Worker retirement effect on productivity

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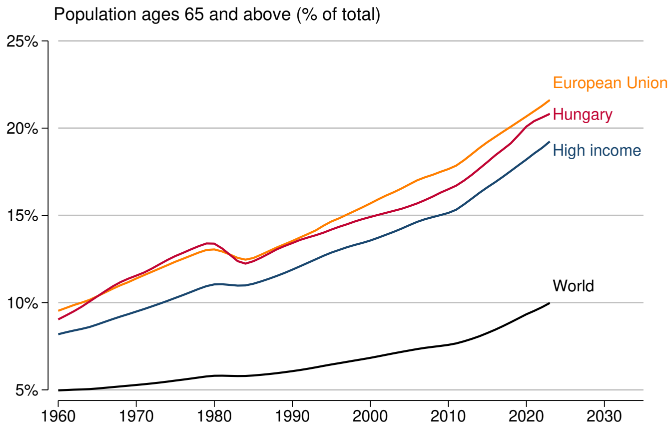
Society is aging

"By 2030, 1 in 6 people in the world will be aged 60 years or over." (WHO, 2025)



Source: World Bank

This means...

- Firms struggle with older workforce
- Each year a larger and larger share of worker exit the labor market
    - with high firm-specific human capital
    - decreasing marginal product

$$\downarrow$$

The impact of retirement on firm productivity is uncertain

Research question

What is the effect of retirement/exit of older workers on firm productivity?

This paper

- Estimates the effect of worker retirement on labor productivity
- Using high quality Hungarian administrative data from 2009-2015
- IV based on a unique early retirement policy change, Nők40 (Women40)
- I find that
    - **high-skill worker retirement decrease labor productivity growth by 2.7%**
    - low-skill worker retirement has no effect on labor productivity

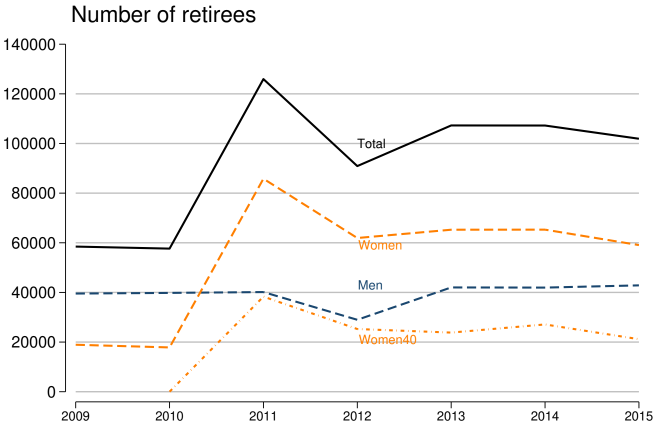
Related literature

- Worker exit
  - High hiring and training costs (Abowd and Kramarz, 2003; Muehlemann and Pfeifer, 2016)
  - Firms lose specific human capital (Becker, 1962; Bartel et al., 2014)
  - External hires are not perfect substitutes of exiting workers (Jäger et al., 2024; Jaravel et al., 2018)
  - Spillover effects on incumbent workers (Azoulay et al., 2010; Waldinger, 2012)
- Productivity of older workers
  - Diminishing marginal productivity of the older workers (Cardoso et al., 2011)
  - High wages relative to marginal product (Lazear, 1979)
- Pension reform effects
  - Retirement age change impact on firms (Bianchi et al., 2023; Boeri et al., 2022)
  - Women40 policy change (Simonovits and Tir, 2017)

Institutional settings

- Pay-as-you-go pension system: active workers finance the benefits of retirees
- 2009-2015: general retirement age was 62
  - (2014-2015: transitional period, retirement age 62.5)
- High average net pension replacement rate (74% in 2011)
- 2011: introduction of Nők40 (Women40) program
  - women with 40 years of contribution can retire
  - 32 years of working relationship (university and vocational school years count)
  - no reduction in pension benefits → incentive to retire early
  - reduce avg. women retirement age by 2.2 years (Simonovits and Tir, 2017)

Impact of policy change on yearly number of retirees



Source: Central Administration of the National Pension Insurance Statistical Yearbook 2015

Data

ADMIN3: linked employer-employee administrative social security data

- 2003-2017, but use only the period 2009-2015
- 50% sample of the Hungarian population in 2003
- Covers approximately 5 million individuals
- Monthly employment and pension transfer data

Balance sheet data: administrative tax declaration forms

- All double-entry bookkeeping firms in Hungary
- Appr. 100k firms yearly
- Contains balance sheets and income statements
- Detailed information on firm characteristics

Final sample

- Narrow to firms with at least 5 employees at any year between 2009-2015
- Exclude government related and financial industries
- 575 458 firm-year observations

Women40 Retirement Eligibility and Worker Skill Classification

- **Women40 eligibility**: Women40 retiree or 58-61 years old woman after 2011
- **High-skill workers**: Managers, Professionals, and Technicians
- **Low-skill workers**: Clerical service and sales workers, Skilled agricultural and trades workers, Plant and machine operators, and assemblers, Elementary occupations

Firm characteristics

	No retiree	Has retiree	t-test
Large (250+ employee)	0.5%	18.5%	***
Foreign	9%	20%	***
ln(Capital)	7.69	9.97	***
ln(Sales)	11.23	13.34	***
ln(Labor productivity)	7.87	8.12	***
Observations	549 084	26 374	

Has retiree: at least 1 worker retirement

Distribution of number of retirement

Number of retirement		High-skill 0	1	2	3	4+
Low-skill	0	549 084	4 148	217	37	29
	1	15 466	771	89	33	28
	2	2 278	337	81	17	21
	3	743	177	53	13	14
	4+	874	369	173	106	277

Potential endogeneity

Retirement is not random

- selection bias: more productive firms retain older workers
- workers use retirement to ”leave the sinking ship”
- firms layout older workers to cut costs

Methodology - FD IV

Causal regression

$$\Delta ln\left(y_{it}\right) = \alpha + \beta_{1IV} \Delta \hat{HS}_{it} + \beta_{2IV} \Delta \hat{LS}_{it} + \upsilon_{it}$$

First stage regressions

$$\Delta \hat{HS}_{it} = \pi_0 + \pi_1 \Delta HSW40_{it} + \pi_2 \Delta LSW40_{it} + \eta_{it}$$

$$\Delta \hat{LS}_{it} = \phi_0 + \phi_1 \Delta HSW40_{it} + \phi_2 \Delta LSW40_{it} + \zeta_{it}$$

- Δ: changes from $t-1$ to t
- y_{it}: labor productivity $= \frac{\text{value added}}{\text{worker}}$
- HS_{it}, LS_{it}: number of high-skilled and low-skilled retired workers
- $HSW40_{it}, LSW40_{it}$: number of high-skilled and low-skilled workers eligible for Women40

Identification assumptions

Relevance condition First Stage

- Women40 policy directly affects retirement behavior
- significant jump in retirement following the policy change
- first stage regression: instruments are strong and relevant
  - high-skill and low-skill instruments are statistically significant
  - F-statistics are above the common threshold of 10

Exclusion restriction

- Women40 policy impacts firm productivity only through worker exits
- the policy change increases only women's retirement eligibility
- only impact on firm productivity through worker retirement

Results

	FD	IV
ΔN. of HS retirement	-0.004	-0.027***
	(0.004)	(0.010)
ΔN. of LS retirement	-0.001	-0.003
	(0.001)	(0.003)
Constant	0.053***	0.053***
	(0.001)	(0.001)
Observations	387 347	387 347

Heterogeneity and robustness checks

Heterogeneity

- Size: small firms drive the effect Size
- Industry: services drive the effect Industry
- Ownership: domestic firms drive the effect Ownership

Robustness

- Exclude transitional period (2014-2015) Transitional

Summary

LS retirement: no effect

HS retirement: negative effect on labor productivity growth

- Mostly small, domestic, service firms drive this effect

Next steps

- Use matching to confirm findings
- Understand the mechanism behind the effect

First stage regressions

	ΔHS	ΔLS
ΔN. of HS W40 eligible	0.273***	0.105*
	(0.035)	(0.057)
ΔN. of LS W40 eligible	0.012*	0.285***
	(0.007)	(0.031)
F-statistic	32.34	53.12
Prob $>$ F	0.00	0.00
R-squared	0.21	0.20

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Heterogeneity by size

	Number of employees	
	5-249	250+
ΔN. of HS retirement	-0.062***	-0.016*
	(0.020)	(0.009)
ΔN. of LS retirement	-0.019*	-0.002
	(0.011)	(0.003)
Constant	0.053***	0.042***
	(0.001)	(0.005)
Observations	381 092	5 897

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Heterogeneity by industry

	Manufacturing	Services
ΔN. of HS retirement	-0.015	-0.032**
	(0.004)	(0.014)
ΔN. of LS retirement	-0.004	-0.003
	(0.004)	(0.006)
Constant	0.049***	0.057***
	(0.002)	(0.001)
Observations	71 695	241 252

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Heterogeneity by ownership

	Domestic	Foreign
ΔN. of HS retirement	-0.032**	-0.016
	(0.014)	(0.011)
ΔN. of LS retirement	-0.014*	0.002
	(0.007)	(0.002)
Constant	0.051***	0.069***
	(0.001)	(0.003)
Observations	350 273	32 224

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Robustness: exclude transitional period

	Main	Excl. transitional
ΔN. of HS retirement	-0.027***	-0.024**
	(0.010)	(0.010)
ΔN. of LS retirement	-0.003	0.003
	(0.003)	(0.002)
Constant	0.053***	0.041***
	(0.001)	(0.001)
Observations	387 347	254 884

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