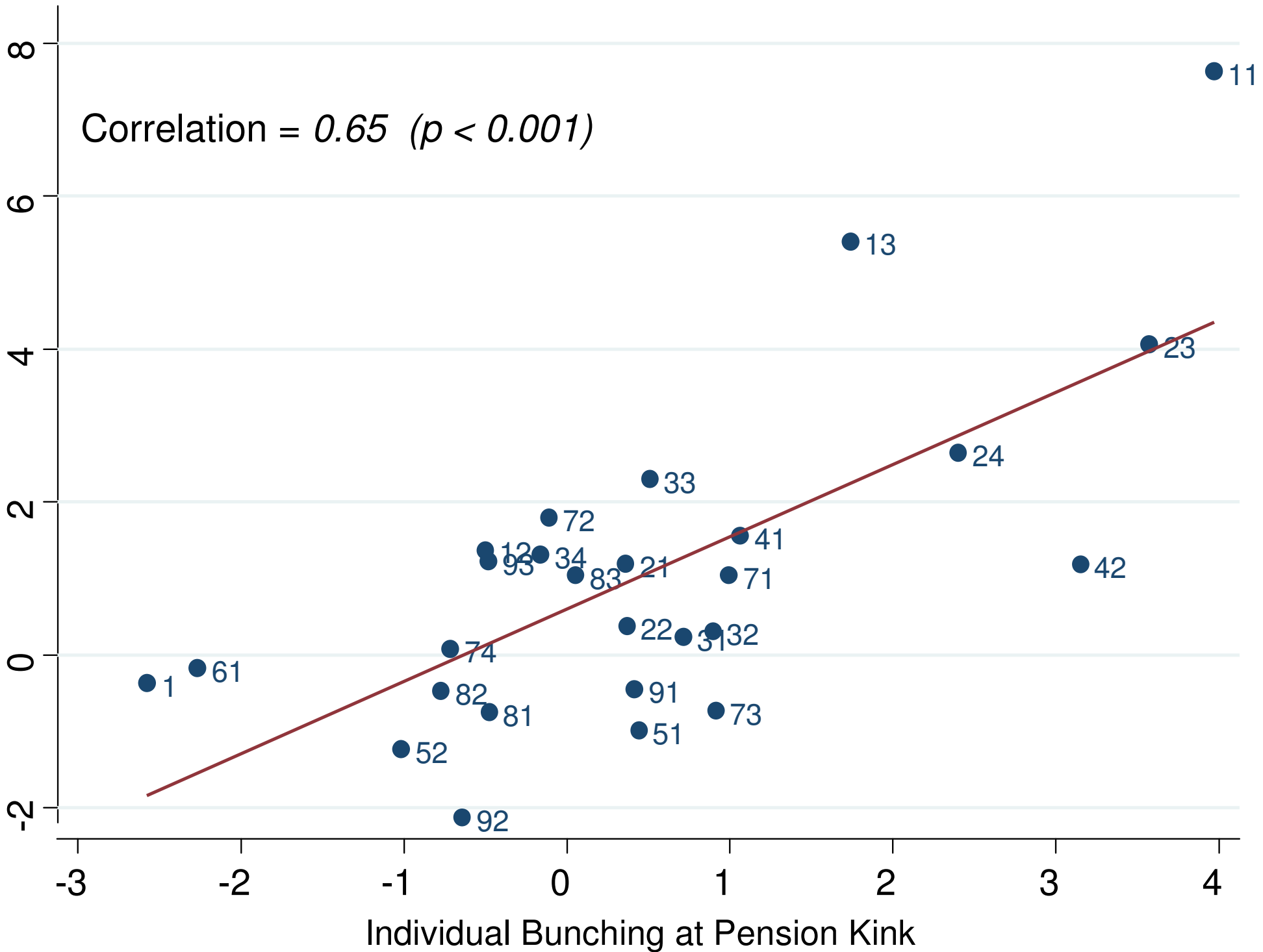**Observed Elasticities vs. Scope of Tax Kink**
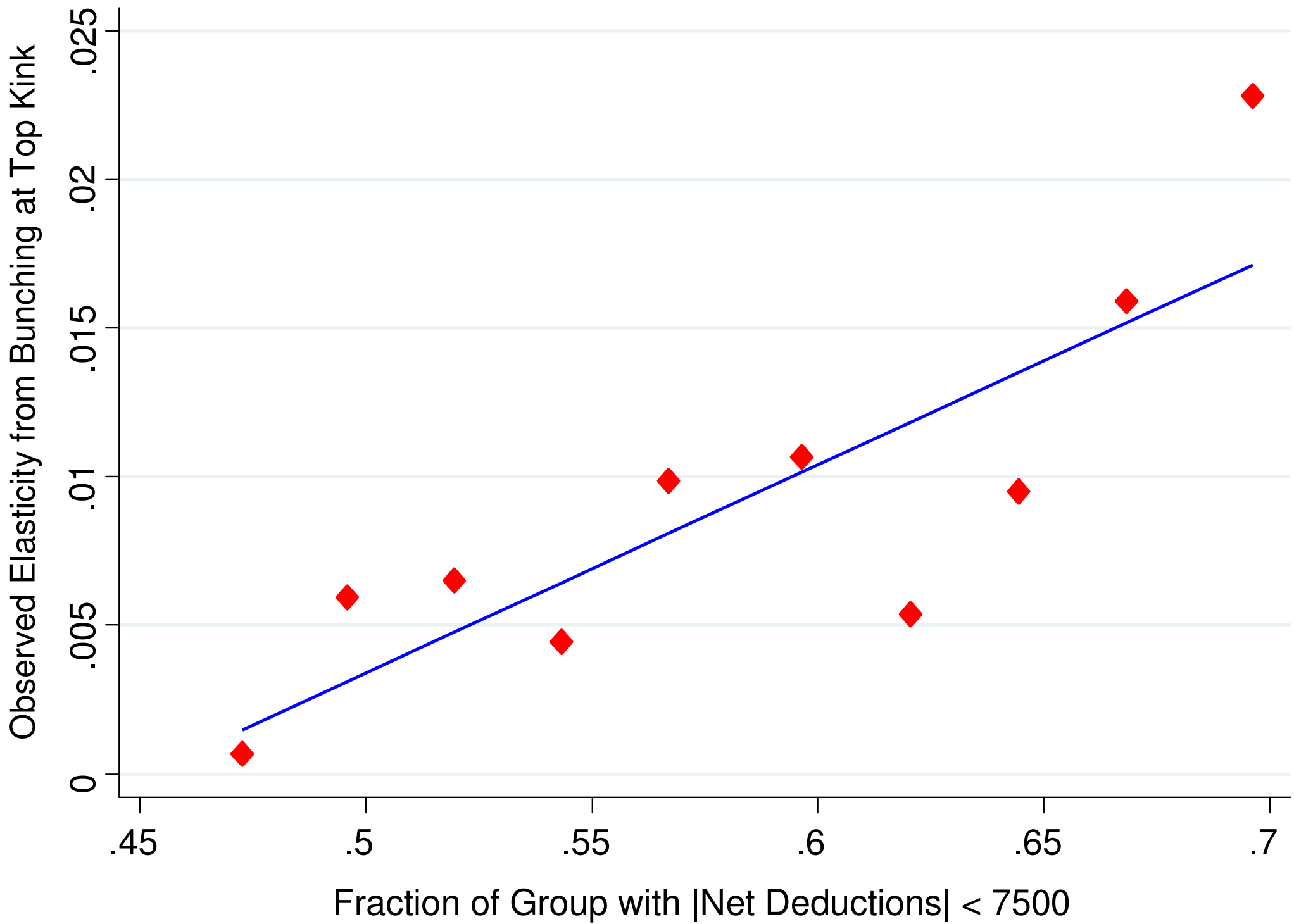
PREDICTION 3: Correlation between Individual and Aggregate Bunching

- Model predicts firms cater to workers' preferences

  - Therefore should see more aggregate bunching in occupation where individuals themselves want to bunch more

- Test by looking at correlation of aggregate and individual bunching across occupations

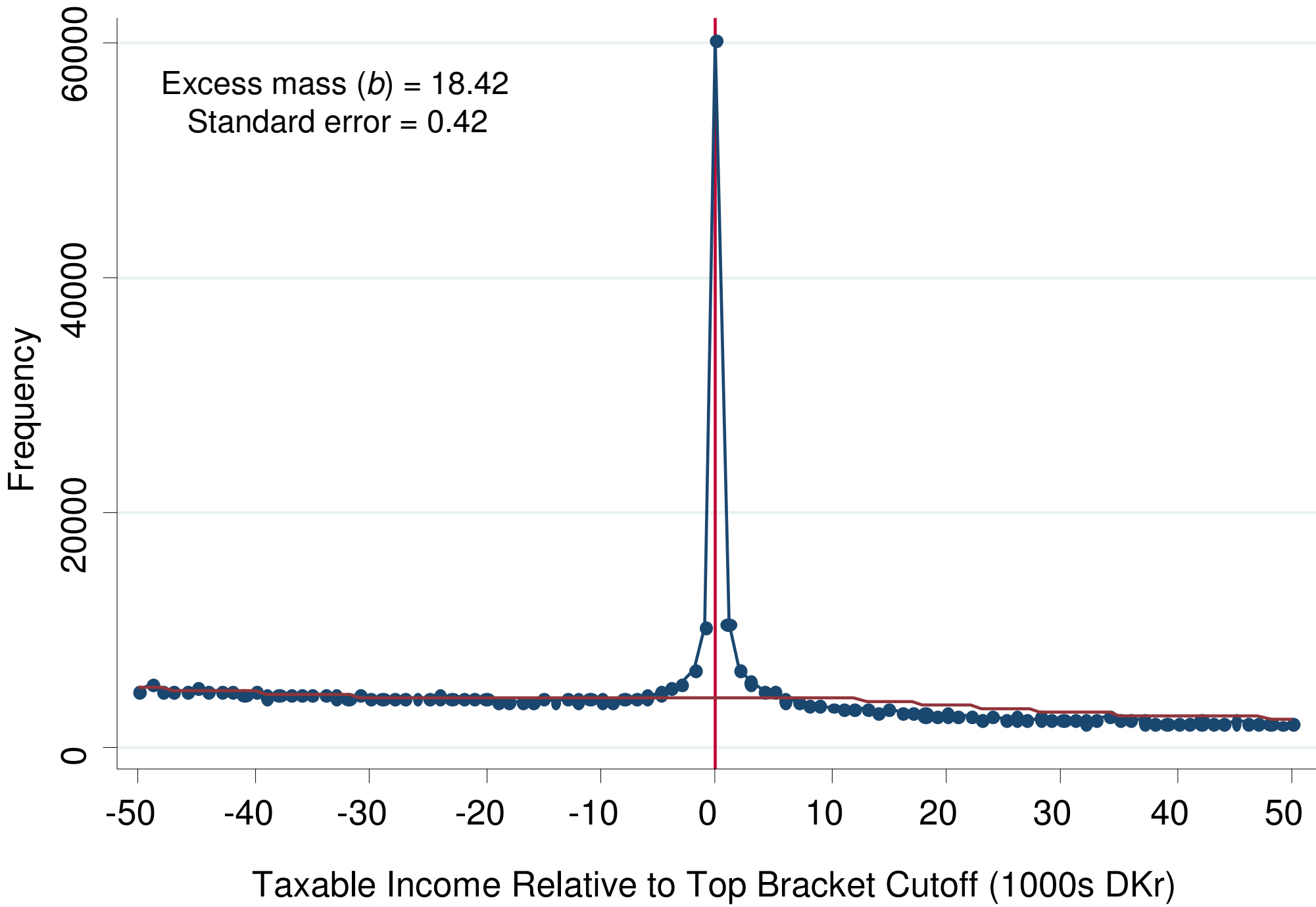 - Classify occupations by two-digit ISCO codes

Correlation between Individual and Aggregate Bunching

Correlation = *0.65 (p < 0.001)*

Self-Employed: Taxable Income Distribution around Top Tax Cutoff

Excess mass (b) = 18.42
Standard error = 0.42

Frequency

Taxable Income Relative to Top Bracket Cutoff (1000s DKr)

Conclusion

- Search costs and institutional constraints attenuate short run behavioral responses substantially

- What is the long run elasticity of policy interest?

  - Evidence suggests an order of magnitude higher than microeconomic estimate:

    - Evidence from self-employed

    - Rough calibration of search model

  - May help explain why cross-country comparisons find larger elasticities