Social Security Eligibility and Labor Force Exit under Local Labor Demand Shocks

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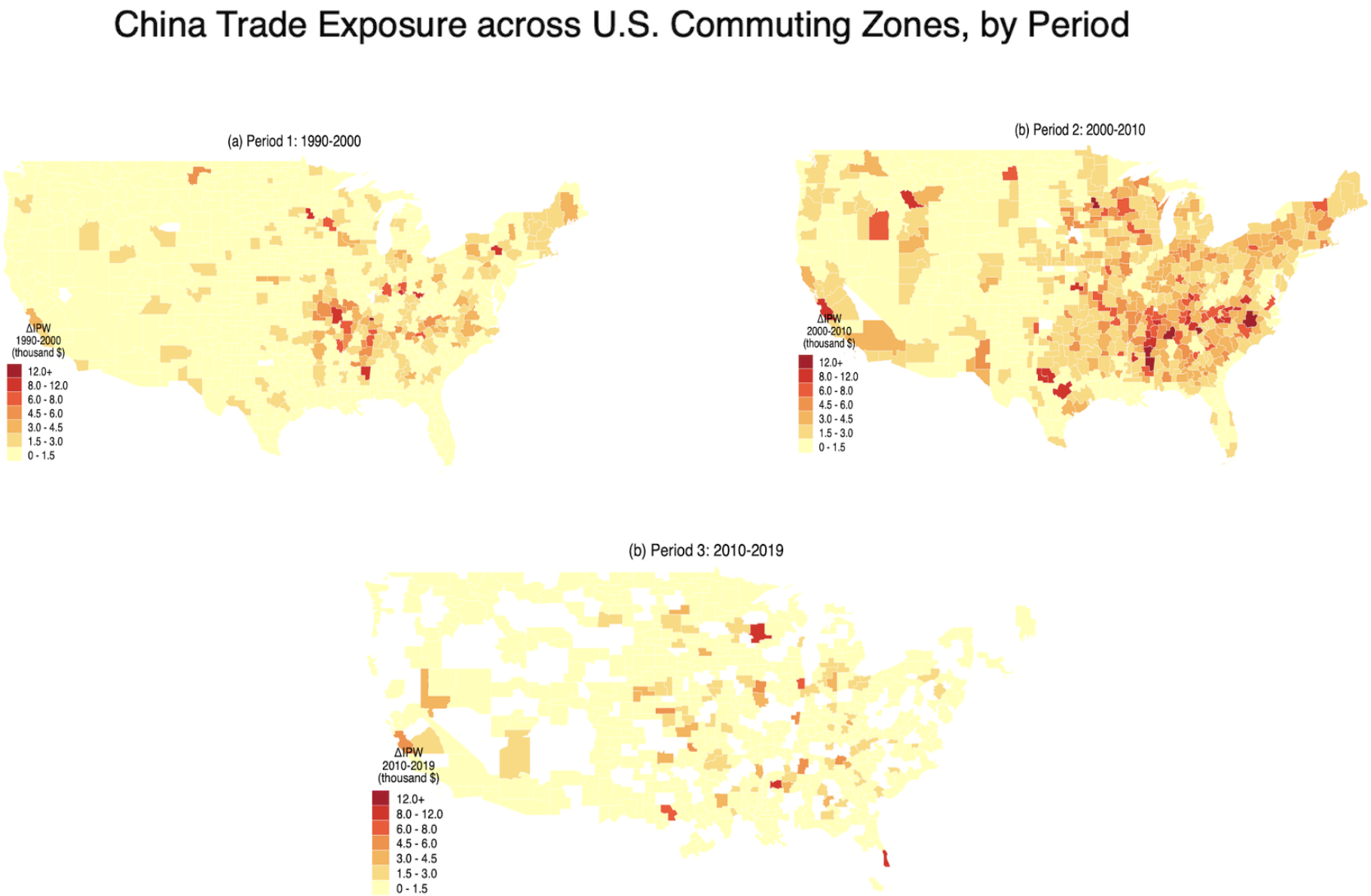
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Motivation


China Trade Exposure across U.S. Commuting Zones, by Period
(a) Period 1: 1990-2000
ΔIPW
1990-2000
(thousand $)
12.0+
8.0 - 12.0
6.0 - 8.0
4.5 - 6.0
3.0 - 4.5
1.5 - 3.0
0 - 1.5
(b) Period 2: 2000-2010
ΔIPW
2000-2010
(thousand $)
12.0+
8.0 - 12.0
6.0 - 8.0
4.5 - 6.0
3.0 - 4.5
1.5 - 3.0
0 - 1.5
(b) Period 3: 2010-2019
ΔIPW
2010-2019
(thousand $)
12.0+
8.0 - 12.0
6.0 - 8.0
4.5 - 6.0
3.0 - 4.5
1.5 - 3.0
0 - 1.5

Motivation

1. **Effects of import competition persist.**
   The China shock plateaued around 2010, while employment-to-population ratios in more exposed areas remained depressed through 2019 (Autor, Dorn, and Hanson, 2021).

2. **Affected workers age in place.**
   Incumbent workers in trade-exposed places age in place, which may raise net transfers to those places as they become eligible for Social Security and Medicare (Autor et al., 2025).

3. **Income options when leaving work depend on age.**
   Retired workers can first claim Social Security benefits at age 62. Individuals in the same local labor market may therefore face different income options, depending on how close they are to that age.

Research Question

Main Question:

- How does import competition affect employment, nonparticipation by income source, and family poverty, and do these effects differ with proximity to age 62?

1. Do estimated employment declines differ across birth cohorts?
2. Does nonparticipation come with Social Security, private pension income, both, or neither?
3. How do poverty responses vary across cohorts?

This Paper

- **Design:**
  Commuting zone design of Autor, Dorn, and Hanson (2013, ADH), with Census and ACS microdata for 1990–2019.

- **Decomposition:**
  Nonparticipation is divided into Social Security only, private pension only, both, or neither.

- **Comparison:**
  Three birth cohorts defined by when they reach age 62: during 2001–2010 (A), 2011–2020 (B), and 2021–2030 (C).

- **Limit:**
  The cohorts differ in age as well as in eligibility, and the data do not separate retirement from disability and survivor benefits. The results do not isolate the effect of eligibility.

Existing Literature

1. **Local Effects of Import Competition**
   - Autor, Dorn and Hanson (2013, 2021)
   - Autor, Dorn, Hanson and Song (2014)
   - Autor, Dorn, Hanson, Jones and Setzler (2025)
   - Besedeš, Lee and Yang (2025)
2. **Retirement and Labor Market Conditions**
   - Engelhardt and Gruber (2004)
   - Coile and Levine (2007, 2011)
3. **Disability Insurance**
   - Autor and Duggan (2003)
   - Black, Daniel and Sanders (2002)
   - Maestas, Mullen and Strand (2021)

Data

- **Outcomes:** Decennial Census (1990, 2000) and American Community Survey one-year samples (2010, 2019) from IPUMS USA.
- **Local industry employment (CBP):**
  County Business Patterns employment in 397 manufacturing industries at the commuting zone level.
- **Chinese imports:**
  - UN Comtrade at the six-digit HS level, mapped to 397 manufacturing industries, in 2019 dollars.
  - ΔIPW_{it}: change in Chinese import penetration per worker, instrumented with Chinese imports in eight other high-income countries, following ADH.
- **Controls (start of period):** manufacturing employment share, college educated share, foreign born share, female employment rate, routine occupation share, offshorability index, and Census division indicators.

Final Sample

- **Geographic Unit:** 722 U.S. Commuting Zones (CZs).
  - Excludes Alaska and Hawaii.
  - Constructed by aggregating individual microdata using year-specific PUMA-to-CZ crosswalks.
- **Samples:**
  - Stacked panel (shock period): 1990–2000 and 2000–2010 ($N = 1{,}444$).
  - Aftermath: changes over 2010–2019 on cumulative exposure over 1990–2010 ($N = 722$).
- **Weighting:** Start-of-period cohort population shares.
- **Inference:** Standard errors clustered by state.

Summary Statistics

Table 2: Summary Statistics: Trade Exposure and Controls

	Stacked panel (1990–2010)		Aftermath (2010–2019)	
	Mean	SD	Mean	SD
Panel A. Exposure ($1,000 per worker)				
ΔIPW	1.889	1.954	3.785	3.117
ΔIPO	1.836	1.803	3.664	2.512
Panel B. Start-of-period controls				
Manufacturing employment share (%)	19.042	9.341	12.072	6.639
College educated share (%)	48.760	9.031	56.958	7.408
Foreign born share (%)	10.334	9.429	13.398	10.233
Female employment rate (%)	64.114	5.455	62.787	4.908
Routine occupation share (%)	32.609	2.546	30.496	1.917
Offshorability index	0.020	0.079	−0.031	0.086
Observations	1,444		722	

Notes: Commuting zone means and standard deviations, weighted by start-of-period population shares of cohort T. Exposure in the stacked panel is per period. Exposure in the aftermath column is cumulative over 1990–2010, which is the exposure measure used in the aftermath regressions; the controls in that column are measured in 2010.

Summary Statistics

Table 3: Summary Statistics: Changes in Cohort Outcomes (Percentage Points)

	Cohort T		Cohort A		Cohort B		Cohort C	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Panel A. Shock period (1990–2010), change per period (N = 1,444)								
Emp/pop	−8.092	5.041	−23.028	10.427	−6.334	5.362	−0.669	3.630
LFP/pop	−7.514	3.468	−23.259	9.593	−5.468	3.744	0.059	3.999
Pov/pop	−0.199	2.189	0.436	1.648	0.162	2.608	−1.063	3.230
Retire/pop	8.565	6.122	26.455	18.888	4.718	3.585	1.445	1.182
SS only	4.683	3.883	14.865	12.903	2.009	1.605	1.060	0.963
Private only	1.228	0.528	1.539	3.215	2.082	1.812	0.289	0.373
Both	2.653	2.471	10.051	9.337	0.627	0.634	0.096	0.164
Other NILF	−1.051	4.288	−3.195	9.878	0.750	2.223	−1.505	4.184
Panel B. Aftermath (2010–2019) (N = 722)								
Emp/pop	−13.637	2.368	−19.492	3.985	−25.126	3.501	−2.289	3.246
LFP/pop	−17.828	2.000	−22.049	4.202	−29.828	3.272	−7.077	2.949
Pov/pop	−0.564	1.413	0.596	2.104	−0.458	2.025	−1.364	2.209
Retire/pop	19.757	2.131	24.607	4.424	35.786	4.093	5.453	2.137
SS only	7.343	1.770	3.543	4.623	17.722	3.243	1.549	1.327
Private only	1.774	0.815	−0.500	1.186	1.633	1.873	3.197	1.264
Both	10.640	2.107	21.564	4.564	16.431	3.767	0.707	0.518
Other NILF	−1.929	1.464	−2.558	1.644	−5.958	2.775	1.625	2.203

Notes: Commuting zone means and standard deviations of the change in each outcome, as a percentage of cohort population, weighted by start-of-period cohort population shares. Retire/pop is the sum of SS only, Private only, and Both. The 2010–2019 changes are not rescaled to ten years.

Empirical Strategy: Model Specification

- **China Import Penetration (ΔIPW)**

$$\Delta \text{IPW}_{it} = \sum_j \frac{L_{ijt}}{L_{jt}} \cdot \frac{\Delta M_{jt}}{L_{it}}$$

  - L_{ijt}: employment in industry j in CZ i at the start of period t
  - L_{jt}: national U.S. employment in industry j at the start of period t
  - L_{it}: total employment in CZ i at the start of period t
  - ΔM_{jt}: the change in U.S. imports from China in industry j over period t (in thousands of dollars)

Empirical Strategy: Model Specification

- **Baseline Specification (Stacked First Differences)**

$$\Delta y_{it} = \beta_0 + \beta_1 \Delta IPW_{it} + X'_{it}\gamma + \delta_t + \epsilon_{it}$$

  - Δy_{it}: percentage point change in an outcome in CZ i over period t (1990–2000, 2000–2010).
  - X_{it}: start-of-period controls. δ_t: period effect.
  - β_1: percentage point change for a \$1,000 increase in exposure per worker.

- **Aftermath (2010–2019)**
  - Relates changes over 2010–2019 to cumulative exposure, with controls measured in 2010.

$$\Delta IPW_i^{sum} = \Delta IPW_{1990-2000} + \Delta IPW_{2000-2010}$$

Empirical Strategy: Instrumental Variable

- **Instrument**

$$\Delta \text{IPO}_{it} = \sum_j \frac{L_{ij,t-1}}{L_{j,t-1}} \cdot \frac{\Delta M_{jt}^{other}}{L_{i,t-1}}$$

  - $L_{ij,t-1}$: employment in industry j in CZ i in the prior decade
  - $L_{j,t-1}$: national U.S. employment in industry j in the prior decade
  - $L_{i,t-1}$: total employment in CZ i in the prior decade
  - ΔM_{jt}^{other}: the change in imports from China in industry j in the eight comparison countries over period t

Empirical Strategy: Instrumental Variable

- Following ADH, the instrument uses Chinese imports in Australia, Denmark, Finland, Germany, Japan, New Zealand, Spain, and Switzerland.
- A simultaneous increase in Chinese exports to all eight markets is likely to reflect supply factors within China rather than demand conditions in any one importing country.
- **First stage:**
  - Weighted correlation of ΔIPW and ΔIPO: about 0.62 (stacked), 0.68 to 0.69 (aftermath).
  - Kleibergen-Paap F with controls: about 35 to 38 (shock period), 68 to 86 (aftermath).
- **Key assumption:** conditional on the controls, Chinese export growth to the eight countries affects outcomes only through U.S. import competition. This cannot be tested directly.

Cohorts and Outcomes

Cohort (Birth Years)	1990	2000	2010	2019	Reaches age 62
A (1939–1948)	42–51	52–61	62–71	71–80	2001–2010
B (1949–1958)	32–41	42–51	52–61	61–70	2011–2020
C (1959–1968)	22–31	32–41	42–51	51–60	2021–2030

- **NILF** = not in the labor force.
  Cohorts span ten birth years and are observed at different ages, so the comparison is not a regression discontinuity at age 62.
- **SS only**: NILF with Social Security income (OASI, SSDI, survivor and dependent benefits), no private pension income.
- **Private only**: NILF with private pension income, no Social Security income.
- **Both**: NILF with both.
- **Other NILF**: NILF with neither. Individuals may still have other income, such as spousal earnings or other transfers.
- **Retire/pop**: SS only + Private only + Both.

Result 1: Employment, Participation, and Poverty

	Shock Period (1990–2010)			Aftermath (2010–2019)		
	Emp/pop	LFP/pop	Pov/pop	Emp/pop	LFP/pop	Pov/pop
	(1)	(2)	(3)	(4)	(5)	(6)
Cohort T (born 1939–1968)						
ΔIPW	−0.770***	−0.578***	0.243**	0.184***	0.107**	−0.030
	(0.209)	(0.161)	(0.098)	(0.053)	(0.052)	(0.035)
Cohort A (born 1939–1948) — crosses age 62 during shock period						
ΔIPW	−0.761***	−0.625***	0.043	0.193*	0.097	−0.143**
	(0.285)	(0.242)	(0.089)	(0.102)	(0.093)	(0.057)
Cohort B (born 1949–1958) — most reach age 62 during aftermath						
ΔIPW	−0.692***	−0.451**	0.400***	0.216**	0.114	0.005
	(0.242)	(0.175)	(0.122)	(0.103)	(0.094)	(0.062)
Cohort C (born 1959–1968) — below age 62 throughout						
ΔIPW	−0.780***	−0.585***	0.245**	0.126**	0.081*	0.006
	(0.181)	(0.152)	(0.122)	(0.056)	(0.046)	(0.045)
N (each panel)	1,444	1,444	1,444	722	722	722
KP *F* (Cohort T)	36.4	36.4	36.4	74.4	74.4	74.4
KP *F* (Cohort A)	37.5	37.5	37.5	82.3	82.3	82.3
KP *F* (Cohort B)	36.8	36.8	36.8	76.4	76.4	76.4
KP *F* (Cohort C)	35.0	35.0	35.0	67.9	67.9	67.9

Result 1: Summary

- **Employment declines are similar across cohorts (1990–2010).**
  Cohort A -0.76, cohort B -0.69, cohort C -0.78. I cannot reject equality ($p = 0.734$).

- **Poverty responses differ across cohorts ($p = 0.003$).**
  Cohort A 0.04 (not significant), cohort B 0.40, cohort C 0.25.
  A vs. B: $p = 0.001$. A vs. C: $p = 0.068$. B vs. C: $p = 0.084$.

- **Scale.**
  One standard deviation of exposure (about \$1,950 per worker) corresponds to employment declines of 1.35 to 1.52 percentage points and a poverty increase of 0.78 percentage points in cohort B.

- **Interpretation.**
  Consistent with the timing of age 62, but cohort A estimates also include 1990–2000, when all of its members are below age 62, and the cohorts differ in age.

Result 2: Nonparticipation by Income Source

See Population

	Shock Period (1990–2010)					Aftermath (2010–2019)				
	Retire/pop	SS only	Private only	Both	Other NILF	Retire/pop	SS only	Private only	Both	Other NILF
Cohort T (born 1939–1968)										
ΔIPW	0.289***	0.198**	-0.002	0.094*	0.289***	−0.122**	−0.081**	0.019	-0.060	0.015
	(0.110)	(0.083)	(0.028)	(0.055)	(0.109)	(0.053)	(0.040)	(0.032)	(0.053)	(0.027)
Cohort A (born 1939–1948) — crosses age 62 during shock period										
ΔIPW	0.561***	0.362	0.010	0.189	0.064	−0.159	−0.189	−0.001	0.031	0.062
	(0.206)	(0.230)	(0.091)	(0.225)	(0.156)	(0.108)	(0.173)	(0.027)	(0.145)	(0.043)
Cohort B (born 1949–1958) — most reach age 62 during aftermath										
ΔIPW	0.203*	0.152***	−0.005	0.057**	0.248**	−0.166**	−0.023	0.020	−0.163***	0.053
	(0.113)	(0.044)	(0.074)	(0.029)	(0.113)	(0.083)	(0.073)	(0.062)	(0.063)	(0.059)
Cohort C (born 1959–1968) — below age 62 throughout										
ΔIPW	0.077	0.065	0.006	0.006	0.508***	−0.014	−0.039	0.016	0.009	−0.067
	(0.048)	(0.040)	(0.030)	(0.011)	(0.135)	(0.032)	(0.029)	(0.031)	(0.011)	(0.046)
N (each panel)	1,444	1,444	1,444	1,444	1,444	722	722	722	722	722
KP F (Cohort T)	36.4	36.4	36.4	36.4	36.4	74.4	74.4	74.4	74.4	74.4
KP F (Cohort A)	37.5	37.5	37.5	37.5	37.5	82.3	82.3	82.3	82.3	82.3
KP F (Cohort B)	36.8	36.8	36.8	36.8	36.8	76.4	76.4	76.4	76.4	76.4
KP F (Cohort C)	35.0	35.0	35.0	35.0	35.0	67.9	67.9	67.9	67.9	67.9

Result 2: Summary

- **Cohort A (reaches age 62 during 2001–2010)**
  Retire/pop +0.56 (1% level). SS only (0.36) and Both (0.19) are not individually significant.
- **Cohort B (below age 62 through 2010)**
  SS only +0.15 (1% level), likely SSDI and survivor benefits, although the data do not separate them. Other NILF +0.25 (5% level). The poverty estimate is largest in this cohort.
- **Cohort C (aged 42 to 51 in 2010)**
  Other NILF +0.51 (1% level), larger than cohort A ($p = 0.014$) and cohort B ($p = 0.004$). Cohorts A and B do not differ significantly ($p = 0.278$).
- **Private only**
  Not significant in any cohort.
- **Equality across cohorts**
  Rejected for Retire/pop ($p = 0.038$), SS only ($p = 0.041$), and Other NILF ($p = 0.006$), but not for Private only ($p = 0.989$) or Both ($p = 0.206$).

Result 3: Differences by Gender

	Shock Period (1990–2010)					Aftermath (2010–2019)				
	Retire/pop	SS only	Private only	Both	Other NILF	Retire/pop	SS only	Private only	Both	Other NILF
Cohort T (born 1939–1968)										
Male	0.298**	0.165**	0.028	0.105*	0.245**	−0.090	-0.037	-0.018	-0.035	0.010
	(0.130)	(0.080)	(0.043)	(0.060)	(0.108)	(0.058)	(0.042)	(0.033)	(0.060)	(0.047)
Female	0.286***	0.233**	-0.031	0.084	0.301**	−0.151**	−0.121**	0.054	-0.083	0.020
	(0.109)	(0.093)	(0.034)	(0.054)	(0.128)	(0.059)	(0.051)	(0.039)	(0.054)	(0.031)
Cohort A (born 1939–1948)										
Male	0.693***	0.365	0.135	0.193	0.204	−0.160	−0.236	−0.102**	0.178	0.084
	(0.245)	(0.234)	(0.134)	(0.240)	(0.144)	(0.124)	(0.163)	(0.043)	(0.138)	(0.066)
Female	0.448**	0.362	−0.095	0.181	−0.101	−0.157	−0.137	0.086**	−0.106	0.045
	(0.223)	(0.260)	(0.100)	(0.222)	(0.187)	(0.130)	(0.219)	(0.039)	(0.185)	(0.061)
Cohort B (born 1949–1958)										
Male	0.196	0.129**	−0.013	0.080*	0.244*	−0.105	0.056	0.015	−0.176**	0.001
	(0.138)	(0.062)	(0.094)	(0.041)	(0.126)	(0.122)	(0.072)	(0.072)	(0.088)	(0.066)
Female	0.209*	0.174**	−0.000	0.035	0.246*	−0.220***	−0.095	0.027	−0.152**	0.097
	(0.115)	(0.068)	(0.079)	(0.029)	(0.142)	(0.082)	(0.112)	(0.065)	(0.067)	(0.076)
Cohort C (born 1959–1968)										
Male	0.049	0.027	0.012	0.010	0.294**	0.002	0.010	−0.009	0.001	−0.039
	(0.058)	(0.051)	(0.038)	(0.023)	(0.132)	(0.052)	(0.040)	(0.036)	(0.017)	(0.058)
Female	0.100*	0.100**	−0.001	0.001	0.680***	−0.028	−0.082**	0.038	0.016	−0.095
	(0.053)	(0.047)	(0.030)	(0.013)	(0.188)	(0.054)	(0.037)	(0.058)	(0.012)	(0.082)
N (each panel)	1,444	1,444	1,444	1,444	1,444	722	722	722	722	722
KP *F* (Cohort T, male / female)			36.2 / 36.6					74.7 / 74.1		
KP *F* (Cohort A, male / female)			37.0 / 38.0					85.5 / 79.5		
KP *F* (Cohort B, male / female)			36.6 / 36.9					74.9 / 77.7		
KP *F* (Cohort C, male / female)			34.9 / 35.1					68.4 / 67.5		

Result 3: Summary

Most differences by gender are not statistically significant. The main exceptions:

- **Cohort A employment**
  Men -1.06, women -0.46 ($p = 0.008$).
- **Cohort B poverty**
  Men 0.34, women 0.47 ($p = 0.037$).
- **Cohort C Other NILF**
  Men 0.29, women 0.68 ($p = 0.038$). The estimate is significant for both.

Result 4: The Aftermath Period (2010–2019)

- **Employment** declines less in more exposed areas.
  Cohorts A, B, C: 0.19, 0.22, 0.13, per $1,000 of cumulative exposure. Equality not rejected ($p = 0.811$).
- **Retirement share** falls in cohort B (-0.17), mainly in Both (-0.16). Equality not rejected ($p = 0.183$).
- **Poverty** does not fall significantly in cohort B, most of whose members reach age 62 in this period.
  Cohorts A, B, C: -0.14, 0.005, 0.006.
- **Dependence on controls.** Without controls, the employment estimate for cohort C is 0.04 and not significant, and the poverty estimate for cohort B is -0.08 (10% level).
- **Cohort population.** Coefficients are not significant, with or without controls. This does not rule out changes in composition.
- **Interpretation.** The employment pattern is consistent with regional adjustment, but the equality test cannot rule out cohort-specific responses related to reaching age 62. It could also reflect mean reversion or conditions after the Great Recession.

Limitations

- **Age and eligibility.** Cohorts are ten-year birth bands compared at different ages. The design is not a regression discontinuity at age 62.
- **Exclusion restriction.** It cannot be tested directly. The pretrend analysis is only suggestive and shows significant pretrends without controls.
- **Income measures.** INCSS does not separate retirement, disability, survivor, and dependent benefits. Other NILF does not mean an absence of all income.
- **Repeated cross sections.** I cannot follow individuals, and selective migration or mortality cannot be ruled out.
- **Multiple testing.** *P*-values are not adjusted, and a failure to reject equality does not show that coefficients are equal.
- **Scope.** Estimates capture relative differences across local labor markets rather than national effects.

Summary

1. **Estimated employment declines are similar across cohorts** during 1990–2010, but the accompanying income sources and poverty responses differ.
   - Cohort A: retirement share rises, poverty does not rise significantly.
   - Cohort B: Social Security only and Other NILF both rise, and the poverty estimate is the largest.
   - Cohort C: the largest response is Other NILF.
   - Private only does not respond significantly in any cohort.
2. **Aftermath:** employment rates decline less in more exposed areas, and poverty does not fall significantly in cohort B. Both depend in part on the controls.
3. **Interpretation:** these patterns are consistent with Social Security retirement benefits limiting the poverty consequences of exit for those who can claim them, but they do not isolate the effect of eligibility.

Future Research

Tracing Cohort B

- Besedeš, Lee, and Yang (2025) find that the increase in multidimensional deprivation is largest for young adults aged 17 to 24.
- In this paper, the poverty estimate is largest for cohort B, which is close to but below age 62 at the end of the shock period.
- Possible retirement-specific dimensions:
  1. Early-claim reduction (claiming before the full retirement age)
  2. Income poverty
  3. Medicare insurance gap (age 62–64)
  4. Nonparticipation with no Social Security or private pension income
  5. Lifetime earnings shortfall
- Administrative records could separate benefit types and follow the same individuals over time.

Appendix

Tests of Equal Coefficients

Panel A. Across cohorts				
	A = B	A = C	B = C	A = B = C
Shock period (1990–2010)				
Emp/pop	0.677	0.935	0.541	0.734
LFP/pop	0.388	0.852	0.174	0.308
Pov/pop	0.001	0.068	0.084	0.003
Retire/pop	0.056	0.013	0.170	0.038
SS only	0.361	0.208	0.015	0.041
Private only	0.918	0.972	0.885	0.989
Both	0.555	0.409	0.112	0.206
Other NILF	0.278	0.014	0.004	0.006
Aftermath (2010–2019)				
Emp/pop	0.795	0.598	0.518	0.811
Retire/pop	0.948	0.210	0.085	0.183
Pov/pop	0.052	0.050	0.995	0.097
Panel B. Men = women, by cohort				
	Cohort T	Cohort A	Cohort B	Cohort C
Shock period (1990–2010)				
Emp/pop	0.848	0.008	0.612	0.095
Pov/pop	0.249	0.881	0.037	0.364
Retire/pop	0.901	0.257	0.909	0.357
SS only	0.234	0.988	0.638	0.187
Other NILF	0.596	0.057	0.986	0.038
Aftermath (2010–2019)				
Emp/pop	0.989	0.905	0.868	0.972
Retire/pop	0.224	0.984	0.356	0.725

Employment, Participation, and Poverty by Gender

	Shock Period (1990–2010)			Aftermath (2010–2019)		
	Emp/pop (1)	LFP/pop (2)	Pov/pop (3)	Emp/pop (4)	LFP/pop (5)	Pov/pop (6)
Cohort T (born 1939–1968)						
Male	−0.774***	−0.543***	0.200*	0.183***	0.079	−0.012
	(0.230)	(0.176)	(0.105)	(0.068)	(0.067)	(0.043)
Female	−0.738***	−0.587***	0.283***	0.185***	0.131**	−0.045
	(0.221)	(0.178)	(0.103)	(0.061)	(0.058)	(0.042)
Cohort A (born 1939–1948)						
Male	−1.062***	−0.897***	0.055	0.183	0.076	−0.112
	(0.317)	(0.275)	(0.142)	(0.140)	(0.136)	(0.074)
Female	−0.456	−0.347	0.036	0.200*	0.113	−0.166**
	(0.286)	(0.250)	(0.068)	(0.110)	(0.100)	(0.068)
Cohort B (born 1949–1958)						
Male	−0.743***	−0.440**	0.335***	0.226	0.104	0.048
	(0.263)	(0.200)	(0.128)	(0.144)	(0.131)	(0.072)
Female	−0.631**	−0.455**	0.467***	0.205**	0.123	−0.034
	(0.268)	(0.197)	(0.124)	(0.095)	(0.096)	(0.071)
Cohort C (born 1959–1968)						
Male	−0.556***	−0.343**	0.190*	0.126*	0.037	−0.009
	(0.212)	(0.152)	(0.111)	(0.071)	(0.049)	(0.053)
Female	−0.957***	−0.780***	0.300*	0.129	0.123	0.019
	(0.214)	(0.208)	(0.156)	(0.083)	(0.078)	(0.066)
N	1,444	1,444	1,444	722	722	722
KP *F* (Cohort T)	Male 36.2	Female 36.6		Male 74.7	Female 74.1	
KP *F* (Cohort A)	Male 37.0	Female 38.0		Male 85.5	Female 79.5	
KP *F* (Cohort B)	Male 36.6	Female 36.9		Male 74.9	Female 77.7	
KP *F* (Cohort C)	Male 34.9	Female 35.1		Male 68.4	Female 67.5	

Estimates without Controls

	Shock Period (1990–2010)			Aftermath (2010–2019)		
	Emp/pop	LFP/pop	Pov/pop	Emp/pop	LFP/pop	Pov/pop
	(1)	(2)	(3)	(4)	(5)	(6)
Cohort T (born 1939–1968)						
ΔIPW	−0.639***	−0.532***	0.209***	0.160***	0.129***	−0.039
	(0.174)	(0.184)	(0.072)	(0.055)	(0.048)	(0.037)
Cohort A (born 1939–1948) — crosses age 62 during shock period						
ΔIPW	−0.690***	−0.593***	0.067	0.290**	0.254*	−0.108***
	(0.183)	(0.163)	(0.085)	(0.139)	(0.141)	(0.035)
Cohort B (born 1949–1958) — most reach age 62 during aftermath						
ΔIPW	−0.603***	−0.470**	0.275***	0.177*	0.139	−0.082*
	(0.174)	(0.190)	(0.089)	(0.103)	(0.094)	(0.049)
Cohort C (born 1959–1968) — below age 62 throughout						
ΔIPW	−0.584***	−0.493***	0.243***	0.042	0.017	0.028
	(0.124)	(0.134)	(0.087)	(0.082)	(0.076)	(0.059)
N	1,444	1,444	1,444	722	722	722
KP *F* (Cohort T)	74.5	74.5	74.5	131	131	131
KP *F* (Cohort A)	79.4	79.4	79.4	150.8	150.8	150.8
KP *F* (Cohort B)	75.9	75.9	75.9	134.6	134.6	134.6
KP *F* (Cohort C)	69.8	69.8	69.8	116.6	116.6	116.6

Change of Population

Back to Result 2

Appendix 1: Cohort Population, 1990–2019

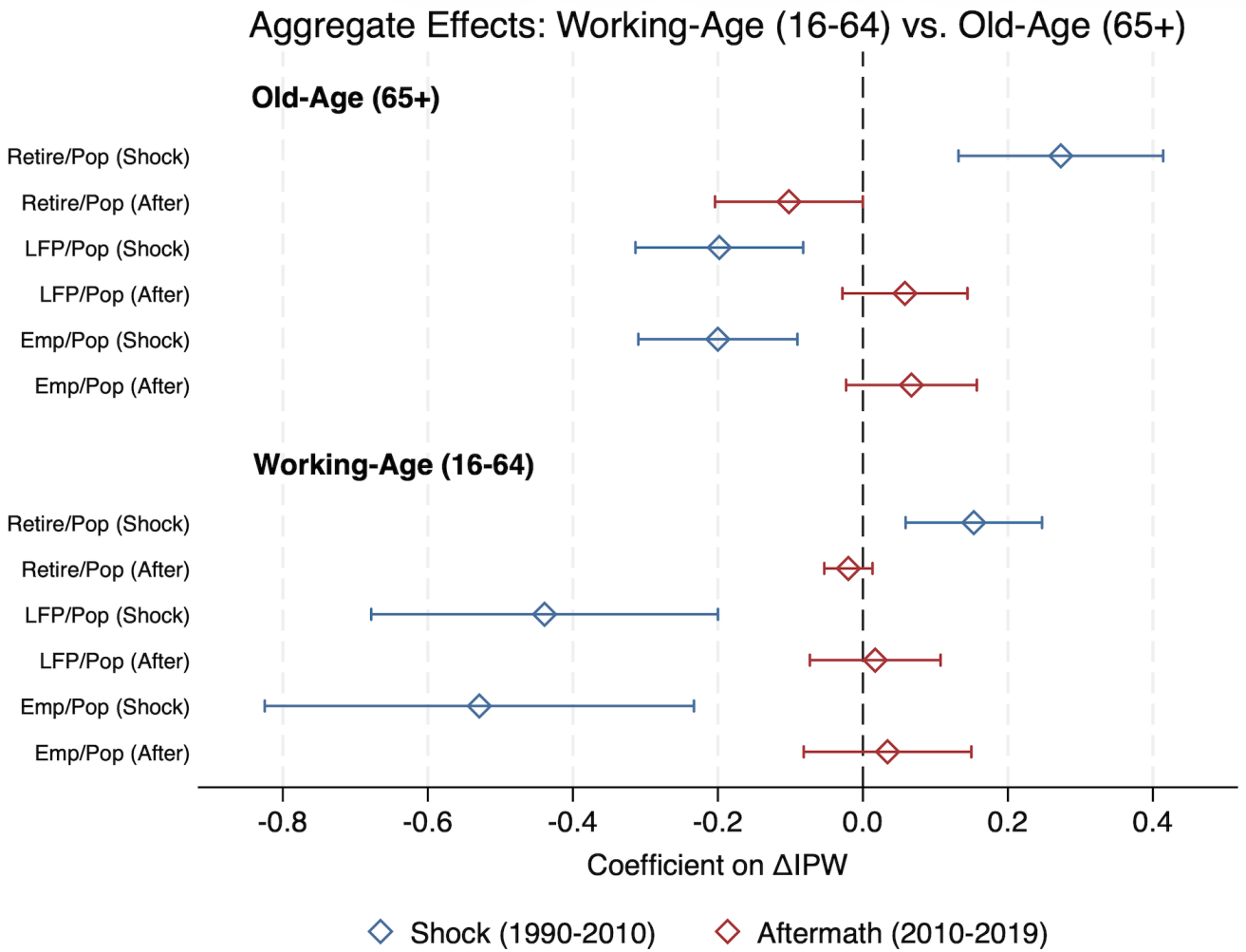
	1990	2000	2010	2019	1990–2019
Panel A: Total population (millions)					
Cohort A (1939–1948)	29.0	28.0	26.4	22.2	−6.8
Cohort B (1949–1958)	40.4	41.0	39.9	37.0	−3.4
Cohort C (1959–1968)	41.1	44.6	44.2	41.8	+0.7
Panel B: Population index (1990 = 100)					
Cohort A (1939–1948)	100.0	96.5	91.1	76.6	−23.4%
Cohort B (1949–1958)	100.0	101.4	98.7	91.5	−8.5%
Cohort C (1959–1968)	100.0	108.4	107.6	101.7	+1.7%

Cohort Population and Trade Exposure

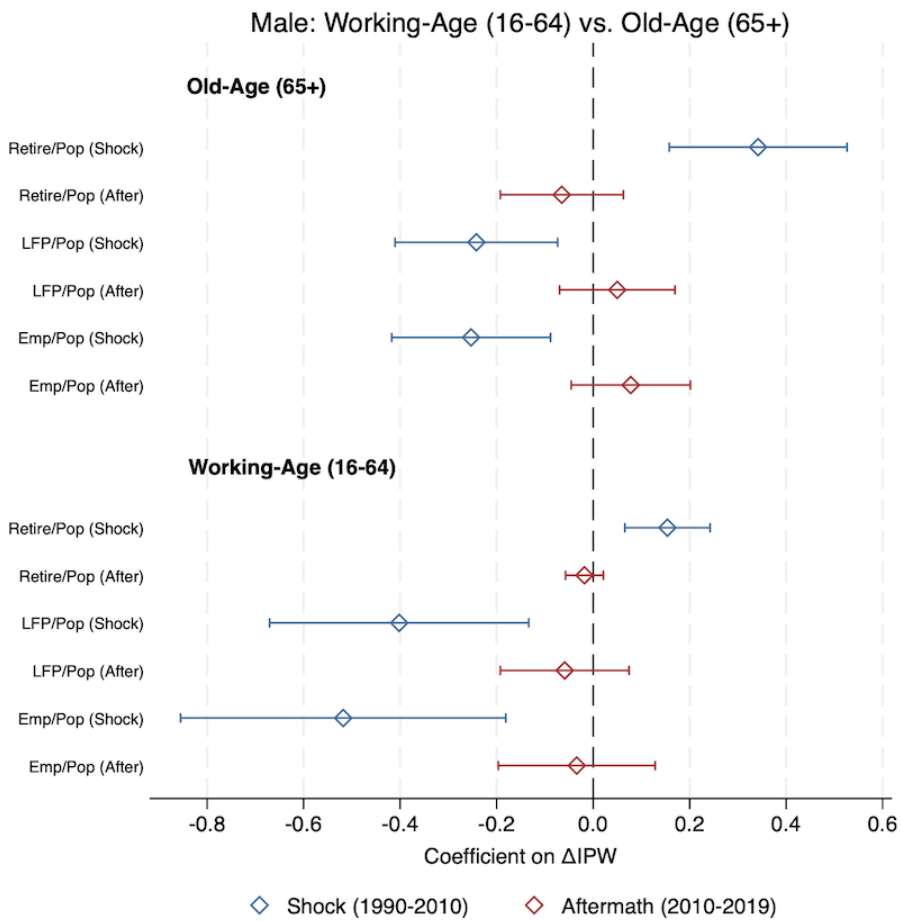
	Stacked (1990–2010)		Aftermath (2010–2019)	
	$\frac{\text{pop}_{t_1}}{\text{pop}_{t_0}}$	$\ln \text{pop}_{t_1} - \ln \text{pop}_{t_0}$	$\frac{\text{pop}_{2019}}{\text{pop}_{2010}}$	$\ln \text{pop}_{2019} - \ln \text{pop}_{2010}$
	(1)	(2)	(3)	(4)
Cohort T (born 1939–1968)				
ΔIPW	0.418	0.004	0.229	0.003
	(0.358)	(0.004)	(0.206)	(0.002)
N	1,444	1,444	722	722
R^2	0.439	0.453	0.312	0.312
KPF	36.4	36.4	74.4	74.4
Cohort A (born 1939–1948)				
ΔIPW	0.608	0.006	0.269	0.004
	(0.438)	(0.005)	(0.218)	(0.003)
N	1,444	1,444	722	722
R^2	0.396	0.424	0.245	0.236
KPF	37.5	37.5	82.3	82.3
Cohort B (born 1949–1958)				
ΔIPW	0.332	0.003	0.239	0.003
	(0.354)	(0.004)	(0.290)	(0.003)
N	1,444	1,444	722	722
R^2	0.397	0.406	0.280	0.285
KPF	36.8	36.8	76.4	76.4
Cohort C (born 1959–1968)				
ΔIPW	0.356	0.003	0.184	0.002
	(0.405)	(0.004)	(0.178)	(0.002)
N	1,444	1,444	722	722
R^2	0.432	0.432	0.264	0.258
KPF	35.0	35.0	67.9	67.9

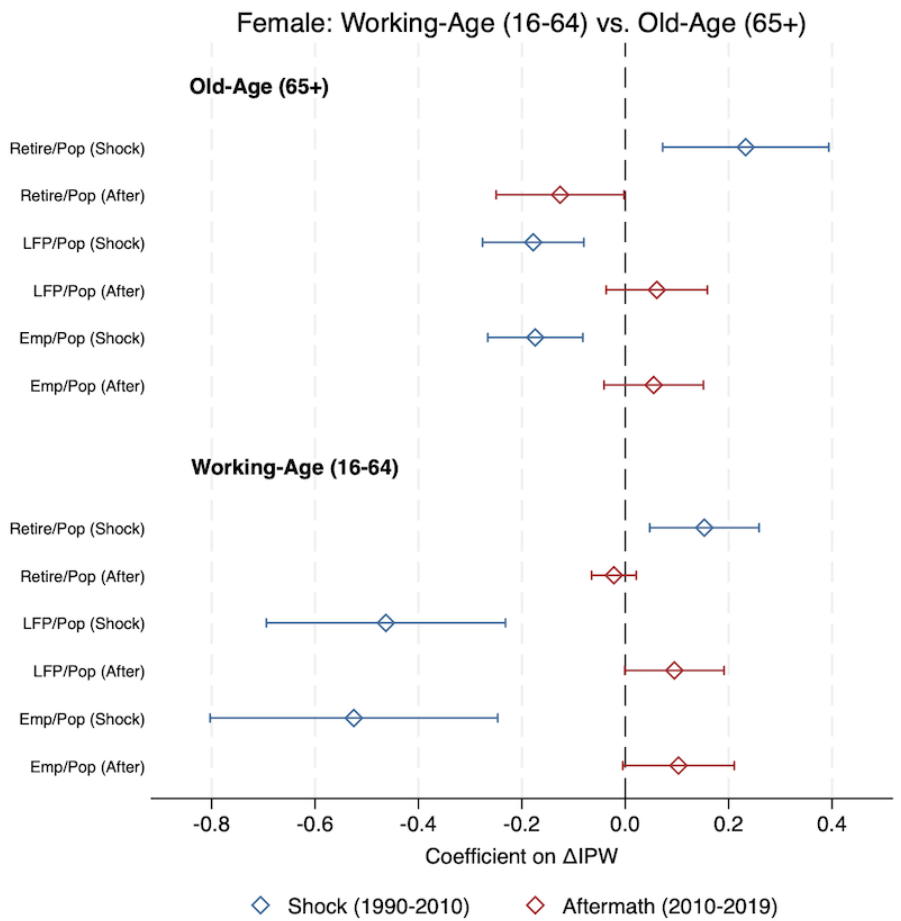
Supplementary: Working Age vs. Old Age

See Table



Supplementary: Working Age vs. Old Age





Supplementary: Aggregate

See Figure

Table 2: Aggregate Effects of China Trade Exposure: Working-Age vs. Old-Age

	Working Age (16–64)			Old Age (65+)		
	(1) Emp/pop	(2) LFP/pop	(3) Retirement/pop	(4) Emp/Pop	(5) LFP/Pop	(6) Retirement/pop
Panel A: Shock Period (Stacked 1990–2010)						
ΔIPW	-0.529^{***}	-0.439^{***}	0.153^{***}	-0.200^{***}	-0.198^{***}	0.273^{***}
	(0.151)	(0.122)	(0.048)	(0.056)	(0.059)	(0.072)
p_2	-1.325	2.898^{***}	0.763^{***}	1.601^{***}	1.878^{***}	1.234^{***}
	(0.838)	(0.729)	(0.130)	(0.302)	(0.322)	(0.247)
N	1,444	1,444	1,444	1,444	1,444	1,444
R^2	0.071	0.146	0.307	0.136	0.178	0.158
KP F-stat	78.12	78.12	78.12	94.21	94.21	94.21
Panel B: Aftermath (2010–2019)						
ΔIPW_{sum}	0.034	0.017	-0.020	0.067	0.058	-0.102^{*}
	(0.059)	(0.046)	(0.017)	(0.046)	(0.044)	(0.052)
N	722	722	722	722	722	722
R^2	0.000	-0.001	0.006	-0.002	-0.002	0.000
KP F-stat	111.19	111.19	111.19	141.87	141.87	141.87

Supplementary: Male

Table 3: Effects of China Trade Exposure: Male

	Working-age (16–64)			Older workers (65+)		
	(1) Emp/pop	(2) LFP/pop	(3) Retirement/pop	(4) Emp/pop	(5) LFP/pop	(6) Retirement/pop
Panel A: Shock Period (Stacked 1990–2010)						
ΔIPW	-0.518^{***}	-0.402^{***}	0.154^{***}	-0.253^{***}	-0.242^{***}	0.342^{***}
	(0.172)	(0.137)	(0.045)	(0.084)	(0.086)	(0.094)
p_2	-1.176	4.038^{***}	0.608^{***}	1.194^{***}	1.930^{***}	0.562^{*}
	(0.895)	(0.788)	(0.130)	(0.445)	(0.464)	(0.311)
N	1,444	1,444	1,444	1,444	1,444	1,444
R^2	0.035	0.272	0.192	0.025	0.088	0.044
KP F-stat	77.2	77.2	77.2	93.7	93.7	
Panel B: Aftermath (2010–2019)						
$\Delta\text{IPW}_{\text{sum}}$	-0.034	-0.059	-0.018	0.078	0.050	-0.065
	(0.083)	(0.068)	(0.020)	(0.063)	(0.061)	(0.065)
N	722	722	722	722	722	722
R^2	-0.000	0.000	-0.001	-0.002	-0.002	-0.003
KP F-stat	111.1	111.1	111.1	140.6	140.6	140.6

Supplementary: Female

Table 4: Effects of China Trade Exposure: Female

	Working-age (16–64)			Older workers (65+)		
	(1) Emp/pop	(2) LFP/pop	(3) Retirement/pop	(4) Emp/pop	(5) LFP/pop	(6) Retirement/pop
Panel A: Shock Period (Stacked 1990–2010)						
ΔIPW	−0.525***	−0.463***	0.153***	−0.174***	−0.178***	0.233***
	(0.142)	(0.118)	(0.054)	(0.047)	(0.050)	(0.082)
p_2	−1.435*	1.818***	0.915***	1.784***	1.721***	1.828***
	(0.775)	(0.662)	(0.140)	(0.216)	(0.242)	(0.247)
N	1,444	1,444	1,444	1,444	1,444	1,444
R^2	0.088	0.014	0.328	0.202	0.173	0.213
KP F-stat	79.0	79.0	79.0	94.5	94.5	94.5
Panel B: Aftermath (2010–2019)						
ΔIPW_{sum}	0.103*	0.095*	-0.022	0.055	0.061	−0.126**
	(0.055)	(0.049)	(0.022)	(0.049)	(0.050)	(0.063)
N	722	722	722	722	722	722
R^2	-0.000	-0.005	0.009	-0.001	0.000	0.006
KP F-stat	111.2	111.2	111.2	142.8	142.8	142.8

Supplementary: Fixed Denominator (1990)

Appendix 3: 1990-Denominator Outcomes Aftermath (2010–2019)

	Aftermath: 2010–2019			
	Emp_{2019} - Emp_{2010}		Retire_{2019} - Retire_{2010}	
	Emp/Pop_{2010}	Emp/Pop_{1990}	Retire/Pop_{2010}	Retire/Pop_{1990}
	(1)	(2)	(3)	(4)
Cohort A (1939–1948)				
ΔIPW	0.290***	0.389***	−0.348***	−1.094***
	(0.105)	(0.143)	(0.116)	(0.391)
Cohort B (1949–1958)				
ΔIPW	0.177	0.157	−0.019	−0.355
	(0.116)	(0.194)	(0.148)	(0.425)
Cohort C (1959–1968)				
ΔIPW	0.042	−0.064	0.107	0.071
	(0.074)	(0.136)	(0.076)	(0.102)
N (each cohort)	722			
KP F (Cohort A)	132.7			
KP F (Cohort B)	119.3			
KP F (Cohort C)	107.7			