

Earnings Capacity of Disability Insurance Recipients

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Purpose: Compensate for lost earnings capacity

Problem: Imperfect observation of earnings capacity

Policy: Compensate lost earnings capacity
vs encourage use of remaining earnings capacity

Research: Striking right balance?

Use **rejected DI applicants** to estimate earnings capacity of **successful applicants**

- US: Bound (1989), Chen & Van der Klaauw (2008), Von Wachter et al (2011), Maestas et al (2013), French & Song (2014), Autor et al (2017)
- Overestimate recipients' earnings capacity if declines while on DI

Few use responses to benefit cuts to estimate earnings capacity of recipients

- US: Moore (2015)
- NL: Borghans et al (2014)

Estimate unused earnings capacity of Dutch DI recipients

Linked admin. data on universe of DI recipients

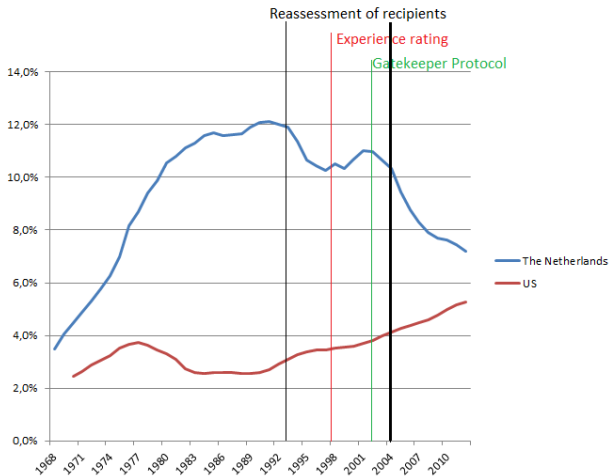
Effect of reassessment under more stringent criteria resulting in benefit cuts

Examine whether:

- earnings capacity deteriorates with time on DI
- partial disability helps retain earnings capacity
- difficult-to-verify conditions \Rightarrow greater earnings capacity
- spousal labor supply responds to benefit cuts

The only peak in the Netherlands!

Disability insurance recipients as % of insured population



Disability Insurance entitlement

Physician and vocational expert assess *earnings capacity*

$$\text{Degree of Disability} = 1 - \frac{\text{Earnings Capacity}}{\text{Pre - Disability Earnings}}$$

Degree of Disability	Replacement Rate
0-14%	0
15-24%	14%
25-34%	21%
35-44%	28%
45-54%	35%
55-64%	42%
65-79%	50.75%
80-100%	70%

Can work and supplement earnings with DI

Reassess degree of disability of all recipients < 45 years old on July 1, 2004

- 1 Medical examination
- 2 Earnings capacity calculated under **stricter** rules
- 3 Overtime excluded from pre-disability earnings

2 & 3 weakly reduced DI entitlement

▶ [Detail of changes](#)

Timing of reassessments

Reassessments of recipients aged 30-44 by year

Year	Cumulative %
2004 (Oct-Dec)	1.2
2005	46.0
2006	81.0
2007	96.5
2008	99.9
2009	100.0
TOTAL	137,814

2007: Age eligibility reduced from < 50 to < 45

Outcomes of reassessment

DI entitlement	
Terminated	24.4%
Reduced	10.4%
Unchanged	58.5%
Increased	6.4%
N	137,814

▶ Transition matrix

Younger recipients reassessed, older are not

Age group difference-in-differences?

- No, earnings trends differ by age

Assumption: age difference in earnings trends would be period invariant

If holds, period diff. in age diff. in trends identifies average effect of reassessment on reassessed

- Differential trend adjusted DID (Bell et al 1999)

► Identification assumption

Periods

- Reform: 2004-2008
- Non-reform: 1999-2003

Sample selection: Receiving DI January 1999 / 2004

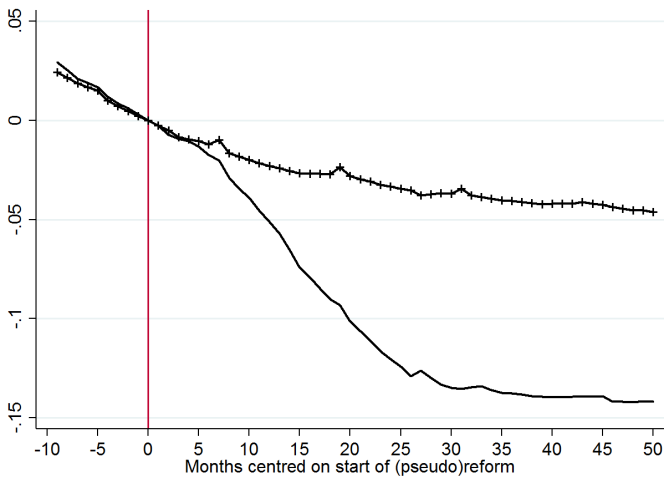
Age groups

- 30-44 years
- 50-53 years

▶ Descriptives

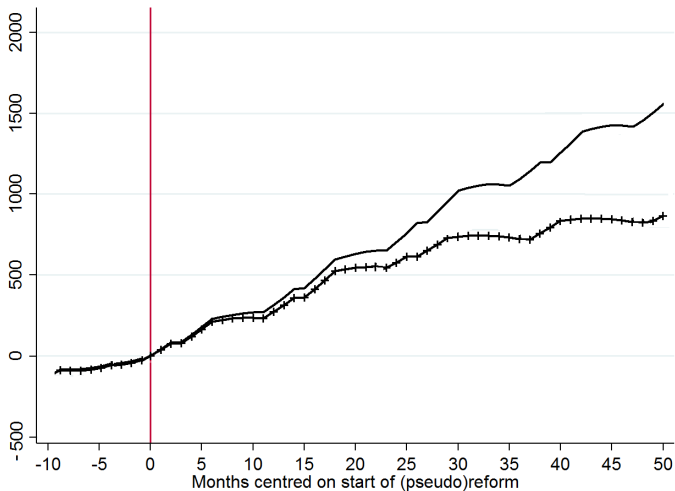
DI receipt: Age difference-in-differences by period

- Reform period sample
- + Non-reform period sample



Earnings: Age difference-in-differences by period

- Reform period sample
- + Non-reform period sample



$$Y_{it} = \sum_{t=1}^4 \left(\beta_t AGE_i \times PERIOD_i \times YEAR_t + \theta_t YEAR_t \right. \\ \left. + \gamma_t AGE_i \times YEAR_t + \delta_t PERIOD_i \times YEAR_t \right) + \mu_i + \varepsilon_{it}$$

- $AGE_i = 1$ if age=30-44 (July 1999 or 2004)
- $PERIOD_i = 1$ if reform period (2004-2008) panel
- $YEAR_t = 1$ if year $t \in \{1, 2, 3, 4\}$ within panel

- Under the DADID assumption, $\beta_4 = ATET$

Effect of reassessment on DI benefit

	Effect	Effect as % mean if no reform
Benefit Receipt (pp)	-14.40*** (0.17)	-17.0%
Benefit Amount (€/year)	-1,565*** (31.70)	-19.8%
N individuals	496,586	
N observations	2,482,930	

Effect on 34% with reduced degree of disability: [4549, 5530]

Lower bound equivalent to 54% of average pre-reform benefit income

Effects of reassessment on labor supply

	Effect	Effect scaled by	
		mean if	€1000 benefit
		no reform	cut
Employment (pp)	6.68*** (0.22)	19.8%	4.27
Earnings (€/year)	995*** (43.19)	18.1%	635.8
N individuals	496,586		
N observations	2,482,930		

8.5pp increase in probability work & not claim DI

Earnings effect on 34% whose benefits cut: [2892, 3516]

- Lower bound 53% of mean earnings if no reform

Placebo test

Apply empirical strategy to non-recipients of DI

They are not impacted by reform

Pick up any change in age difference in trends

	Effect	Predicted mean	Effect as % predicted mean
Employment (pp)	-0.57*** (0.01)	73.43	-0.78%
Earnings (€/year)	-195.90 (125.78)	34,061	-0.58%
N individuals	3,345,789		
N observations	16,728,945		

Does earnings capacity vary with claim duration?

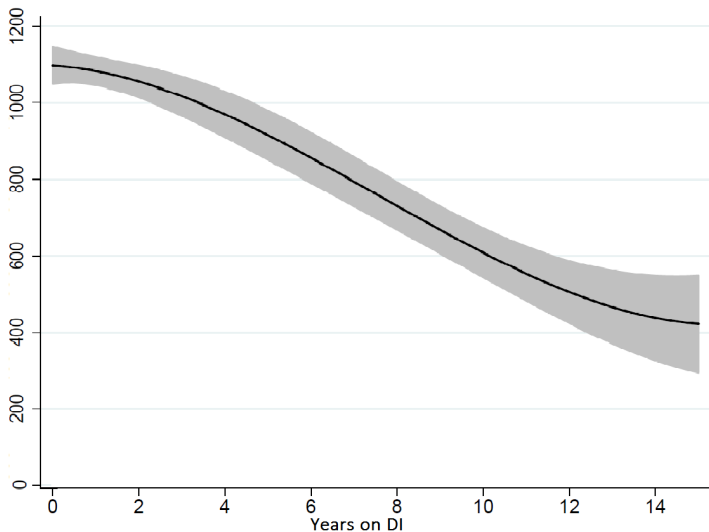
Decrease if labor market detachment as claim lengthens

Increase if DI provides time to recover health

Interact treatment indicator with 3rd order polynomial of claim duration

▶ Regression

Earnings effect (€/year) by claim duration

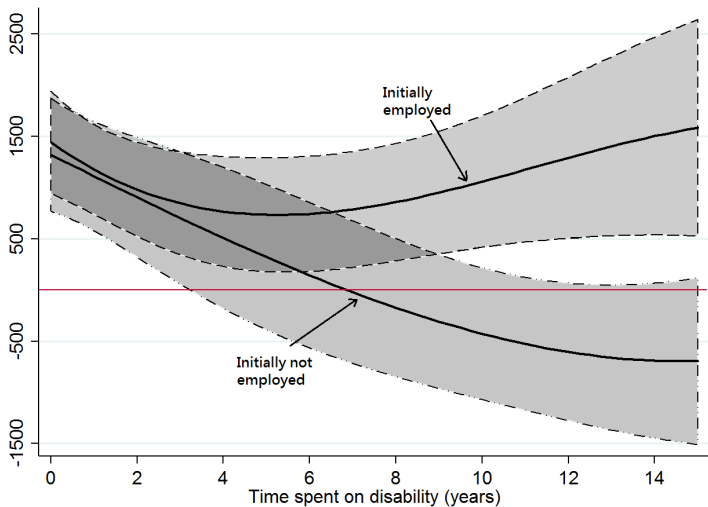


▶ DI

▶ Employment

▶ Scaled

Earnings effect for partially disabled by claim duration & employment



Earnings effect by diagnosis

	Effect (€/year)	Effect per €1000 benefit cut	N indvs.
Musculoskeletal	1,221*** (83.47) [16.93%]	606	144,172
Mental	1,156*** (66.17) [27.45%]	746	177,596
Other	620*** (76.46) [10.38%]	558	174,816

► DI

► Employment

► Duration

Earnings effects on recipients & spouses

	Effect (€/year) (1)	Effect per €1000 benefit cut (2)	Predicted mean if no reform (3)	Relative effect (1)/(3)
Recipients	998.78*** (84.97)	621.52*** (140.61)	6,765	14.75%
Spouses	446.24*** (108.87)	333.82** (160.56)	27,809	1.70%
N couples	369,890			
N observations	1,848,636			

▸ Placebo

▸ Employment

▸ Trends

Earnings effects on recipients & spouses by sex

	Female recipients		Male recipients	
	Recipient	Spouse	Recipient	Spouse
Effect (€/year)	1,375*** (83.0)	864*** (100.4)	897*** (159.2)	-106 (1243.0)
Effect per €1000 benefit cut	673*** (85.1)	471** (101.4)	683*** (160.3)	-81.4 (125.5)
<i>N couples</i>	187,907		182,062	
<i>N observations</i>	882,169		857,127	

Effects by spouse initial employment - female recipients

	Spouse initially			
	Employed		Not employed	
	Recipient	Spouse	Recipient	Spouse
Effect (€/year)	1,369*** (93.3)	1,229*** (190.9)	1,271*** (223.1)	-35.41 (238.6)
Effect per €1000 benefit cut	674.4*** (92.2)	605.5** (191.5)	551.9** (230.7)	-15.10 (241.3)
<i>N couples</i>	156,719		29,040	
<i>N observations</i>	732,434		124,093	

Reassessment of stock of Dutch DI recipients

- 14 pp increase in DI exit
- 20% cut in benefit income
- earnings replace €640 of €1000 benefit cut

Larger effects on recipients with:

- difficult-to-verify diagnoses
- shorter claim duration
- female
- younger

“Partial disability” may slow deterioration of earnings capacity

Large earnings response from (working) spouses of female recipients

Wellbeing of DI recipients (presumably) reduced

Social welfare?

- Depends if earnings response is price or income effect
- US: earnings crowd-out mostly income effect (Gelber et al 2017)
- NL: Likely large efficiency gain from reduced moral hazard:
 - Size of earnings response suggests not only income effect
 - Higher DI dependency & replacement rates in NL
 - Larger effects on those with difficult-to-verify diagnoses

Reform did not make across-the-board benefit cuts

- Restricted to 34% assessed to have unused earnings capacity
- Earnings response suggests targeting reasonably accurate
- Targeting more efficient approach to DI retrenchment

Periodic reassessment of earning capacity in stock of DI recipients

Additional Slides

Degree of Disability weakly reduced due to...

- Expand pool of work used to estimate earnings capacity
 - Average over 3 highest paying occupations claimant capable of performing that at least 3 (previously 10) workers were engaged in locally
 - Full time jobs considered even if worked part-time before disability
 - Jobs requiring Dutch and IT skills considered even if claimant without these abilities
 - Jobs involving night shifts considered
- Pre-disability earnings re-calculated with hours truncated at 38

▶ back

Degree of disability before and after reassessment

	After (%)								N
	<15%	[15,25)	[25,35)	[35,45)	[45,55)	[55,65)	[65,80)	[80,100]	
Before (%)									
[15,25)	47.9	35.5	6.3	1.8	0.9	0.8	0.4	6.4	12,498
[25,35)	29.7	18.7	34.9	5.6	2.0	1.0	0.8	7.4	11,554
[35,45)	23.8	9.8	16.4	31.8	5.8	1.6	1.4	9.5	8,210
[45,55)	25.8	5.3	6.4	9.6	32.3	4.2	2.1	14.3	7,562
[55,65)	23.7	6.9	5.6	5.6	10.6	25.9	4.6	17.1	4,281
[65,80)	16.6	5.5	6.9	7.2	7.1	8.4	26.7	21.6	3,574
[80,100]	17.1	2.5	2.1	1.8	1.9	1.4	1.5	71.9	90,135
N	33,585	11,069	8,661	5,842	5,274	3,102	2,594	67,687	137,814

▶ back

Total effect of reform

	After first reassessment							80-
	<15%	15-24%	25-34%	35-44%	45-54%	55-64%	65-79%	
Before								
15-24%	41.9	47.7	6.4	1.7	0.7	0.9	0.7	
25-34%	22.2	23.4	46.0	4.7	1.6	1.1	1.0	
35-44%	16.8	13.1	23.2	38.1	5.6	1.2	2.0	
45-54%	15.8	6.3	9.6	13.8	46.4	5.2	2.8	
55-64%	15.0	10.4	5.9	8.3	15.5	39.0	5.9	
65-79%	11.1	5.9	8.8	9.0	8.7	12.8	45.6	
80-100%	49.6	10.9	10.0	7.5	7.2	6.7	7.6	
N	3,778	2,659	2,403	1,462	1,279	737	688	

Recipients aged 45 to 49 reassessed once under new rules and second time under old rules based on information obtained in first reassessment

Effect of revision of health status

	After second reassessment						
	<15%	15-24%	25-34%	35-44%	45-54%	55-64%	65-79%
Before							
15-24%	27.7	45.2	15.7	3.8	1.3	0.9	0.8
25-34%	13.8	17.1	47.1	13.0	3.1	1.2	1.2
35-44%	11.5	7.4	19.7	38.4	12.4	2.8	2.2
45-54%	12.7	4.3	7.3	13.1	44.7	8.4	4.2
55-64%	11.6	5.9	8.2	7.8	13.6	34.6	9.7
65-79%	8.4	3.2	7.8	8.7	9.5	11.3	40.7
80-100%	33.8	9.2	9.8	8.6	6.8	5.4	7.4
N	2,654	2,118	2,555	1,751	1,411	750	731

Recipients aged 45 to 49 reassessed once under new rules and second time under old rules based on information obtained in first reassessment

Identification assumption

$$\begin{aligned} & \mathbb{E} [Y_{i4}^0 - Y_{i0}^0 \mid AGE_i = 1, PERIOD_i = 1] \\ & \quad - \mathbb{E} [Y_{i4}^0 - Y_{i0}^0 \mid AGE_i = 0, PERIOD_i = 1] \\ = & \mathbb{E} [Y_{i4}^0 - Y_{i0}^0 \mid AGE_i = 1, PERIOD_i = 0] \\ & \quad - \mathbb{E} [Y_{i4}^0 - Y_{i0}^0 \mid AGE_i = 0, PERIOD_i = 0] \end{aligned}$$

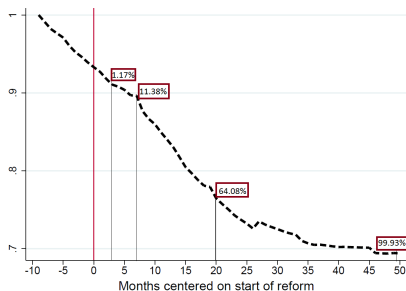
- $Y_{it}^1, Y_{it}^0 \Rightarrow$ Potential outcomes
- $AGE_i = 1 \Rightarrow$ aged 30-44
- $AGE_i = 0 \Rightarrow$ aged 50-53
- $PERIOD_i = 1 \Rightarrow$ Reform period: 2004-2008
- $PERIOD_i = 0 \Rightarrow$ Non-reform period: 1999-2003
- $t = 0 \Rightarrow$ 1999/2004, $t = 4 \Rightarrow$ 2003/2008

Means at sample entry

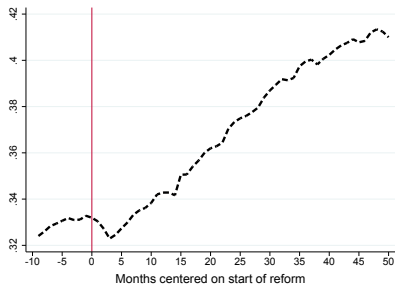
	Reform period		Non-reform period	
	Age 30-44	Age 50-53	Age 30-44	Age 50-53
<i>Demographics</i>				
Female	60.3%	45.7%	53.4%	37.4%
Age	38.7	52.1	38.8	52.1
<i>Disability insurance</i>				
Benefit amount (€/year)	8,422	9,950	8,559	10,634
Fully disabled	63.5%	64.0%	65.4%	69.4%
Claim duration (years)	5.44	9.52	5.90	9.96
<i>Labor market</i>				
Employed	35.9%	35.8%	40.7%	34.6%
Earnings (€/year)	4,207	5,162	4,947	4,879
<i>Diagnosis</i>				
Mental disorders	43.1%	33.8%	34.4%	27.9%
Musculoskeletal	28.9%	32.9%	25.0%	31.2%
<i>N</i>	160,194	94,404	139,524	102,464

Trends in DI and employment-Treatment group

Proportion in Disability Insurance



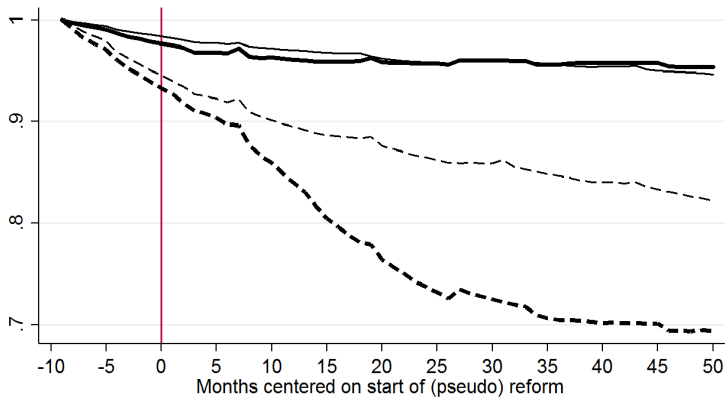
Proportion in Employment



----- Aged 30-44, reform period (treatment group)

DI receipt by age and period

- Aged 30-44, reform period (treatment group)
- - - Aged 30-44, non-reform period
- Aged 50-53, reform period
- Aged 50-53, non-reform period

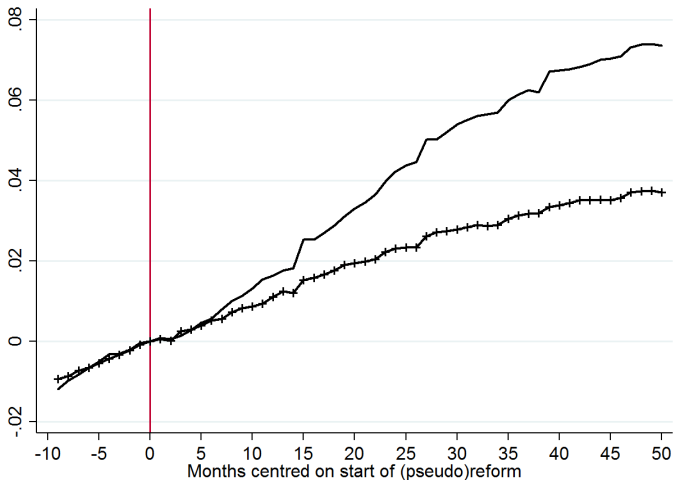


▶ back

Employment: Age difference-in-differences by period

— Reform period sample

+ Non-reform period sample



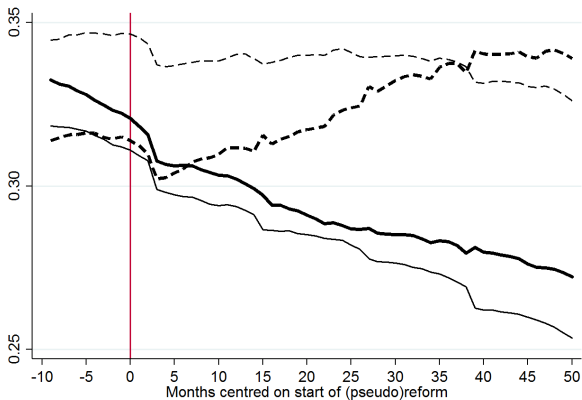
▶ back

▶ Extended trends

▶ Raw trends

Employment by age and period

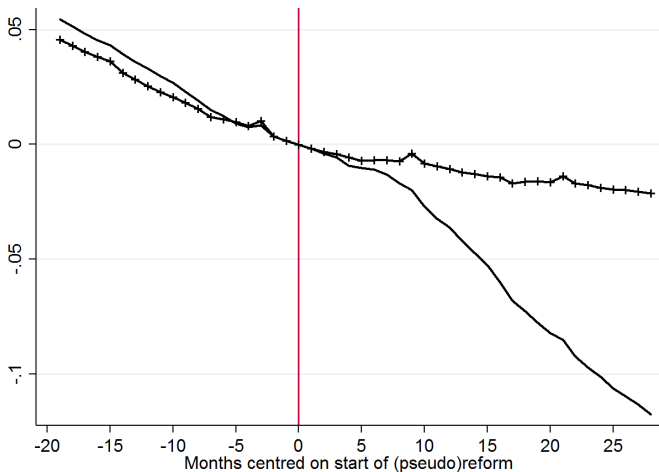
- Aged 30-44, reform period (treatment group)
- - - Aged 30-44, non-reform period
- Aged 50-53, reform period
- Aged 50-53, non-reform period



▶ back

DI receipt: Age difference-in-differences by period II

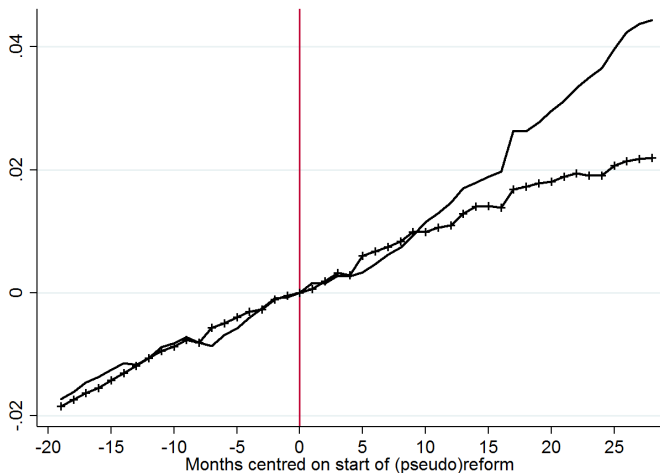
- Reform period sample
- + Non-reform period sample



Employment: Age difference-in-differences by period II

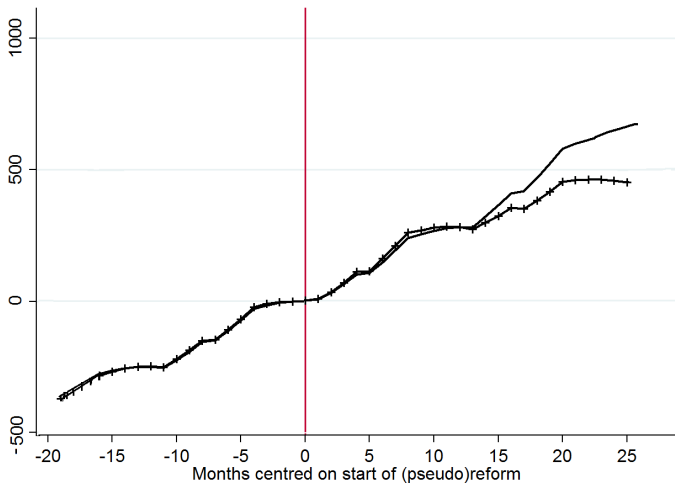
— Reform period sample

+ Non-reform period sample

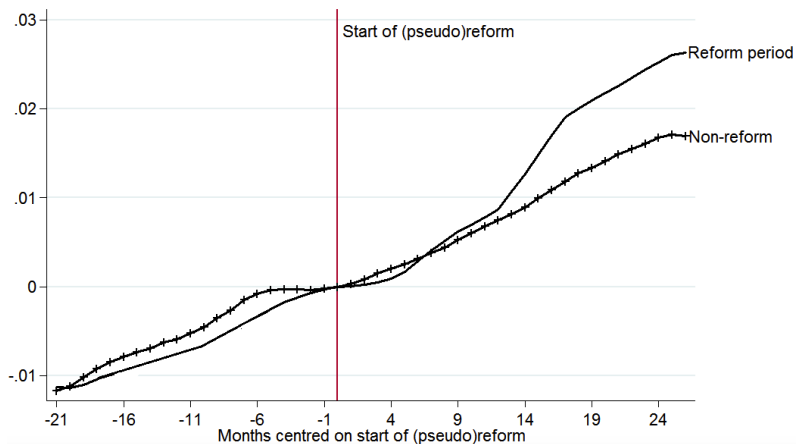


Earnings: Age difference-in-differences by period II

- Reform period sample
- + Non-reform period sample

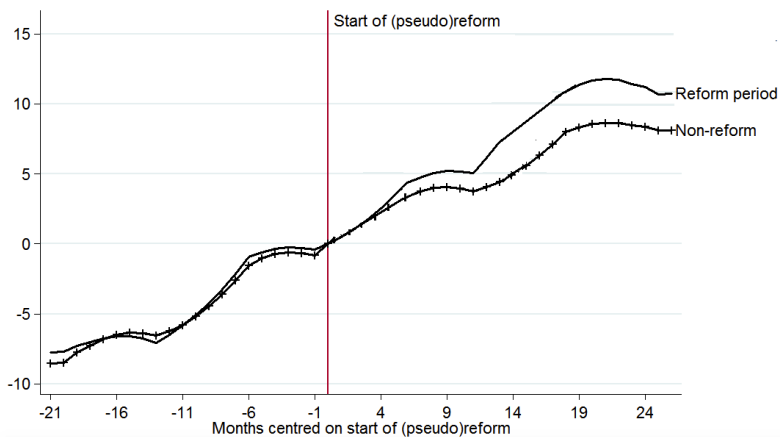


Spousal Employment: Age diff-in-diffs by period II



▶ back

Spousal Earnings: Age diff-in-diffs by period II



▶ back

Robustness of estimates

	Disability Insurance		Labor Market			
	Benefit Receipt	Benefit Amount	Employment (pp)		Earnings (€/year)	
	(pp)	(€/year)	Effect	Scaled effect	Effect	Scaled effect
	(1)	(2)	(3)	(3)/ (2) × 1000	(5)	(5)/ (2) × 1000
A. Main estimates	-14.40*** (0.17)	-1,565*** (31.7)	6.68*** (0.22)	4.27	995*** (43.2)	636
B. Drop those with claim duration \leq 12 months	-12.50*** (0.20)	-1,504*** (33.5)	6.85*** (0.25)	4.55	803*** (53.7)	534
C. Define comparison group by other ages						
Ages 50 to 52	-14.20*** (0.21)	-1,615*** (39.7)	6.90*** (0.27)	4.27	968*** (58.1)	599
Ages 50 to 54	-14.10*** (0.19)	-1,584*** (33.4)	7.03*** (0.24)	4.44	990*** (49.8)	625
D. Use monthly data	-13.57*** (0.37)	-1,521*** (65.2)	5.67*** (0.46)	3.73	784*** (93.1)	515

▶ back to DI

▶ back to Labor

Effects on all outcomes

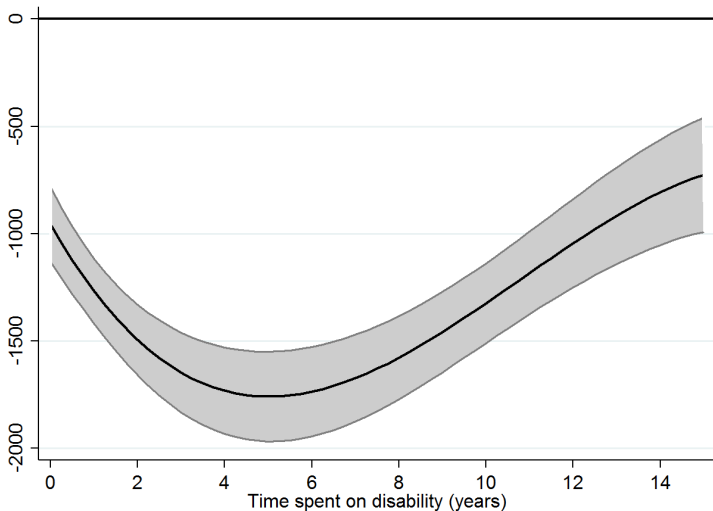
	Effect	Effect scaled by predicted mean if no reform	benefit reduction (in €1000s/year)
<i>Disability Insurance</i>			
Benefit Receipt (pp)	-14.40*** (0.17)	-17.0%	NA
Benefit Amount (€/year)	-1,565*** (31.70)	-19.8%	NA
<i>Labor Market</i>			
Employment (pp)	6.68*** (0.22)	19.8%	4.27
Days worked (year)	17.03*** (0.58)	22.3%	10.88
Earnings (€/year)	995*** (43.19)	18.1%	635.8
<i>Other social transfers</i>			
Benefit amount (€/year)	376*** (17.73)	42.9%	240.3

Analysis by duration of claim

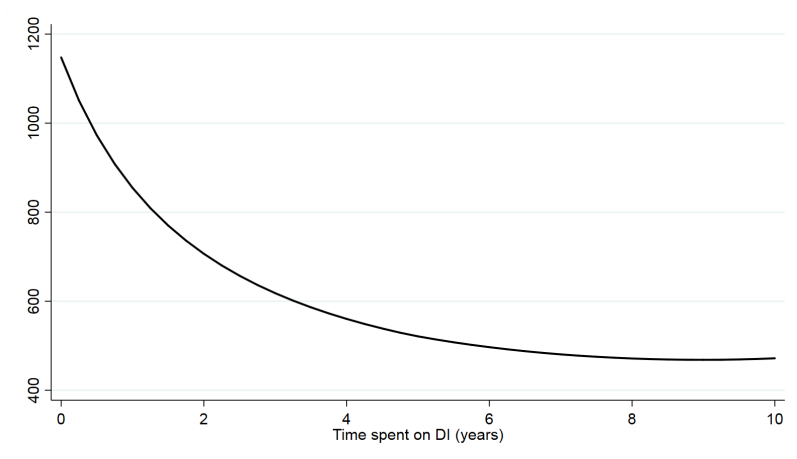
$$Y_{it} = \sum_{t=1}^4 \sum_{j=0}^3 \left[\beta_{tj} \left(AGE_i \times PERIOD_i \times YEAR_t \times DURATION_i^j \right) \right. \\ \left. + \theta_{it} \left(YEAR_t \times DURATION_i^j \right) \right. \\ \left. + \gamma_{it} \left(AGE_i \times YEAR_t \times DURATION_i^j \right) \right. \\ \left. + \delta_{it} \left(PERIOD_i \times YEAR_t \times DURATION_i^j \right) \right] + \mu_i + \varepsilon_{it}$$

- $DURATION_i$: years on DI at sample entry
- β_{40} : effect on someone who had just entered DI in Jan. 2004
- β_{41}, β_{42} and β_{43} gives effects at positive duration

Effect on DI benefit (€/year) by claim duration



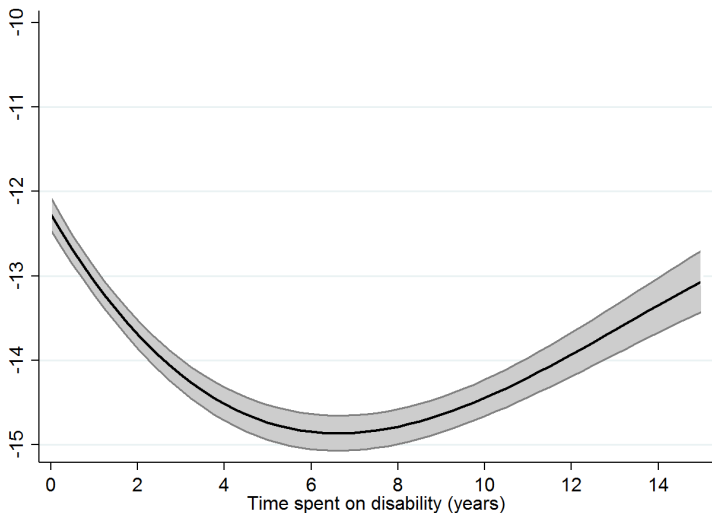
Earnings effect (€) per €1,000 benefit reduction by claim duration



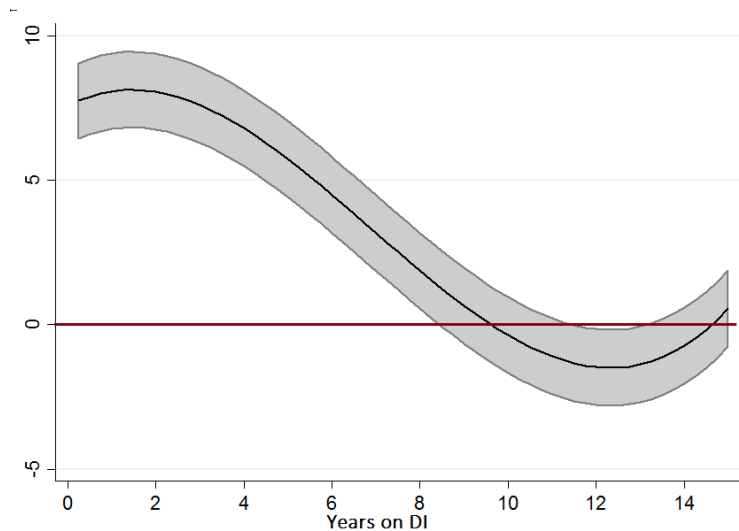
▶ back

▶ Employment

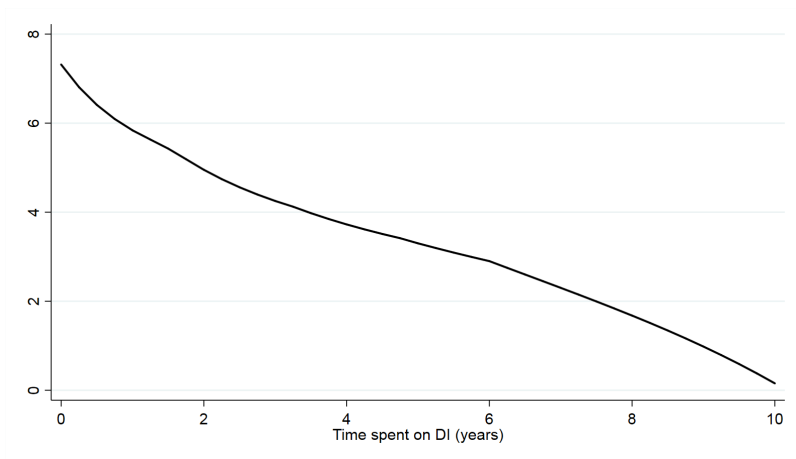
Effect on DI receipt (pp) by claim duration



Employment effect (pp) by claim duration



Employment effect (pp) per €1,000 benefit reduction by claim duration



▶ back

Effect on DI benefit by diagnosis

	DI Benefit Amount (€/year)	N individuals
Musculoskeletal	-2,015*** (58.06)	144,172
[Relative effect]	[27.83%]	
Mental	-1,549*** (51.82)	177,596
[Relative effect]	[18.49%]	
Other	-1,111*** (56.36)	174,816
[Relative effect]	[13.52%]	

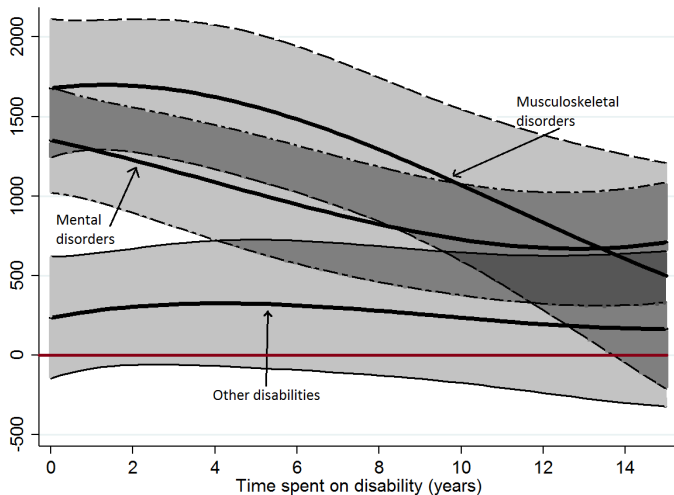
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Labor supply effects by diagnosis

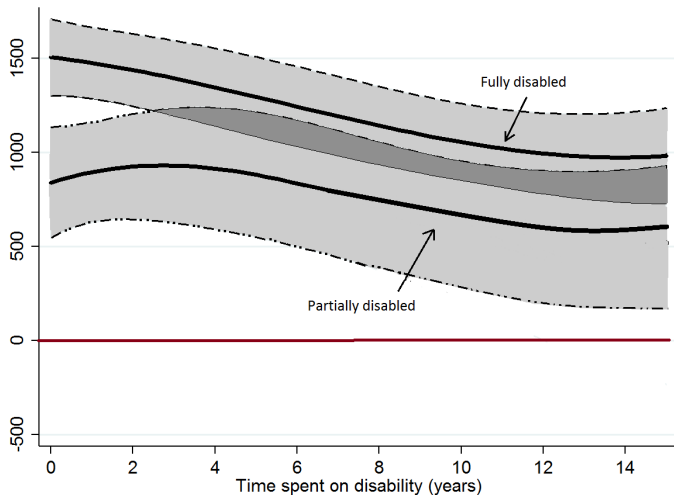
	Employment (pp)		Earnings (€/year)		N
	Effect	Effect per €1000 benefit cut	Effect	Effect per €1000 benefit cut	indvs.
Musculoskeletal	7.82*** (0.42) [18.84%]	3.88	1,221*** (83.47) [16.93%]	606	144,172
Mental	6.45*** (0.37) [22.22%]	4.16	1,156*** (66.17) [27.45%]	746	177,596
Other	5.48*** (0.37) [15.33%]	4.93	620*** (76.46) [10.38%]	558	174,816

▶ back

Earnings effect by claim duration & diagnosis



Earnings effect by claim duration & degree of disability



▶ All effects by degree of disability

Effects by degree of disability

	Disability Insurance	Labor Market			No. individuals (4)	
	Benefit Amount (€/year) (1)	Employment (ppt) Effect (2)	Scaled effect (2)/ (1) × 1000 (2)	Earnings (€/year) Effect (3)		Scaled effect (3)/ (1) × 1000 (3)
<i>Degree of disability</i>						
Fully disabled	-1,656*** (37.49) [17.05%]	8.08*** (0.26) [49.93%]	4.88	1,037*** (38.74) [51.03%]	626	324,485
Partially disabled	-1,243*** (57.40) [25.30%]	4.00*** (0.41) [6.06%]	3.22	838*** (99.65) [7.09%]	674	172,101
<i>Partially disabled</i>						
Not employed	-2,032*** (156.4) [22.72%]	10.90*** (1.04) [53.93%]	10.56	1,315*** (274.3) [34.50%]	647	44,087
Employed	-1,383*** (86.86) [18.83%]	-0.66 (0.41) [0.80%]	-0.48	548* (227) [2.94%]	396	98,655

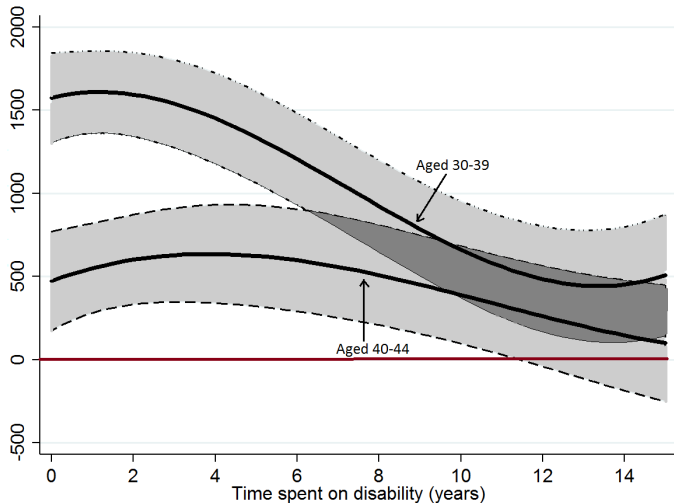
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Effects by age and sex

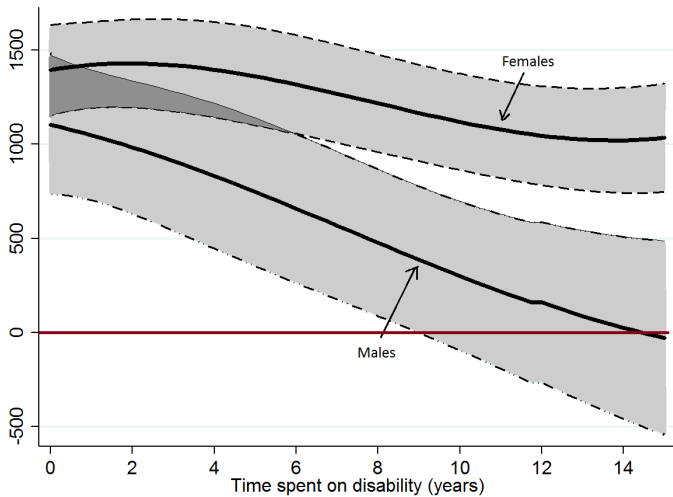
	Disability Insurance	Labor Market				No. individuals
	Benefit Amount (€/year) (1)	Employment (ppt) Effect (2)	Scaled effect (2)/ (1) × 1000 (3)	Earnings (€/year) Effect (3)	Scaled effect (3)/ (1) × 1000 (4)	(4)
Age						
30-39 years	-1,823*** (36.09) [24.48%]	8.55*** (0.27) [25.17%]	4.69	1,248*** (51.01) [23.28%]	685	330,042
40-44 years	-1,225*** (39.47) [14.06%]	4.30*** (0.27) [12.27%]	3.51	667*** (53.30) [11.29%]	544	363,412
Sex						
Males	-1,375*** (49.79) [15.55%]	4.21*** (0.32) [10.80%]	3.06	815*** (72.91) [11.05%]	593	244,076
Females	-1,769*** (38.39) [42.43%]	7.87*** (0.32) [24.68%]	4.45	1,338*** (46.90) [31.71%]	756	252,510

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Earnings effect by claim duration & age



Earnings effect by claim duration & sex



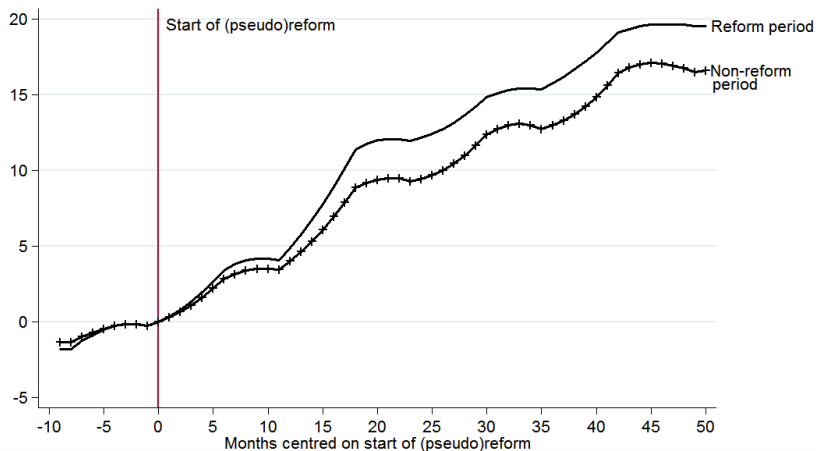
Is there an effect on spousal labor supply?

- Income effect (+)
- Price effect (-)
- Complementarity of leisure (+)
- Reverse crowding out of household by formal insurance (+)
- Type I error:
 - Recipient incapable of increasing earnings
 - Spouse raises earnings to compensate for loss of benefits (+)

Sample selection for effects on spouses

- DI recipients in same age groups & periods
- Restrict to those registered as cohabiting
- Drop if both partners claimed DI at any time within period
- Drop if couple separates
 - Find no effect on probability of separation
 - Estimates robust to including & censoring at separation

Spousal Earnings: Age diff-in-diffs by period



▶ back

▶ Extended trends

▶ Employment

Labor supply effects on recipients & spouses

	Effect (1)	Effect per €1000 benefit cut (2)	Predicted mean if no reform (3)	Relative effect (1)/(3)
Recipients				
Employment (pp)	8.83*** (0.28)	5.49*** (0.44)	36.50	24.20%
Earnings (€/year)	998.78*** (84.97)	621.52*** (140.61)	6,765	14.75%
Spouses				
Employment (pp)	1.11*** (0.24)	0.95*** (0.34)	78.67	1.40%
Earnings (€/year)	446.24*** (108.87)	333.82** (160.56)	27,809	1.70%
N couples	369,890			
N observations	1,848,636			

[▶ back](#)[▶ Placebo](#)

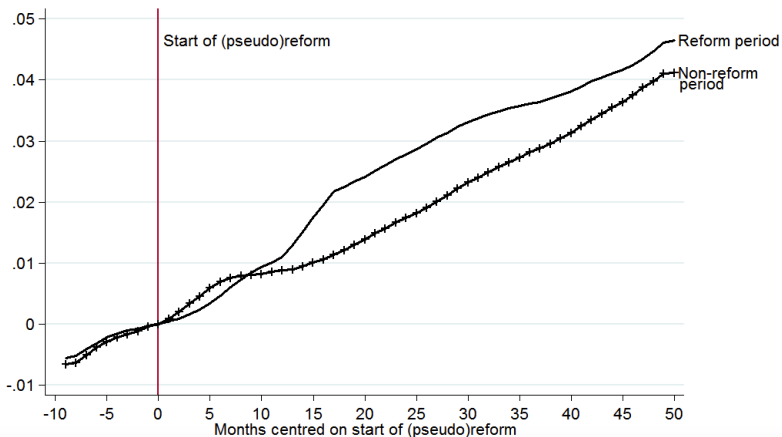
Labor supply effects on recipients & spouses by sex

	Female recipients		Male recipients	
	Recipient	Spouse	Recipient	Spouse
Employment (pp)				
Effect	9.48*** (0.41)	2.51*** (0.25)	5.58*** (0.40)	-0.30 (0.23)
Effect per €1000 benefit cut	4.64*** (0.45)	1.37*** (0.26)	4.24*** (0.40)	-0.23 (0.26)
Earnings (€/year)				
Effect	1,375*** (83.0)	864*** (100.4)	897*** (159.2)	-106 (1243.0)
Effect per €1000 benefit cut	673*** (85.1)	471** (101.4)	683*** (160.3)	-81.4 (125.5)
<i>N couples</i>	187,907		182,062	
<i>N observations</i>	882,169		857,127	

Effects by spouse initial employment - female recipients

	Spouse initially			
	Employed		Not employed	
	Recipient	Spouse	Recipient	Spouse
Employment (pp)				
Effect	9.14*** (0.47)	3.20*** (0.28)	9.31*** (1.06)	0.63 (0.65)
Effect per €1000 benefit cut	7.41*** (0.48)	1.58** (0.30)	4.04*** (1.15)	0.27 (0.68)
Earnings (€/year)				
Effect	1,369*** (93.3)	1,229*** (190.9)	1,271*** (223.1)	-35.41 (238.6)
Effect per €1000 benefit cut	674.4*** (92.2)	605.5** (191.5)	551.9** (230.7)	-15.10 (241.3)
<i>N couples</i>	156,719		29,040	
<i>N observations</i>	732,434		124,093	

Spousal Employment: Age diff-in-diffs by period



▶ back

▶ Extended trends

Placebo test of identification of spousal effects

	Placebo "Recipients" (1)	Placebo "Spouses" (2)
Employment (pp)	-0.96*** (0.07)	-0.25 (0.72)
Earnings (€/year)	-228.09 (157.91)	74.00 (125.78)
N individuals	1,516,987	
N observations	7,584,935	

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