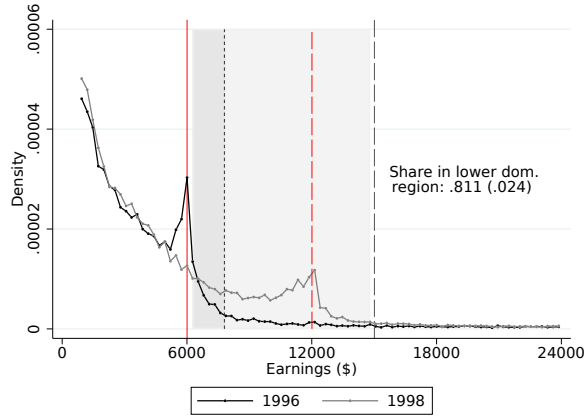# Online Appendix

"Labor Supply Responses to Learning the Tax and Benefit Schedule"

**Andreas R. Kostøl and Andreas S. Myhre**

A Additional Tables and Figures

## Figure A.1: Nonoptimizers in Lower Range of Dominated Region

Notes: The figure illustrates the earnings distributions of DI recipients in 1996 and 1998. The dark shaded region and short dashed line denote the lower part of the dominated region in which we can identify the fraction of nonoptimizers for in 1996. Our non-parametric approach covers 20 percent of the dominated region using 1998 as a counterfactual. The light-gray shaded region and long-dashed line denote the full dominated region in 1996. The sample consists of DI recipients with full (100 percent) benefit at the beginning of the calendar year during the period 1996 to 1998. Earnings are adjusted using the average wage growth, and are reported in 2015 dollars (NOK/$ = 7.5).

Figure A.2: Fraction of Nonoptimizers in 2014

(a) Nonoptimizers Over Full Dominated Range
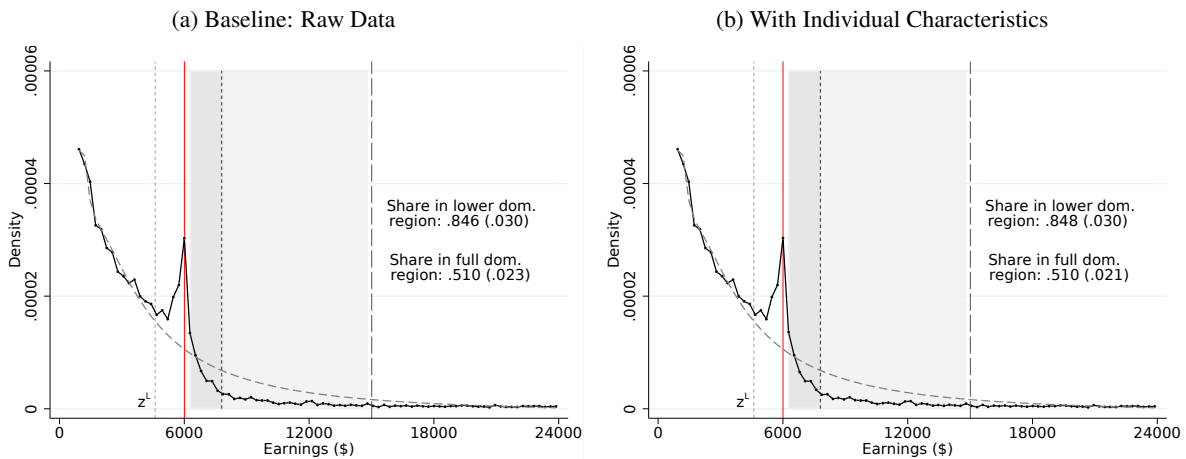
(b) Nonoptimizers By Polynomial Order
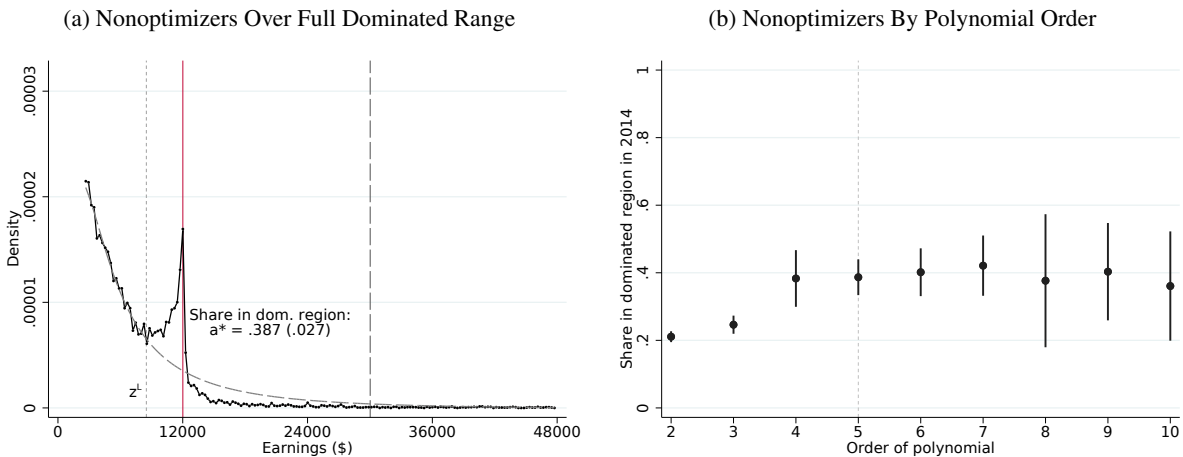
Notes: Figure a illustrates the earnings distribution of DI recipients in 2014 and the fitted counterfactual density using the polynomial approach. The polynomial order is chosen to minimize the distance between the estimate of nonoptimizers from the non-parametric approach and the parametric approach for the lowest range of the dominated region (see Figure 3a). The long-dashed line denotes the full dominated region, the red line denotes the SGA threshold in 2014. The short-dashed line represents the lower part of the excluded range. Figure b shows the sensitivity of the estimated fraction of nonoptimizers to the polynomial order of the fitted counterfactual density. The sample consists of DI recipients with full (100 percent) benefit at the beginning of 2014 and an award date after January 1st, 2004. Earnings are adjusted using the average wage growth, and are reported in 2015 dollars (NOK/$ = 7.5).

## Figure A.3: Dominated Behavior and Strength of Notch Incentives
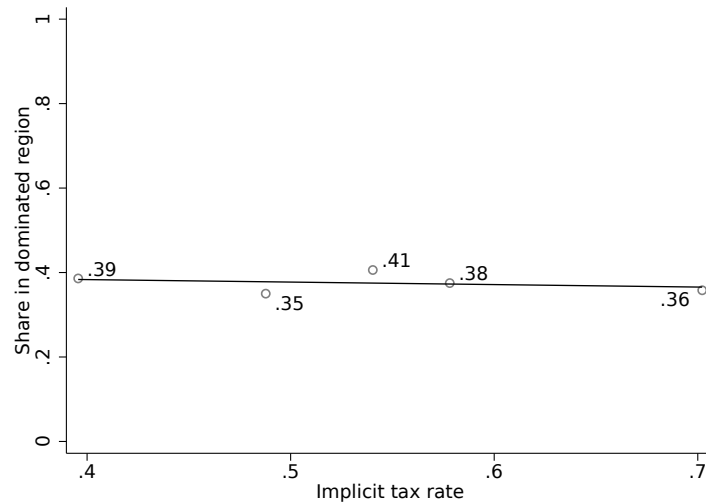
Notes: This figure plots subsample estimates of the fraction of nonoptimizers among DI recipients in 2014 using the polynomial approach (see Figure 4). The implicit tax rate is calculated using the benefit level over average indexed earnings. The sample consists of DI recipients with full (100 percent) benefit at the beginning of 2014 with DI award after January 1st, 2004.

Figure A.4: Nonoptimizers in Lower Dominated Region: Controlling for Individual Characteristics
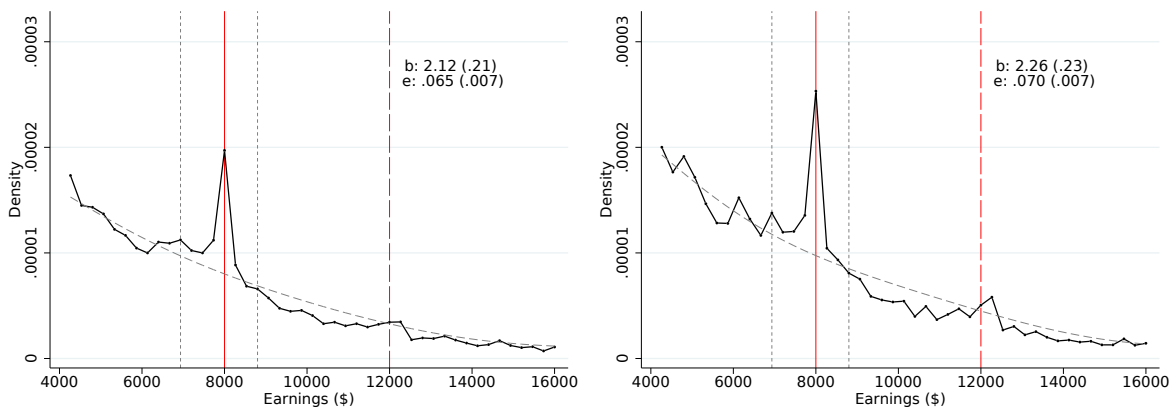

Notes: Figure a illustrates the earnings distribution of DI recipients in 1996 and the fitted counterfactual density using the polynomial approach. The polynomial order is chosen to minimize the distance between the estimate of nonoptimizers from the non-parametric approach and the parametric approach for the lowest range of the dominated region (see Figure 3a). The dark shaded region and short dashed line denote the lower part of the dominated region in which we can identify nonoptimizers using 1997 as a non-parametric estimate for the counterfactual distribution in 1996. The light-gray shaded region and long-dashed line denote the full dominated region in 1996. The red (dashed) line denotes the old (new) SGA threshold. Figure b shows the sensitivity of the estimated fraction of nonoptimizers over the full dominated range after we re-weight observations using propensity score weights $w(x) = \frac{P(B=1|x)}{P(B=1)} \frac{1-P(B=1)}{1-P(B=1|x)}$, where $P(B=1)$ denotes the probability of bunching. The probability is estimated using a logit specification, controlling for a dummy for each age, and education level, gender, and year of award.

Figure A.5: Dynamics of Dominated Behavior Over Time
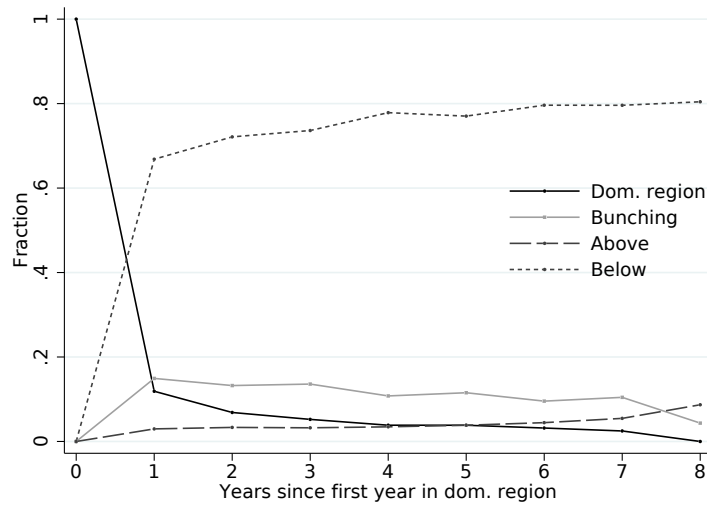
Notes: The figure illustrates the dominated behavior of individuals relative to the first year a person is observed with earnings in the dominated region. The sample consists of DI recipients between 2004-2014 with full (100 percent) benefit at the beginning of the calendar year and an award date after January 1st, 2004.

Figure A.6: Polynomial Approach: Bunching Elasticity in 2015

(a) Notch sample: Bunching Elasticity in 2015	(b) Kink sample: Bunching Elasticity in 2015

Notes: Figure a illustrates the earnings distributions in 2015 of DI recipients awarded benefits after January 1, 2004 and the fitted counterfactual density using the polynomial approach. Figure b illustrates the earnings distributions in 2015 of DI recipients awarded benefits before January 1, 2004 and the fitted counterfactual density using the polynomial approach. The red (dashed) line denotes the old (new) SGA threshold. The polynomial order is chosen to minimize the distance between the estimate from the non-parametric approach and the parametric approach (see Figures 3a and 3b). The sample consists of DI recipients with full (100 percent) benefit at the beginning of 2015. Earnings are adjusted using the average wage growth, and are reported in 2015 dollars (NOK/$ = 7.5).

Figure A.7: Specification Checks for Polynomial Approach: Bunching Elasticity in 2015
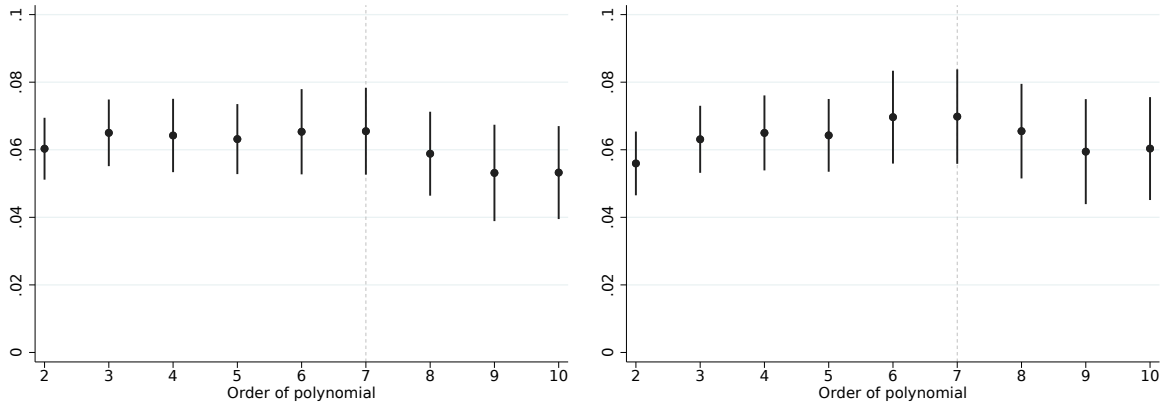
(a) Notch sample: Sensitivity of Bunching Elasticity in 2015   (b) Kink sample: Sensitivity of Bunching Elasticity in 2015

Notes: Figure a illustrates the estimated bunching elasticity in 2015 for DI recipients awarded benefits after January 1, 2004. Figure b illustrates the earnings distributions in 2015 of DI recipients awarded benefits before January 1, 2004 and the fitted counterfactual density using the polynomial approach. The dots represent point estimates, and the solid vertical lines represent 95 percent confidence intervals. The x-axis represent different specifications for the polynomial order in equation 3. The two samples consist of DI recipients with full (100 percent) benefit at the beginning of 2015. Earnings are adjusted using the average wage growth, and are reported in 2015 dollars (NOK/$ = 7.5).
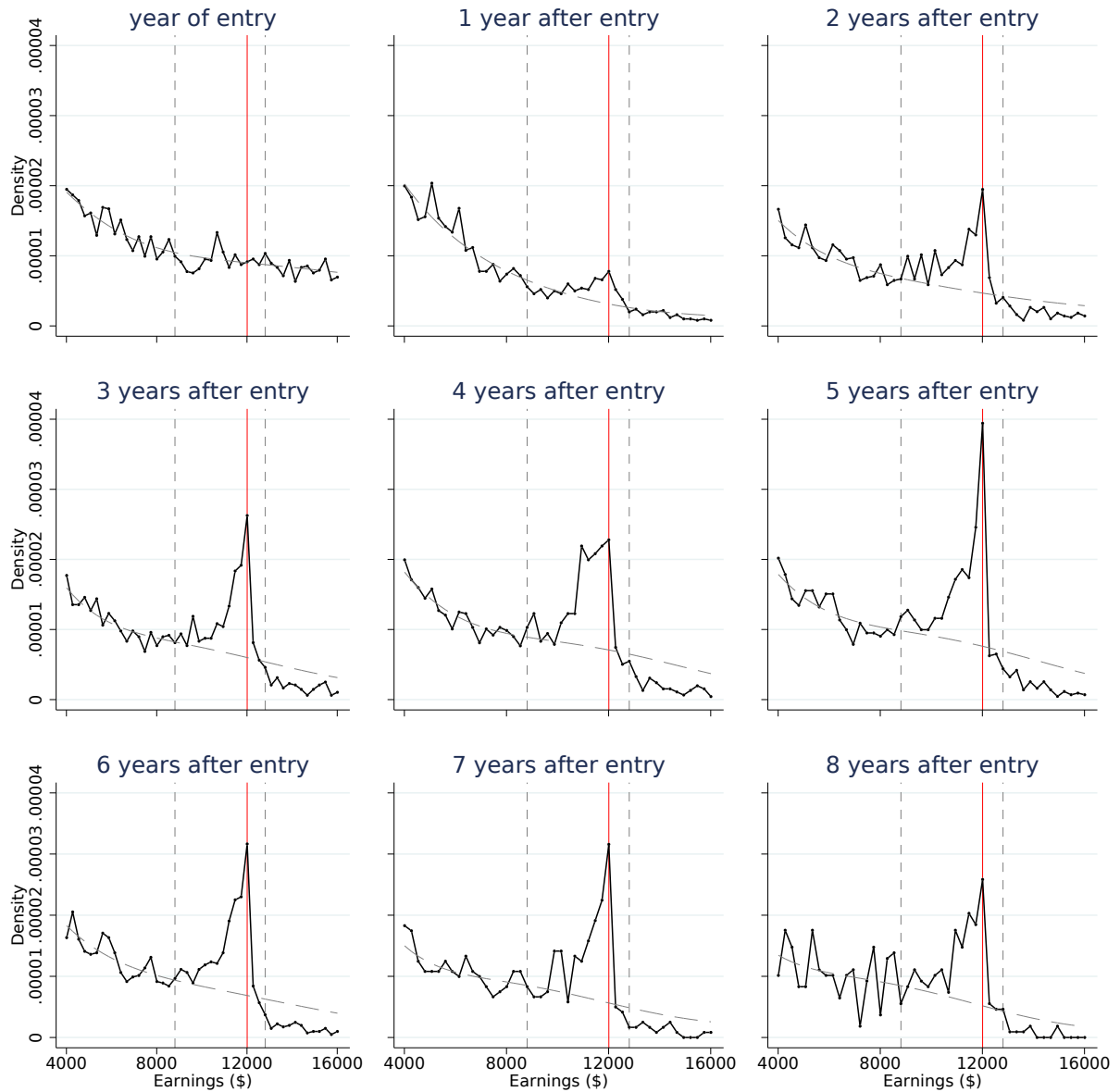
Figure A.8: Earnings Distributions by Years Since DI Award for Kink Sample

Notes: The figures show the earnings distributions around the SGA threshold (marked by the red line) for each year since DI award for the sample of recipients awarded DI in 2003 and faced a kinked budget (see Figure 2b). The gray long-dashed lines illustrate 7th degree polynomials fitted to the empirical distributions. The excluded bunching region is indicated by the vertical gray lines in each graph. In each figure, we use bins of $266 (2,000 NOK). Earnings are measured in 2015 dollars (NOK/$ = 7.5).

Figure A.9: Bunching Elasticities by Years Since DI Award
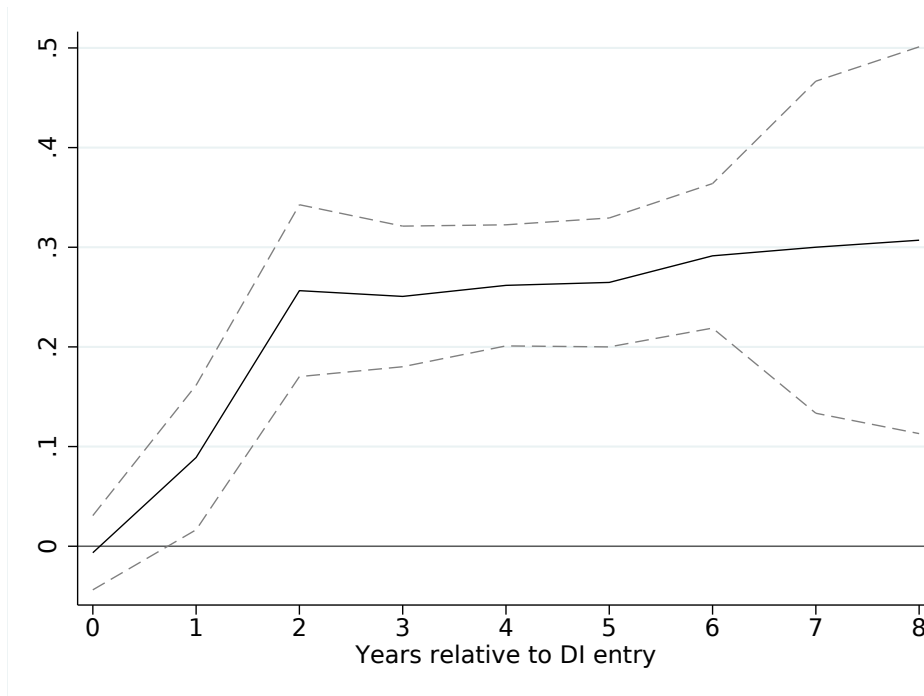
Notes: The figure shows the bunching elasticity for each year since DI award for the sample of recipients awarded DI in 2003 who faced a kinked budget (see Figure 2b) with full (100 percent) benefit. The dashed lines indicate 95 percent confidence intervals. The baseline specification uses the polynomial order that minimizes the distance between the estimate from the non-parametric approach and the parametric approach ($p = 7$).

Figure A.10: Observed vs. Structural Elasticities Across Selected Studies
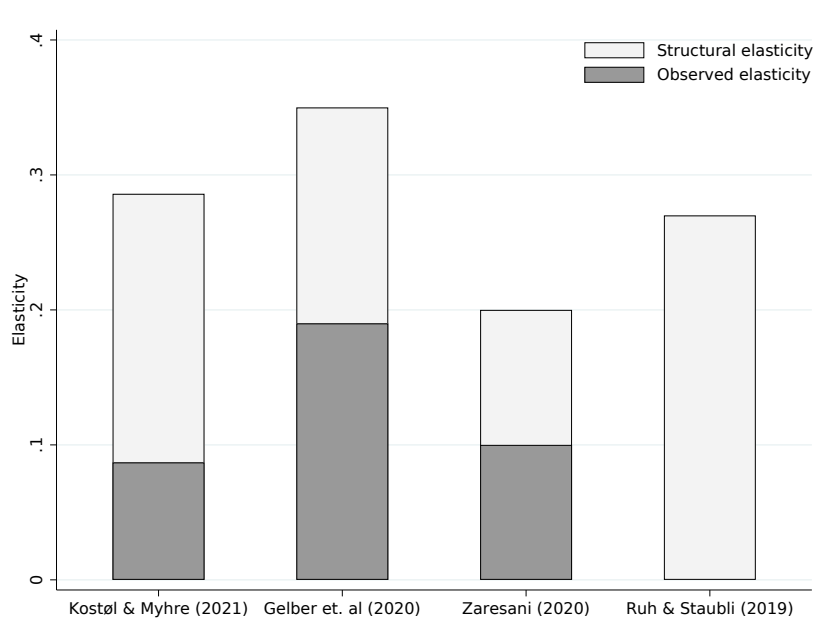
Notes: This figure plots estimates of observed and structural elasticities from a selected set of studies of transfer policies. The structural elasticity equals the total height of the observed and the structural elasticity.

Figure A.11: CDF Approach: Bunching Elasticity in 2015
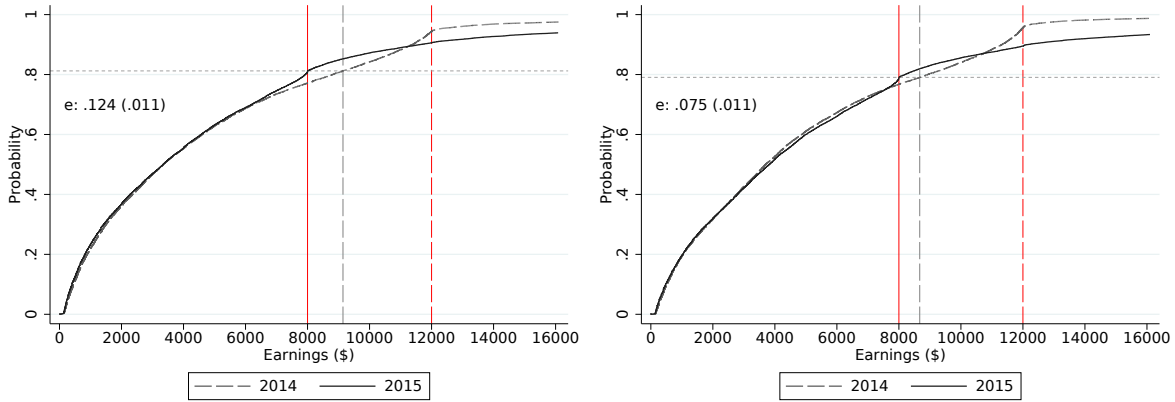
(a) Notch sample: Bunching Elasticity in 2015   (b) Kink sample: Bunching Elasticity in 2015

Notes: Figure a illustrates the cumulative earnings distributions in 2014 and 2015 for DI recipients with awards after January 1, 2004 (i.e.,. notch sample), and Figure b illustrates the cumulative earnings distributions in 2014 and 2015 for DI recipients with awards before January 1, 2004 (i.e.,. kink sample). The red (dashed) line denotes the old (new) SGA threshold. The gray dashed line represents the earnings response, and equals the SGA level in 2015 plus the response, which is calculated as the difference $F_{14}^{-1}(F_{15}(\$8,000)) - \$8,000$ (see Blomquist *et al.* (2019) for a detailed description of the approach). The sample consists of DI recipients with a full (100 percent) benefit during 2014 and 2015. Earnings are adjusted using the average wage growth, and are measured in 2015 dollars (NOK/$ = 7.5).

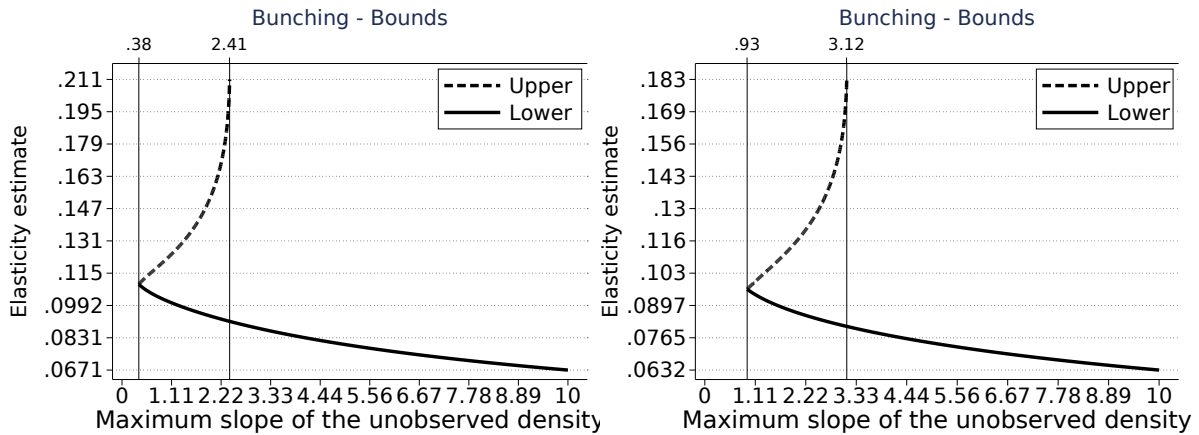### Figure A.12: Bounds on the Bunching Elasticity in 2015

(a) Notch sample: Bunching Bounds in 2015   (b) Kink sample: Bunching Bounds in 2015

Notes: Figure a illustrates upper- and lower bounds for the bunching elasticity for DI recipients with awards after January 1, 2004 (i.e., notch sample), and Figure b illustrates upper- and lower bounds for the bunching elasticity for DI recipients with awards before January 1, 2004 (i.e.,. kink sample). Earnings are transformed by the natural logarithm, and the earnings distribution is filtered in the bunching segment (from ln(8,000) - 0.12 to ln(8,000)+0.12). We then vary the maximum slope parameter from 0 to 10 to identify the bounds (see Theorem 2 in Bertanha *et al.* (2019) for a detailed description). The vertical lines denote the minimum and maximum slope of the unobserved heterogeneity. The line to the left is the smallest slope that allows a continuous probability density function (PDF) to be consistent with both the bunching mass and observed income distribution. The right line is the maximum slope before the set of possible distributions allow for a PDF that equals zero in the bunching interval (see Figure 1 in Bertanha *et al.* (2019)). The sample consists of DI recipients with a full (100 percent) benefit during 2015.

Figure A.13: Polynomial Approach: Bunching Elasticity in 2014
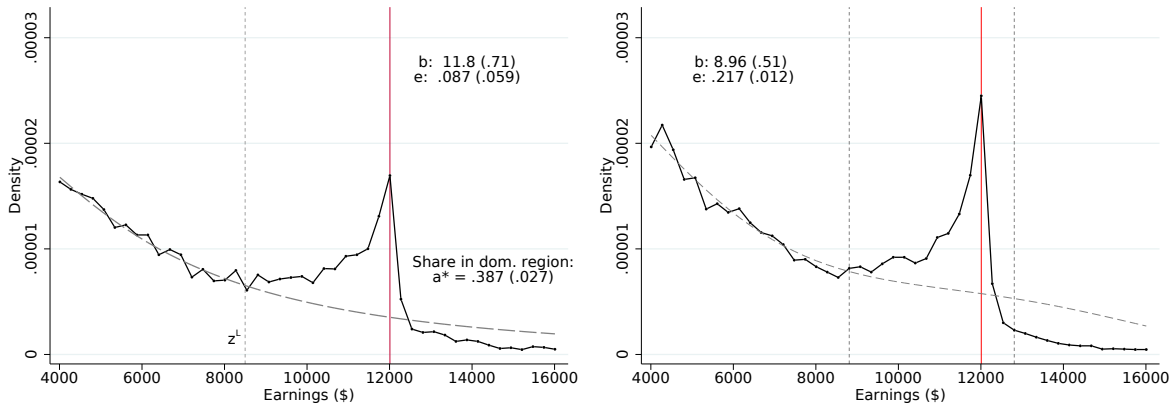
(a) Notch sample: Bunching Elasticity in 2014   (b) Kink sample: Bunching Elasticity in 2014

Notes: Figure a illustrates the earnings distribution in 2014 for DI recipients awarded benefits after January 1, 2004 and the fitted counterfactual density using the polynomial approach. Figure b illustrates the earnings distribution in 2014 for DI recipients awarded benefits before January 1, 2004 and the fitted counterfactual density using the polynomial approach. The red lines denote the SGA threshold in 2014. The polynomial order is chosen to minimize the distance between the estimate from the non-parametric approach and the parametric approach in 2015 (see Figures 3a and 3b).. The sample consists of DI recipients with full (100 percent) benefit at the beginning of 2015. Earnings are adjusted using the average wage growth, and are measured in 2015 dollars (NOK/$ = 7.5).

Figure A.14: Information letter

Returadresse:
NAV HAUGESUND POSTBOKS 353 5501 HAUGESUND

Dato: 11. juni 2015

NAV har mottatt opplysninger om inntekten din

Fødselsnummer:

Saksreferansen:

Opplysninger fra arbeidsgiver viser at den årlige arbeidsinntekten din kan bli høyere enn inntekten vi brukte til å beregne utbetalingen av uføretrygden din.

Dersom inntekten din i år overstiger 174 926 kroner skal utbetalingen av uføretrygden reduseres. Det lønner seg likevel å jobbe, fordi inntekt og uføretrygd vil være høyere enn uføretrygd alene. Selv om vi reduserer uføretrygden din, beholder du uføregraden du har fått innvilget.

Dette kan du gjøre

Vi sender deg dette brevet slik at du så tidlig som mulig kan melde fra om eventuell ny årlig forventet inntekt.

Forventer du at inntekten din i år ikke overstiger 174 926 kroner, trenger du ikke gjøre noe.

Dersom du forventer at inntekten i år overstiger 174 926 kroner, må du melde fra om den nye inntekten din. Dette kan du gjøre under menyvalget «Uføretrygd» når du logger deg inn på nav.no. Det er viktig at du melder fra om ny årlig inntekt slik at du får riktig utbetaling av uføretrygd.

Dette kan NAV gjøre

Dersom opplysninger fra arbeidsgiver på et senere tidspunkt viser at inntekten din har oversteget 174 926 kroner, reduserer vi uføretrygden. Dette kan imidlertid være for sent til at du får riktig årlig utbetaling av uføretrygden din.

Du vil motta vedtaksbrev fra NAV dersom vi justerer uføretrygden din på grunn av endret inntekt.

Dersom du har fått for lite eller for mye utbetalt i uføretrygd, foretar vi et etteroppgjør. Dette gjør vi på høsten når likningen for året for er klar.

Har du spørsmål?

Kontakt oss gjerne på telefon 55 55 33 33. Du må alltid oppgi fødselsnummeret ditt når du tar kontakt med NAV. Da kan vi lettere gi deg rask og god hjelp.

Med vennlig hilsen
NAV Forvaltning

NAV Forvaltning

Postadresse: NAV HAUGESUND // POSTBOKS 353 // 5501 HAUGESUND
Besøksadresse: DYREGATA 126 // 5527 HAUGESUND
Tel: 55 55 33 33
nav.no

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Notes: This is an example of an anonymized letter (in Norwegian) for a DI recipient working part time. **"NAV/SSA has received information about your income".** Personal identifier (removed), Case file (removed). 1st paragraph: The information from your employer shows that the annualized labor earnings can be higher than the earnings we used to calculate your benefit level. Second paragraph: If your earnings this year exceed X kroner, your benefit payments will be reduced. It still pays to work more, as earnings and benefits are higher than benefits alone. Even if we reduce your benefits, you will keep the disability rating you were awarded. **"This is what you can do".** We send you this letter so you can prepare, and notify us as soon as you expect your annual income to increase. Fourth paragraph: If you expect your annual earnings to not exceed X, you do not need to do anything. Fifth paragraph: If you expect your earnings to exceed X kroner, you will have to report your earnings. You can do this under the choice "disability benefits" when logging in to nav.no. It is important that you report your expected annual earnings to receive the correct amount of benefits. Page 2, first paragraph: **"This is what NAV can do".** If the information provided by your employer at a later date shows that your earnings exceeded X kroner, we will reduce your benefit payments. It may be too late to make sure the annual payment is correct. Second paragraph: You will receive a letter from NAV if we reduce your benefits due to changes in the level of earnings. Third paragraph: If you have received too much or too little benefits, we will make a post-settlement. **"Do you have any questions?"** Contact us at phone number Y. You will have to provide your personal identifier when contacting NAV. That way we can provide good and fast assistance.

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Figure A.15: Specification Checks for Polynomial Approach: Bunching Elasticity in 2015
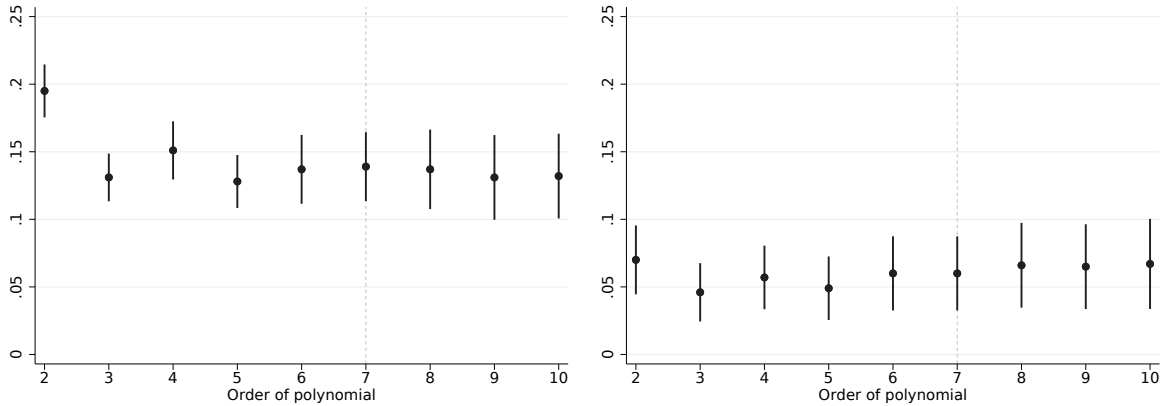
(a) Informed: Sensitivity of Bunching Elasticity in 2015   (b) Non-informed: Sensitivity of Bunching Elasticity in 2015
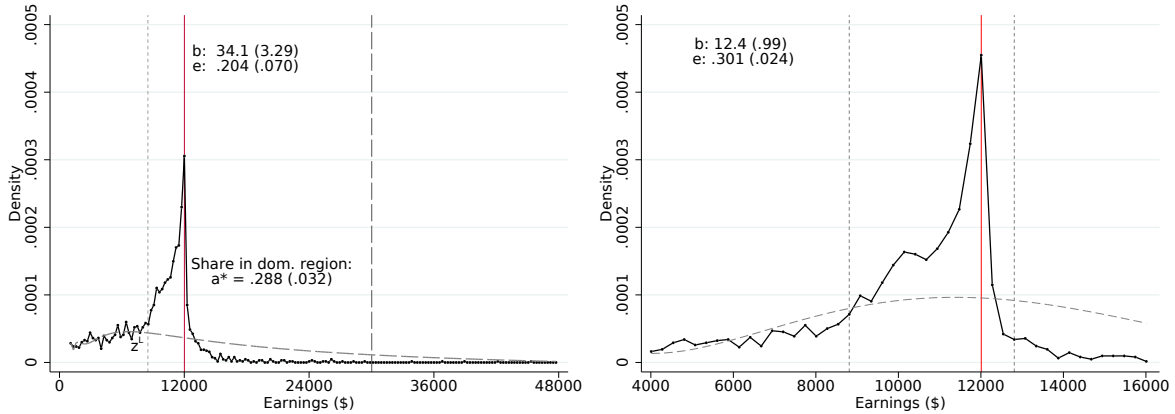
Notes: Figure a illustrates the estimated bunching elasticity in 2015 for treated DI recipients, and figure b illustrates the estimated bunching elasticity in 2015 for non-treated recipients. The dots represent point estimates, and the solid vertical lines represent 95 percent confidence intervals. The x-axis represent different specifications for the polynomial order in equation 3. The two samples consist of DI recipients with full (100 percent) benefit at the beginning of 2015 who were eligible for the information treatment (see details in 3.3). Earnings are adjusted using the average wage growth, and are measured in 2015 dollars (NOK/$ = 7.5).

Figure A.16: Weighted Earnings Distributions Around the SGA Threshold in 2014: By Information Status
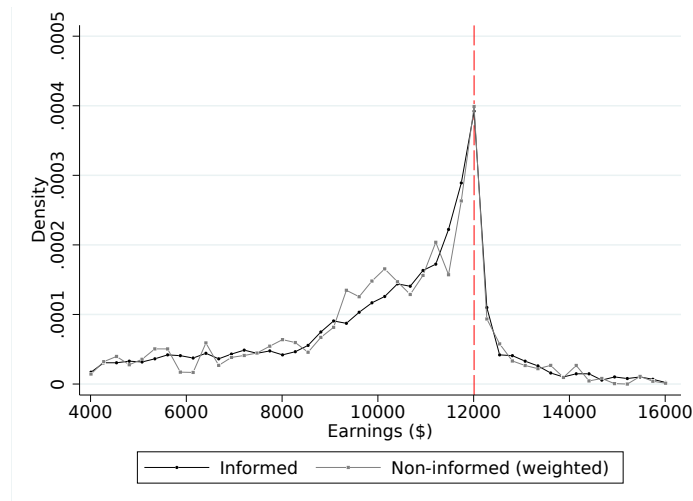
Notes: The figure shows the distribution of annual earnings in 2014 around the SGA threshold (marked by the red dashed line) in $267 (2,000 NOK) bins by information status, where the non-treated units is weighted by propensity score weights $w(x) = \frac{P(I=1|x)}{P(I=1)} \frac{1-P(I=1)}{1-P(I=1|x)}$ where $P(I=1)$ denotes the probability of receiving information treatment. $P(I=1|x)$ is estimated with a logit using DI benefits, AIE, age, years on DI, female, cohabitant, number of children and years of schooling (same as in table 2, not including earnings in 2014 and 2015) as control variables. The sample consists of DI recipients with a full (100 percent) benefit awarded DI before the 1st of January 2015 who were eligible to receive the information letter (see details in 3.3). Earnings are measured in 2015 dollars (NOK/$ = 7.5).

Figure A.17: Polynomial Approach: Bunching Among Eligible in 2014

(a) Eligible Notch Sample: Bunching Elasticity in 2014   (b) Eligible Kink Sample: Bunching Elasticity in 2014

Notes: Figure (a) illustrates the earnings distribution in 2014 for DI recipients awarded benefits after January 1, 2004 and the fitted counterfactual density using the polynomial approach. Figure (b) illustrates the earnings distribution in 2014 for DI recipients awarded benefits prior to January 1, 2004 and the fitted counterfactual density using the polynomial approach. The red lines denote the SGA threshold in 2014. The polynomial order is chosen to minimize the distance between the estimate from the non-parametric approach and the parametric approach ($p = 5$ for notch and $p = 7$ for kink). The sample consists of DI recipients with full (100 percent) benefit at the beginning of 2015, and who were eligible for the information treatment (see details in 3.3). Earnings are adjusted using the average wage growth, and are measured in 2015 dollars (NOK/$ = 7.5).

Figure A.18: Average Earnings By Information Status

Notes: The figure shows the regression coefficients from the distributed lag lag model that tests for significant differences between treated and non-treated individuals prior to the information treatment (see Section 7). The non-treated units are weighted by propensity weights $w(x) = \frac{P(I=1|x)}{P(I=1)} \frac{1-P(I=1)}{1-P(I=1|x)}$ where $P(I = 1)$ denotes the probability of receiving information treatment. $P(I = 1|x)$ is estimated with a logit using DI benefits, AIE, age, years on DI, female, cohabitant, number of children and years of schooling (same as in table 2, not including earnings in 2014 and 2015) as control variables. The sample consists of DI recipients with a full (100 percent) benefit awarded DI before the 1st of January 2015 who were eligible to receive the information letter (see details in 3.3). Earnings are measured in 2015 dollars (NOK/$ = 7.5).

Table A.1: Survey evidence on knowledge about the change in work incentives

Column:	Agree (Strongly agree), %	
	Positive earnings (1)	No earnings (2)
Panel A:		
Agrees to statement "Cash benefit is higher in 2015 than 2014"	73 (54)	68 (48)
Panel B:		
Agrees to statement "Cash benefit is taxed as labor income"	92 (78)	86 (70)
Panel C:		
Agrees to statement "From 2015, it will always pay to work more"	79 (58)	71 (51)
Panel D:		
*Understands how the change affects **myself***	34 (13)	27 (14)
Number of respondents	784	884

Notes: This table displays results from the SSA's (NAV) survey of recipients after the information package in the fall of 2014 had been sent. The letters informed recipients about the overall goal of the reform and details about the changes in work incentives. 39 percent of the sample (78 percent with assistance) recollected receiving the information package about individual thresholds and benefit levels. The survey is made available from NAV.

Table A.2: Descriptive Statistics: By information status

Sample:	Eligible ($\hat{z} > K$)				Ineligible ($\hat{z} < K$)	
	Informed		Non-informed		Comparison group	
Column:	(1)	(2)	(3)	(4)	(5)	(6)
Earnings:	mean	sd	mean	sd	mean	sd
Earnings Jan-May in 2015 ($)	4,861	(1,219)	4,713	(1,203)	1,297	(1,038)
Annual earnings in 2014 ($)	9,679	(6,344)	9,246	(5,724)	4,442	(6,340)
DI information:						
Age at DI award	41.57	(12.46)	36.85	(12.16)	34.72	(15.18)
Years on DI	13.38	(10.01)	11.36	(9.78)	14.07	(11.53)
Uncapped annual DI benefits ($)	35,807	(6,255)	34,859	(5,351)	35,229	(4,970)
Annual indexed earnings ($)	58,200	(22,162)	56,614	(14,618)	55,833	(16,569)
Characteristics:						
Females	.53		.47		.53	
Married/Cohabitants	.57		.56		.39	
Years of Schooling	10.60	(2.32)	10.49	(2.38)	10.04	(2.83)
Number of Children	1.87	(1.29)	2.02	(1.46)	1.27	(1.38)
Observations	3,642		1,521		30,179	

Notes: Columns 1, 3, and 5 report the means and Columns 2, 4 and 6 report standard deviations of key outcome variables and characteristics of three groups. The first group, "Informed" includes recipients whose projected annual earnings (PAE) were above the cutoff and who received the information letter from SSA in June 2015. The second group, "Non-informed" includes recipients whose PAE were above the cutoff, but did not receive the information letter in June 2015 e.g. due to lags in reporting. The third group, "Comparison group" includes recipients whose PAE were below the cutoff and were ineligible to receive the information letter. The sample consists of DI recipients with a full (100 percent) benefit awarded DI before the 1st of January 2015 and had positive earnings at some point during January-May 2015. Uncapped DI benefits are the initial DI benefits before being earnings tested. Annual indexed earnings summarizes earnings history before disability onset. The difference between the sample size in the second column of Table 2 and the total sample size of eligible and ineligible in this table is due to some individuals with high levels of earnings but who were ineligible for the letter. This group included individuals who reported a change in earnings before June 2015, and individuals who had already exceeded the SGA threshold by May 2015 and had already received a letter from SSA informing them about a reduction in benefit payments. All variables are measured in 2015 dollars (NOK/$ = 7.5).

Table A.3: Heterogeneous Effects of Information Treatment on Labor Market Outcomes

| | Probability to Switch Firm (1) | Effects on Labor Supply | | | | | Observations \<individuals\> (7) |
		Monthly earnings ($) (2)	Any earnings (3)	Fixed pay ($) (4)	Variable pay ($) (5)	Contract hours (6)	
A. Rigid hours	-.013	-206***	-.083***	-32**	-113***	-1.18***	28,788
	.009	30	.016	15	23	.31	\<2,399\>
p-value	.136	<.001	<.001	.037	<.001	<.001	
Dep. mean (Pre-Treatment)	.050	873	.807	243	485	9.03	
B. Flexible hours	-.009	-174***	-.079***	-20	-112***	-.97***	28,944
	.008	34	.015	18	26	.37	\<2,412\>
p-value	.270	<.001	<.001	.253	<.001	.009	
Dep. mean (Pre-Treatment)	.039	883	.727	282	473	10.51	

*** significant at 1% level, ** significant at 5% level, * significant at 10% level

Standard errors (in parentheses) are clustered at the individual level and are robust to heteroskedasticity.

Notes: The table presents estimates of the impacts of the information letter on labor market outcomes during 2015-2016. The event study is implemented using a difference-in-difference design, where we include a dummy for the treatment group, a dummy for each month of the year, and an interaction between the post-treatment period and the treatment indicator. Non-treated units are reweighed using propensity score weights $w(x) = \frac{P(I=1|x)}{P(I=1)} \frac{1-P(I=1)}{1-P(I=1|x)}$ where $P(I = 1)$ denotes the probability of receiving the information treatment, and $P(I = 1|x)$ is estimated by logit regression using the characteristics from Table 2. Fixed pay is defined by the work contract. Variable pay is defined as wages paid on an hourly basis, bonuses, overtime pay, or other payments as defined by employers. Switching employer is an indicator variable equal to one if the current employer is different from the main employer at the beginning of the calendar year. The sample consists of DI recipients with a full (100 percent) benefit awarded DI before the 1st of January 2015 who were eligible to receive the information treatment. The sample is restricted to individuals that are observed in the monthly earnings data. Dependent mean (control group) is measured before treatment. We classify an industry as Rigid vs. Flexible using the distribution of weekly hours contracts within an industry (five-digit). If the concentration (% of all contracts) of the five most common hourly contracts is below the median, we classify the industry as flexible. The estimates (available from authors upon request) do not change if we instead use the three most common hours categories. Earnings are measured in 2015 dollars (NOK/$ = 7.5).