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Labor Supply and the Pension Contribution-Benefit Link

Eric French¹ Attila Lindner² Cormac O'Dea³ Tom Zawisza²

¹Cambridge University

²University College London

³Yale University

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Conclusion

- Social security contributions (SSCs) are a large component of 'tax' burden in OECD countries (23% of labor costs in 2010)
 - Potential labor supply disincentive
- **But** pension contributions (largest part of SSCs) lead to higher future pension entitlements
- Policy proposals (from WB, IMF) have advocated tight link between pension contributions and benefits to encourage work
- Does current labor supply respond to future incentives?

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This Paper

- Massive literature showing how labor supply close to retirement age responds to pension incentives
 - Surveys in Lumsdaine and Mitchell (1999), Gruber and Wise (2008), Blundell et al. (2016), many others
- Little is know about how labor supply far from retirement age responds to pension incentives
- We provide an empirical assessment of how pension incentives affect labor supply far from retirement age
 - Exploit 1999 pension reform in Poland from a Defined Benefit (DB) to a Notional Defined Contribution (NDC)

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Polish Pension Reform 1999

• Pre-reform Defined Benefit



• Post-reform Notional Defined Contribution



• The change affected only those aged 50 and younger in 1999

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- Highest earnings years (often around age 50) play key role
- Post-reform Notional Defined Contribution



- All earnings years play equivalent role in pension formula
- The change affected only those aged 50 and younger in 1999

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An Implication of 'Best Years' Type Rules

- Individuals with high wage growth more likely to have 'best' earnings relative to national average later in life (in 50s/60s)
- In DB system, incentives for labor supply late in working life:
 - greater for high-wage-growth individuals
 - worse for low-wage-growth individuals

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An Implication of 'Best Years' Type Rules

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Salience



Ważne!

CO M





Zasady wypłaty emerytur z ZUS

Prawo do emerytury i jej wysokość zależy od daty urodzenia

osoby urodzone przed 1 stycznia 1949 r. mają obliczane świadczenia na starych zasadach z uwzględnieniem części socjalnej oraz kwoty bazowej (3536,87 zł) tylko osoby urodzone przed 1 stycznia 1949 r., za których były opiacane składki, a wniosek o emeryturę o jej przyznanie został złożony po 31 grudnia 2008 r., mają możliwość ustalenia świadczenia **na nowych zasadach**



Data and Design

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Ważnel

Important! A pension is award on application from the insured individual.





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Rules for being awarded the state pension: the right to a pension and its size depend on the date of birth

bilczane śwaje z mają obliczane śwaje z mające starych zasadach z uwzględnieniem części socjanie oraz kwoty bazowej (\$55,67 zł) 1948 1949 1968 1969



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Annual Letter

ZUS	3	Informacja o stanie konta ubezpieczoneg w Zakładzie Ubezpieczeń Społecznych
4. składki na subkoncie:		
• należne (czyli wynikając	e z dokumentów rozliczeniowych przekazonyc	h do ZUSI:
	6 930,34 zł	
wpłacone:		
	6 930,34 zł	
5. zwaloryzowane składki, na subkoncie:	środki, odsetki za zwłokę i opłata prolonę	sacyjna. ogółem, zewidencjonowane
	43 430,49 21	
6. wartość ogółem kwot ze	widencjonowanych:	
• na koncie (I filar):		
	172259,37 2	
• na koncie (I filar) i subk	oncie (II filar) łącznie:	
	215 689,86 zł	
7. hipotetyczna emerytura	obliczona na podstawie wartości ogółem	kwot zewidencjonowanych:
• na koncie (I filar):		
		Wariant 2
Wiek emerytalny	Wariant 1 (według stanu konta ubezpieczonego na 31 grudnia 2015 r.)	(podstawa wyliczenia przyjęta w wariancie 1, powiększona o kwoty hipotetycznych składek w wysokości nominalnej, jakie ubezpieczony mógłby osiągnąć pracując do wieku emerytalnego)
67/ (lata/miesiące)	856,59	1758,26

Dia ubezpieczonego, który przekroczył powszechny wiek emerytalny i nie wystąpił o ustalenie emerytury, hipotetyczną emeryturę podaje się dla jego faktycznego wieku oraz kolejnych pięciu lat.

• na koncie (I filar) i subkoncie (II filar) łącznie:

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Did Labor Supply respond to the Pension Reform?

We want:

$\frac{\Delta \text{Labor Supply Caused by the Reform}}{\Delta \text{Financial Work Incentives Due to the reform}}$

We need:

1. Data

2. Approach for measurement of the change in incentives

3. Research Design to identify causal impact of the policy

Data and Design

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Did Labor Supply respond to the Pension Reform?

We want:

$\frac{\Delta \text{Labor Supply Caused by the Reform}}{\Delta \text{Financial Work Incentives Due to the reform}}$

We need:

- 1. Data
 - We use admin data on entire Polish population from 2000
- 2. Approach for measurement of the change in incentives
- 3. Research Design to identify causal impact of the policy

Data and Design

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Did Labor Supply respond to the Pension Reform?

We want:

$\frac{\Delta \text{Labor Supply Caused by the Reform}}{\Delta \text{Financial Work Incentives Due to the reform}}$

We need:

- 1. Data
- 2. Approach for measurement of the change in incentives
 - We simulate whole-life earnings trajectories, distinguishing between high-earnings-growth and low-earnings-growth regions

3. Research Design to identify causal impact of the policy

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Reform impact on incentives

Region type	High-growth	Low-growth	Difference (High-Low)
1. Change in net return to work (%)	-11.17	-5.94	-5.23

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Reform impact on wealth

Region type	High-growth	Low-growth	Difference
			(High-Low)
1. Change in net return to work (%)	-11.17	-5.94	-5.23
2. Change in pension wealth (%)	-14.58	-14.93	0.34
21 onlinge in penelen neurin (/v)	1.00	1.00	0.01

Wealth effect of reform: expected pension wealth at age 65, absent changes in behavior.

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Did Labor Supply respond to the Pension Reform?

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- 2. Approach for measurement of the change in incentives
- 3. Research Design to identify causal impact of the policy
 - Cohort Based Regression Discontinuity

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Empirical Strategy: Cohort Based Regression Discontinuity

Meet Jan and his twin brother Pawel:





Jan born Pawel born 11:50pm on 31 Dec 1948 0:10am on 01 Jan 1949

Until age 50, they lived parallel lives. In 1999, the pension system changed for Pawel (not Jan).

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Empirical Strategy: Cohort Based Regression Discontinuity

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2000-2002: high-growth regions



2000-2002: low-growth regions



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Reform impact on employment rate

Region type	High-growth	Low-growth	Difference
			(High-Low)
1. Change in net return to work (%)	-11.17	-5.94	-5.23
2. Change in pension wealth (%)	-14.58	-14.93	0.34
3. Change in employment (%)	-2.01	0.28	-2.29
	(0.78)	(0.70)	(0.95)
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Implied elasticities

Table: Elasticity estimates

Region type	High-growth	Low-growth	Difference
			(High-Low)
 Change in net return to work (%) 	-11.17	-5.94	-5.23
2. Change in pension wealth (%)	-14.58	-14.93	0.34
3. Change in employment (%)	-2.01	0.28	-2.29
	(0.78)	(0.70)	(0.95)
4. Employment elasticity (Row 3) / (Row 1)	_	_	0.44
			(0.18)

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Implied elasticities

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3. Change in employment (%)	-2.01	0.28	-2.29
	(0.78)	(0.70)	(0.95)
4. Employment elasticity (Row 3) / (Row 1)	-	-	0.44
			(0.18)

$$\eta^{P} = \frac{\% \Delta \text{Employment}_{t}}{\% \Delta \text{Net return from work}_{t}}$$

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- Placebo tests: estimated effects for neighbouring cohorts small and not statistically significant Placebo example Placebo tests
- Robust to:
 - Finer regions More
 - Alternative estimation methods More
 - Alternative assumptions on earnings process More



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Also in the paper

- 1. Compare to later reform where the return to work changed but where effect of change in incentives is on immediate income
 - Labor supply effects of a qualitatively similar elasticities
- 2. Use the results to estimate the parameters of a lifecycle model to look at the effects over the whole lifecycle
 - The reform improved work-incentives earlier in working life, disimproved them late in working life
 - Negative LS late in working life only partially offset by positive LS effect earlier
 - People later in life are closer to participation margin incentives particularly matter then

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Conclusions

- Empirical assessment of labor supply effects induced by a pension reform
- We find substantial LS effects 15 years before retirement
- Implications for when in the life-cycle to target incentives

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Thank you!

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Simulations: "best-years" by region type



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Finer regional variation: incentives and wealth effect

[noframenumbering]



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Finer regional variation: employment effect





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Formulas





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Assuming Low Eligibility

[noframenumbering]

Region type	Change in net return	Change in net	Change in	Implied
	to work (%)	wealth (%)	empl. (%)	elasticity
All regions	-46.06	0.0	-29.37	0.64
High-growth	-50.63	0.0	-32.03	0.63
Low-growth	-42.99	0.0	-28.27	0.66

Table: Elasticity Estimates using Contemporaneous Incentives

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Assuming Middle Eligibility

Table: Elasticity Estimates using Contemporaneous Incentives

Region type	Change in net return	Change in net	Change in	Implied
	to work (%)	wealth (%)	empl. (%)	elasticity
All regions	-46.06	0.0	-17.62	0.38
High-growth	-50.63	0.0	-19.22	0.38
Low-growth	-42.99	0.0	-16.96	0.39



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Assuming High Eligibility

[noframenumbering]

Region type	Change in net return	Change in net	Change in	Implied
	to work (%)	wealth (%)	empl. (%)	elasticity
All regions	-46.06	0.0	-11.01	0.24
High-growth	-50.63	0.0	-12.01	0.24
Low-growth	-42.99	0.0	-10.60	0.25

Table: Elasticity Estimates using Contemporaneous Incentives

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Appendix: Wage process

Wage process estimated:

$$\log y_{irt} = \alpha + \sum_{k=1}^{4} \beta_r^k age_{irt}^k + \gamma_r \cdot t + \omega_{it} + \varepsilon_{irt}$$
(1)

where y_{irt} are earnings from work, r denotes whether individual i is in high or low-growth region. Permanent component of earnings η_{irt} follows AR(1):

$$\eta_{it} = \rho \eta_{i,t-1} + \varepsilon_{it}, \qquad \varepsilon_{it} \sim \mathcal{N}(0, \sigma_{\varepsilon}^2).$$
(2)

while ω_{it} evolves according to MA(1) process:

$$\omega_{it} = \xi_{it} + \theta \xi_{i,t-1}, \qquad \xi_{it} \sim N(0, \sigma_{\xi}^2). \tag{3}$$

AR(1) and MA(1) process parameters are estimated on 2000-2015 Polish tax data. Back

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Regression discontinuity design: histogram

Histogram of births unrestricted around cutoff:



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Regression discontinuity design: histogram Histogram of births restricted around cutoff.



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Results

Income growth region	Donut	Donut	Full sample
	Linear	Local	Linear
High-growth	-0.0145***	-0.0144***	-0.0188***
	(0.0027)	(0.0049)	(0.0024)
Low-growth	0.0014	0.0029	-0.0010
	(0.0022)	(0.0040)	(0.0020)

- Donut RDD excludes those born Jan 1-5 '49 and Dec 16-31 '48.
- Triangular kernel used for local linear estimation.



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Placebo tests





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Table: Elasticity estimates under different specifications

Region type	Change in net return to work (%)	Change in net wealth (%)	Change in empl. (%)	Implied elasticity
Panel A: Baseline Baseline	-8.52	-0.6	-2.85 (0.80)	0.33 (0.09)
Panel B: Estimation methods (not net of placebo) Linear (full sample)	-8.52	-0.6	-4.05 (0.52)	0.48 (0.06)
Linear (donut RDD)	-8.52	-0.6	-3.67 (0.58)	0.43 (0.07)
Robust (donut RDD)	-8.52	-0.6	-4.03 (1.06)	0.47 (0.12)
Panel C: Simulations of incentives $AR(1)$ earnings (from French, 2005)	-12.70	-0.4	-2.85 (0.80)	0.22 (0.06)
AR(1) + WN earnings	-8.66	-0.4	-2.85 (0.85)	0.33 (0.09)
Panel D: Perception of PV $d = 0.9$	-7.14	-0.6	-2.85 (0.80)	0.35 (0.10)
<i>d</i> = 0.5	-4.18	-0.6	-2.85 (0.80)	0.58 (0.16)



Treatment and placebo comparison

Panel A. Treatment.

Panel B. Placebo.



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Comparison of regions

	High-growth	Low-growth
Rural (%)	65.0%	59.1%
Age < 25 (%)	19.9%	18.8%
Age 25-60 (%) Age ≥ 60 (%)	58.8% 22.3%	57.0% 23.0%
Age > 00 (70)	22.370	23.070
Earnings Growth p25	3.6%	2.6%
Earnings Growth p50	4.0%	3.0%
Earnings Growth p70	4.3%	3.2%

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Pensions

• *pen^k*(*t*, *r*, *y*, *P*) is estimated as containing two components:

- $pen_1^k(t, r, y)$, which agents accrue whether you work or not
- $pen_2^k(t, r, y, P)$, which agents only accrue if they do work
- We estimate these using our simulated data for each year, each year calculating the increment if the agent works or not

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Pre-Retirement Allowance: Effect in High-Growth Regions



Pre-Retirement Allowance: Effect in Low-Growth Regions



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Comparing effects of two incentives

- Eligibility requires employment terminated by employer
- Elasticity of employment w.r.t. net return from work:

$$\eta^P = \frac{\frac{\Delta \text{Employment}_t}{P(P_t=1 \cap \textit{Elig}=1)}}{\%\Delta \text{Net return from work}_t}$$

- Unknown to us what proportion is vulnerable to (or can engineer!) employment termination
- We consider 3 scenarios $P(Elig = 1 | P_t = 1)$:
 - Low (40%), High (80%)

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Comparing effects of two incentives

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- We consider 3 scenarios $P(Elig = 1 | P_t = 1)$:
 - Low (40%), High (80%)

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Estimates

Region type	Change in net return to work (%)	Change in net wealth (%)	Change in empl. (%)	Implied elasticity
40% Eligibility	-26.72	0.0	-14.68	0.82
60% Eligibility	-26.72	0.0	-14.68	0.55
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Estimates

Fraction eligible	Change in	Change in	Change in	Implied
	net return	net wealth	empl.	elasticity
	to work (%)	(%)	(%)	
40% Eligibility	-26.72	0.0	-22.03	0.82
60% Eligibility	-26.72	0.0	-14.68	0.55

→ By Region Low → By Region Medium → By Region High

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Revenue equivalent DB vs. DC systems



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Investigating effects of pension reforms over the lifecycle

Effect of switching from DB to NDC	
Net change in lifecycle labor supply, all	-1.8 months
Net change in lifecycle labor supply, high-growth	-3.3 months
Net change in life-cycle labor supply, low-growth	-0.4 months
Frisch Employment Elasticity	
Frisch Employment Elasticity at age 30	0.52
Frisch Employment Elasticity at age 40	0.57
Frisch Employment Elasticity at age 50	0.68
Frisch Employment Elasticity at age 60	0.90