Wage Setting – Flexibility and Rigidity in the UK since 1975

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Bank of England; Warwick, CAGE & MAC; Bank of England

All views are our own
and not those of the Bank of England or Migration Advisory Committee.

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Labour Market Conference

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Aims

- Measure UK wage rigidity and flexibility.
  - Use two major datasets: NES (ASHE) and LFS.
- Examine how rigidity has developed against the background of macro and labour market developments.
- Distinguish between nominal and real rigidity, in principle and in terms of their measured developments.
- Investigate rigidity measures suggested by modern macro theory.
- Explore the impact of labour supply (composition) changes.

UK recent real earnings growth in historical context

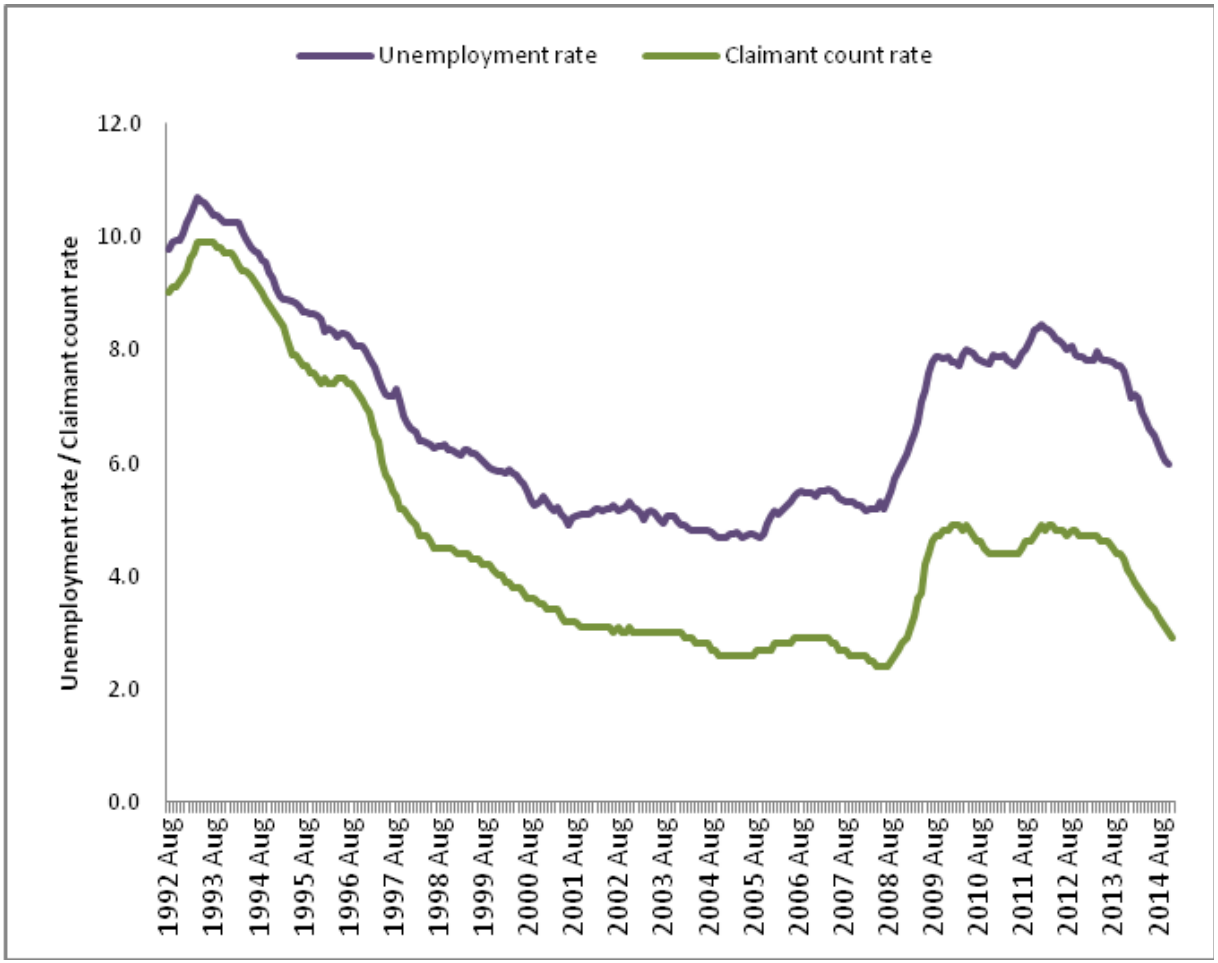
Developments in real consumption earnings growth over 7 year periods including the 5 largest UK real wage declines.

	1865-67	1874-78	1921-23	1976-77	2007-14
Duration (years)	2	4	2	2	7
Depth (%)	-10	-1.7	-8.2	-6.6	-8.2
Recovery (%)	12.8	0.6	4.5	14.5	n.a.
Total change over seven years (%)	1.2	-1.1	-4.0	6.9	-8.2

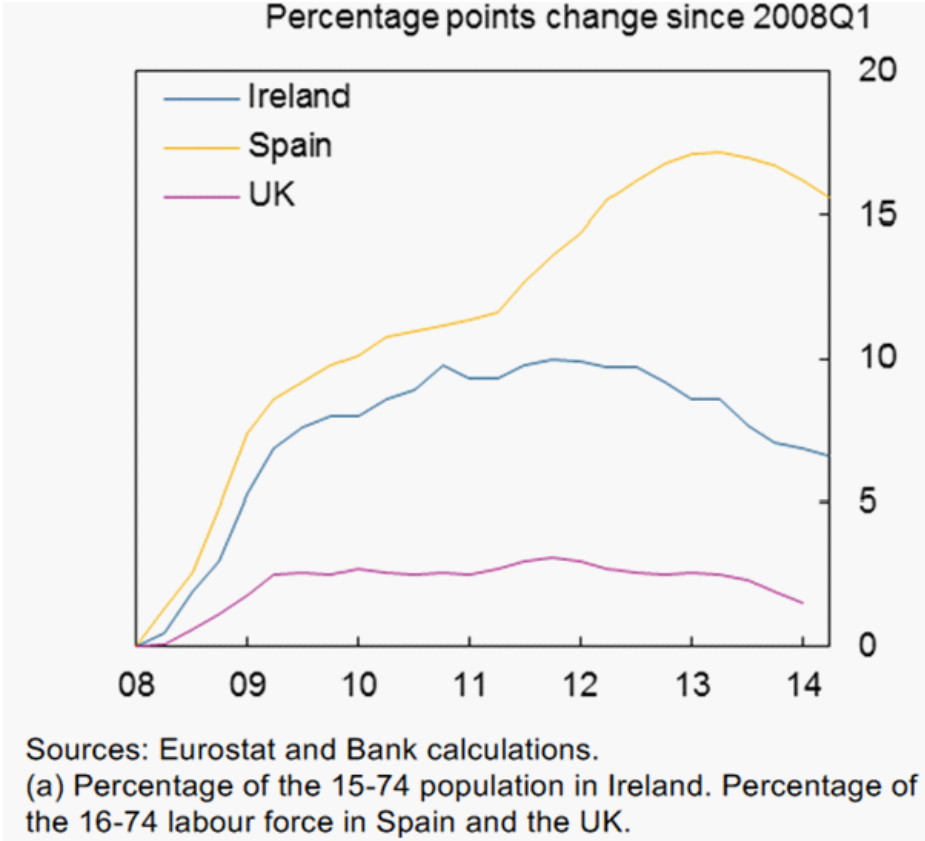
Source: Trade Union Congress. Notes: taken from 'UK workers suffering the most severe squeeze in real earnings since Victorian times', Labour Market and Economic report, available at http://www.tuc.org.uk/economic-issues/labour-market-and-economic-reports/economic-analysis/britain-needs-pay-rise/uk.

Real earnings based on AWE and CPI or nearest equivalents.

UK unemployment

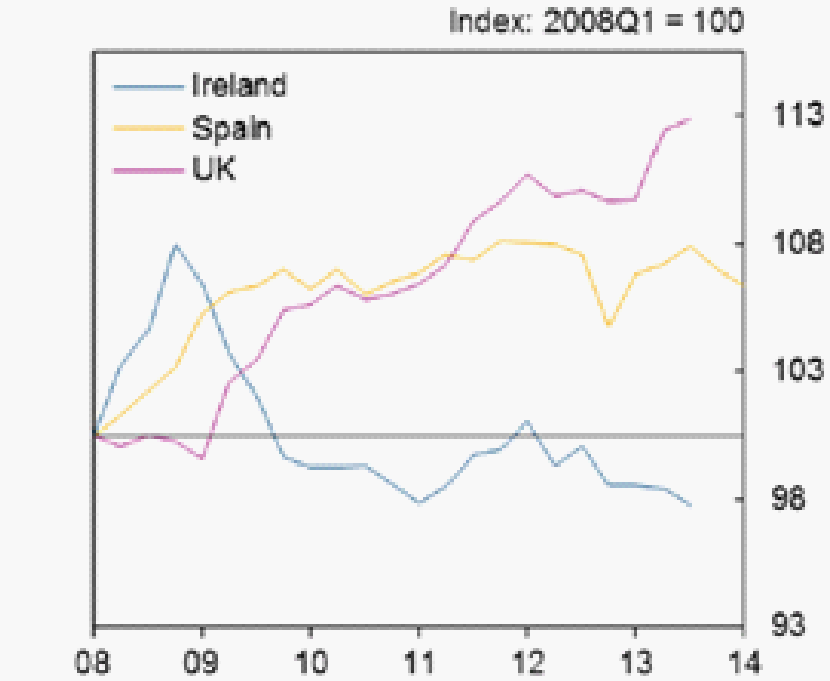


Unemployment rose less in the UK than in Ireland (and Spain)

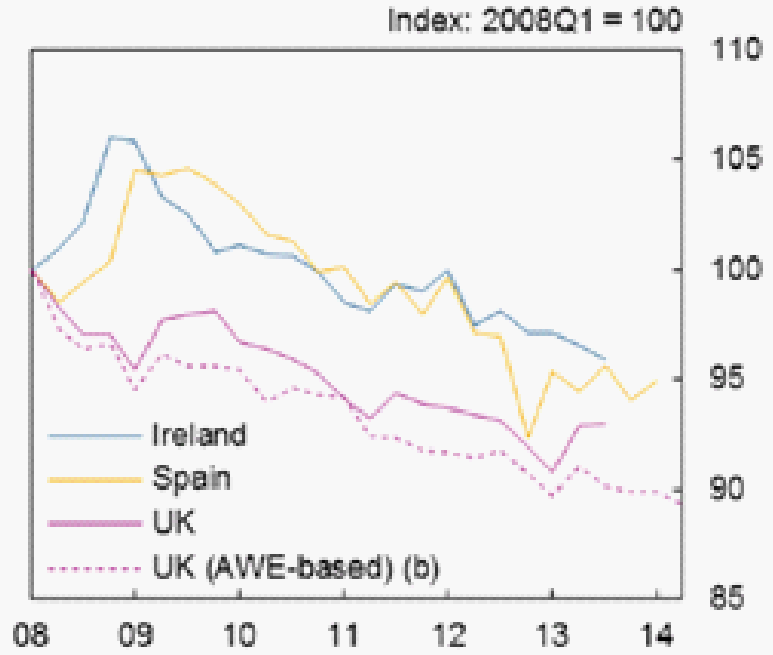


Sources: Eurostat and Bank calculations.
(a) Percentage of the 15-74 population in Ireland. Percentage of the 16-74 labour force in Spain and the UK.

UK nominal wage growth higher than Ireland, but real wage growth lower

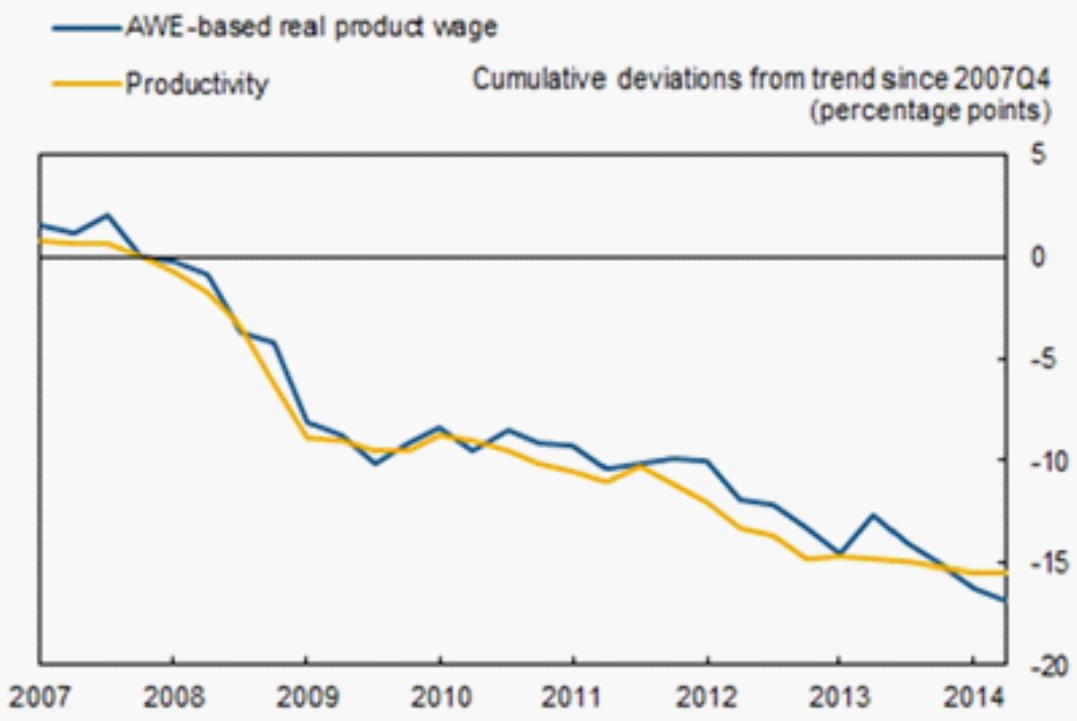


Sources: Eurostat and Bank calculations.
(a) Compensation of employees (expressed in national currencies) divided by number of employees.



Sources: Eurostat and Bank calculations.
(a) Wages and salaries (expressed in national currencies) deflated by CPI and divided by number of employees.
(b) Whole economy average weekly earnings (total pay) deflated by CPI.

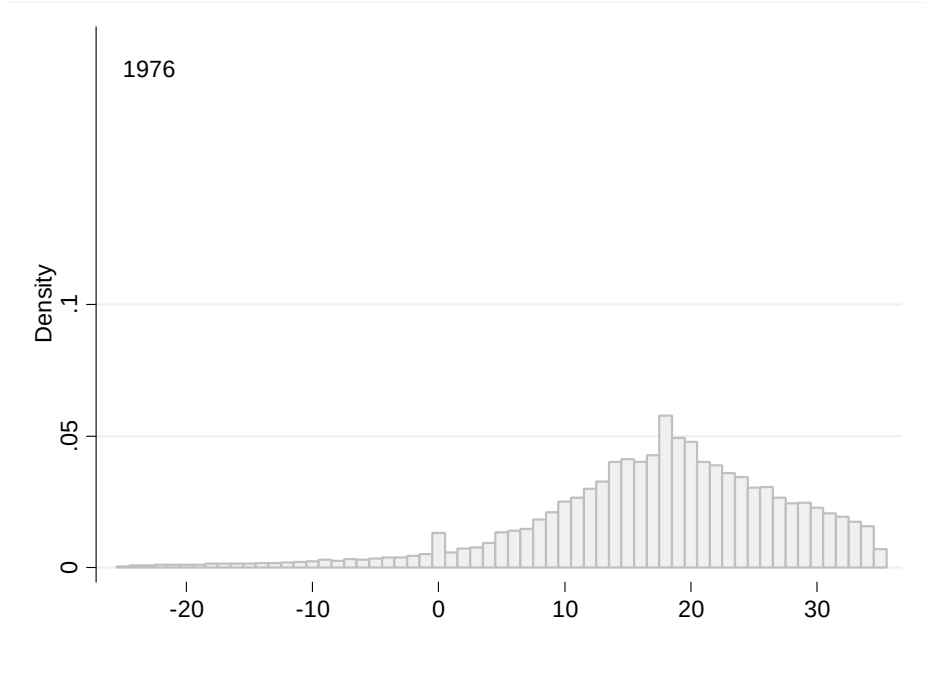
UK real earnings and productivity growth 2007-14



Sources: ONS and Bank calculations. Notes: Trend productivity is calculated using the average growth rate between 1997 Q1 and 2007 Q4. The blue line is calculated based on Average Weekly Earnings (AWE) deflated using the GDP deflator

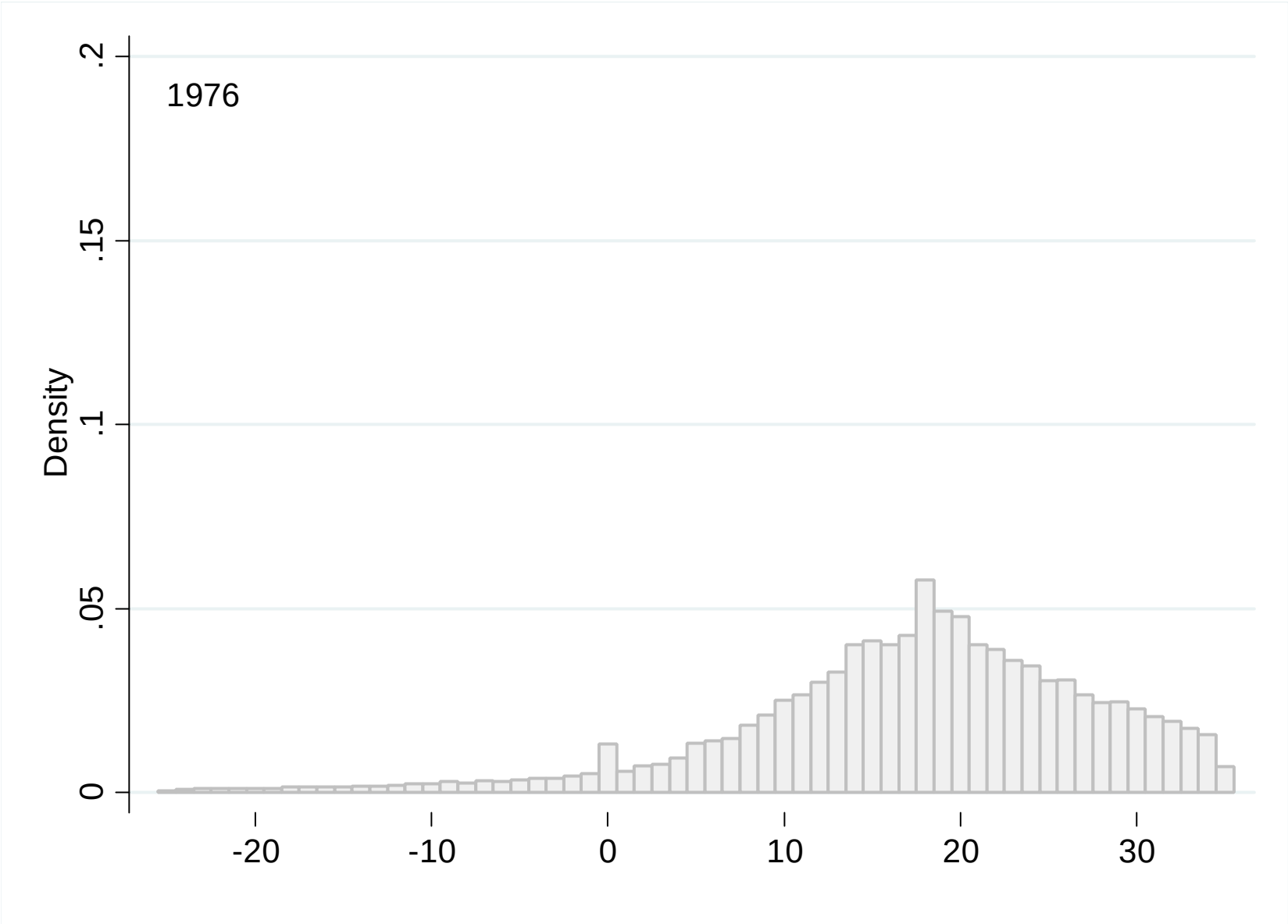
How do average earnings developments relate to changes in the wage growth distribution?

Is recent experience unusual?



- Horizontal axis values are nominal wage growth in %.
- In this histogram, height of each bar shows fraction of employees with nominal wage growth in relevant 1 percentage point band.

Wage growth distributions



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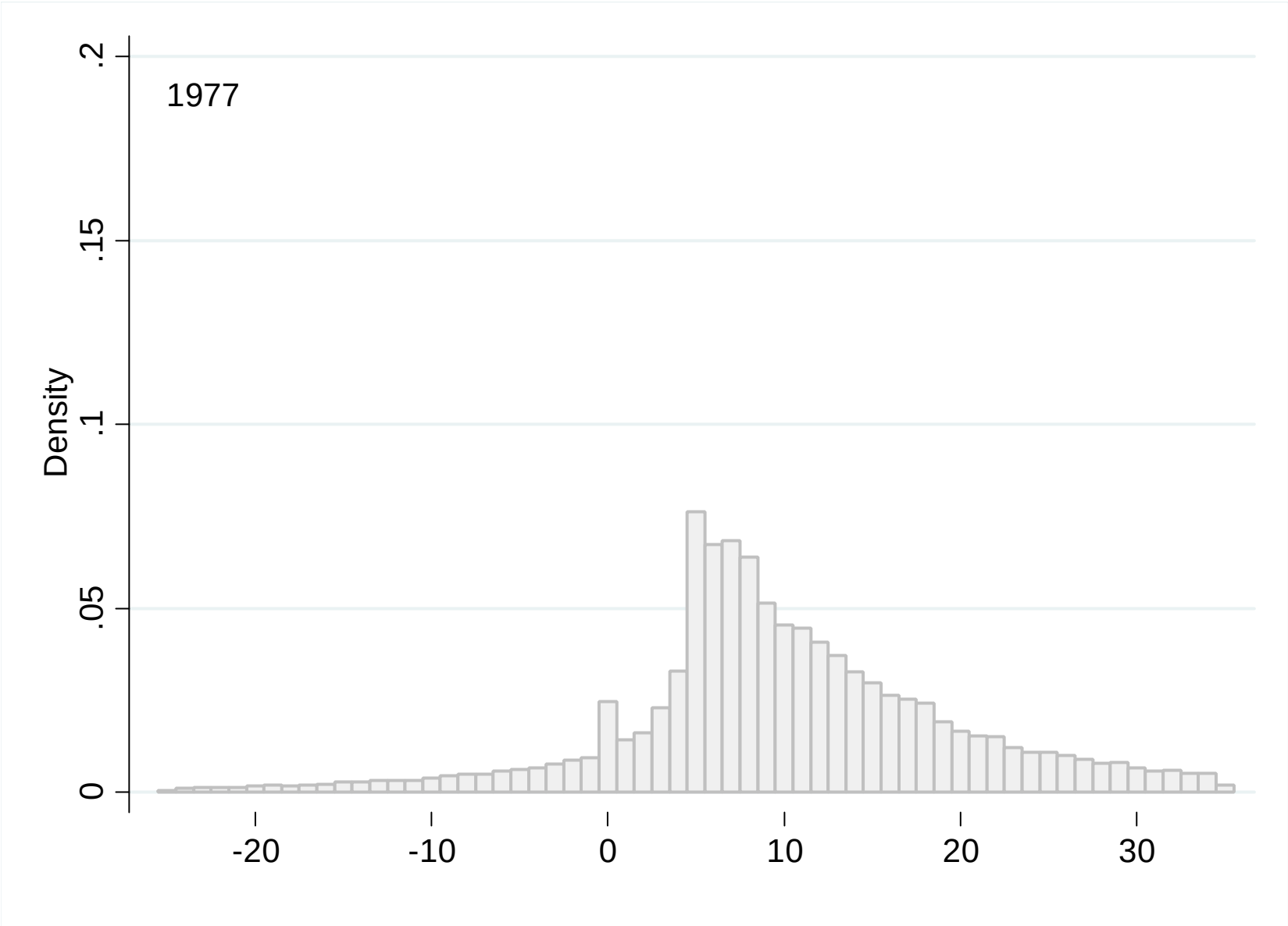

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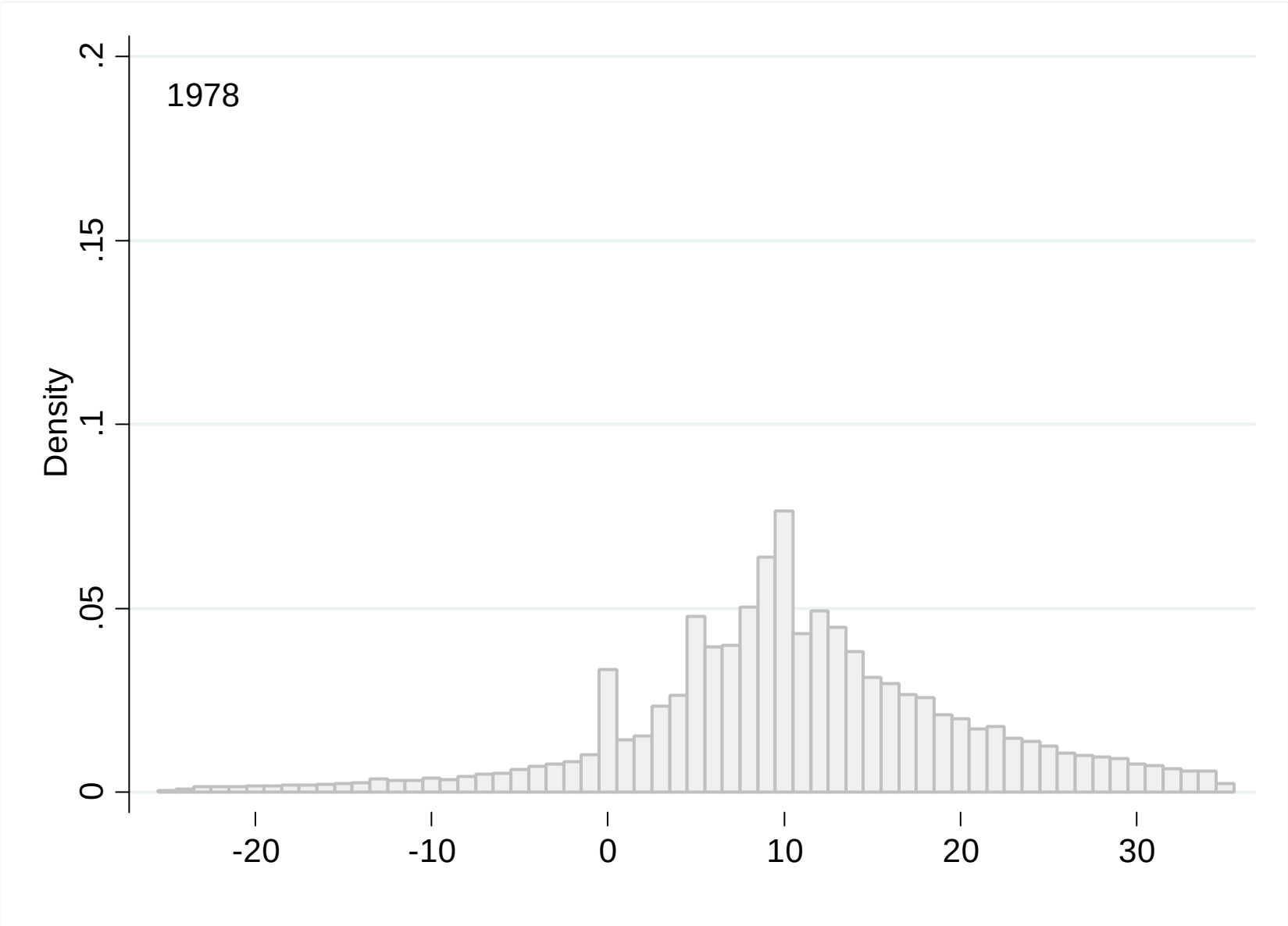

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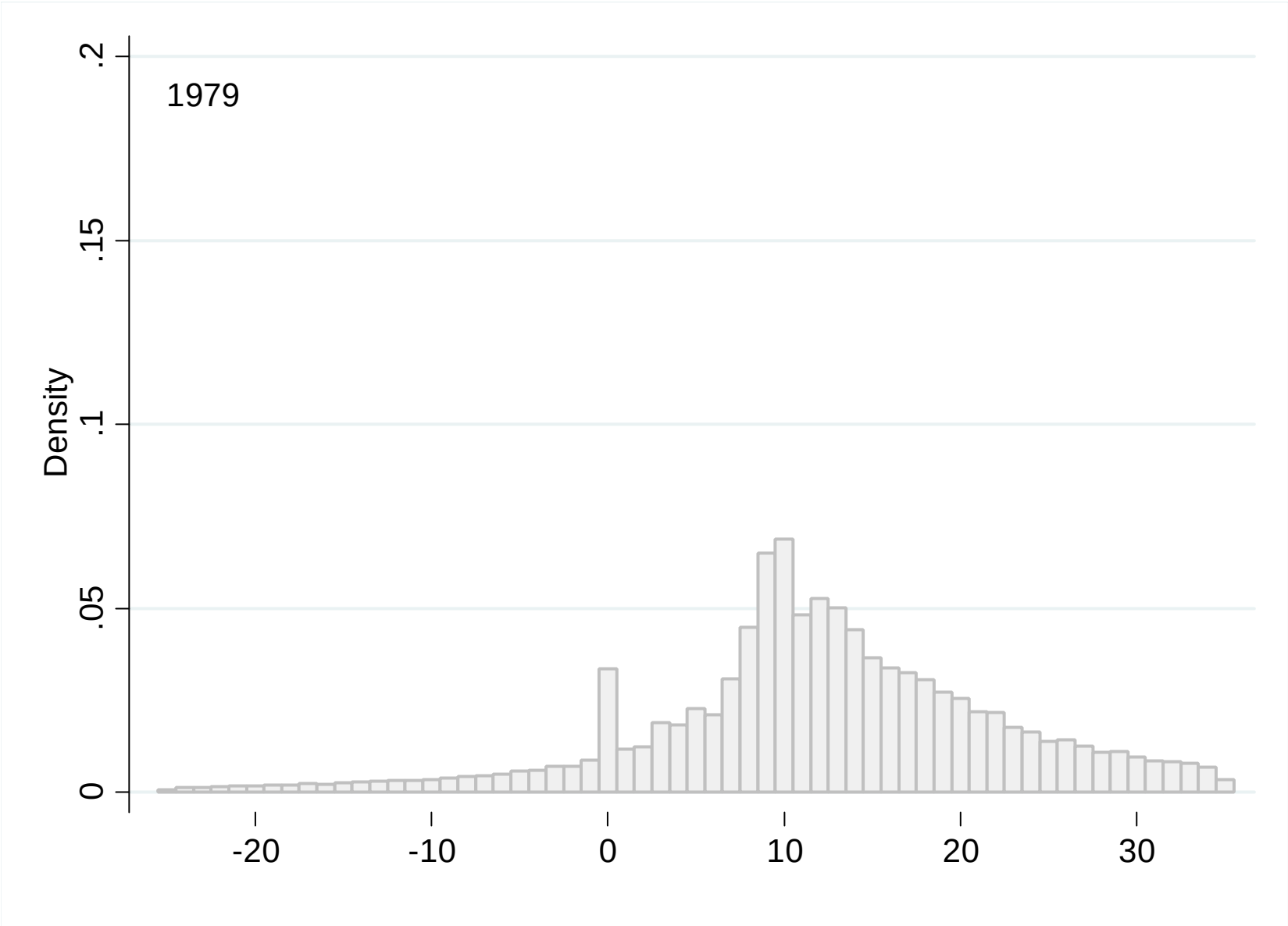

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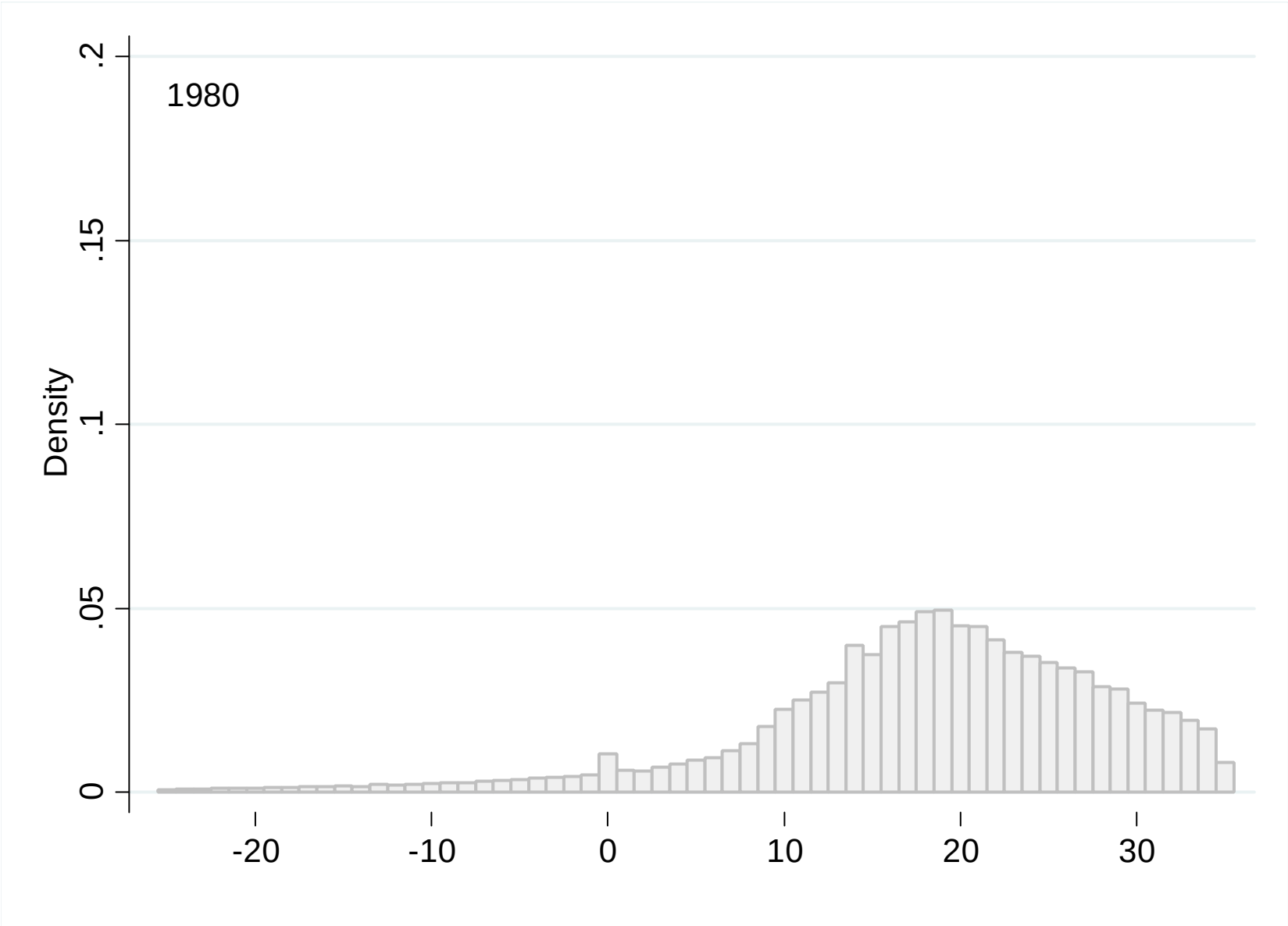

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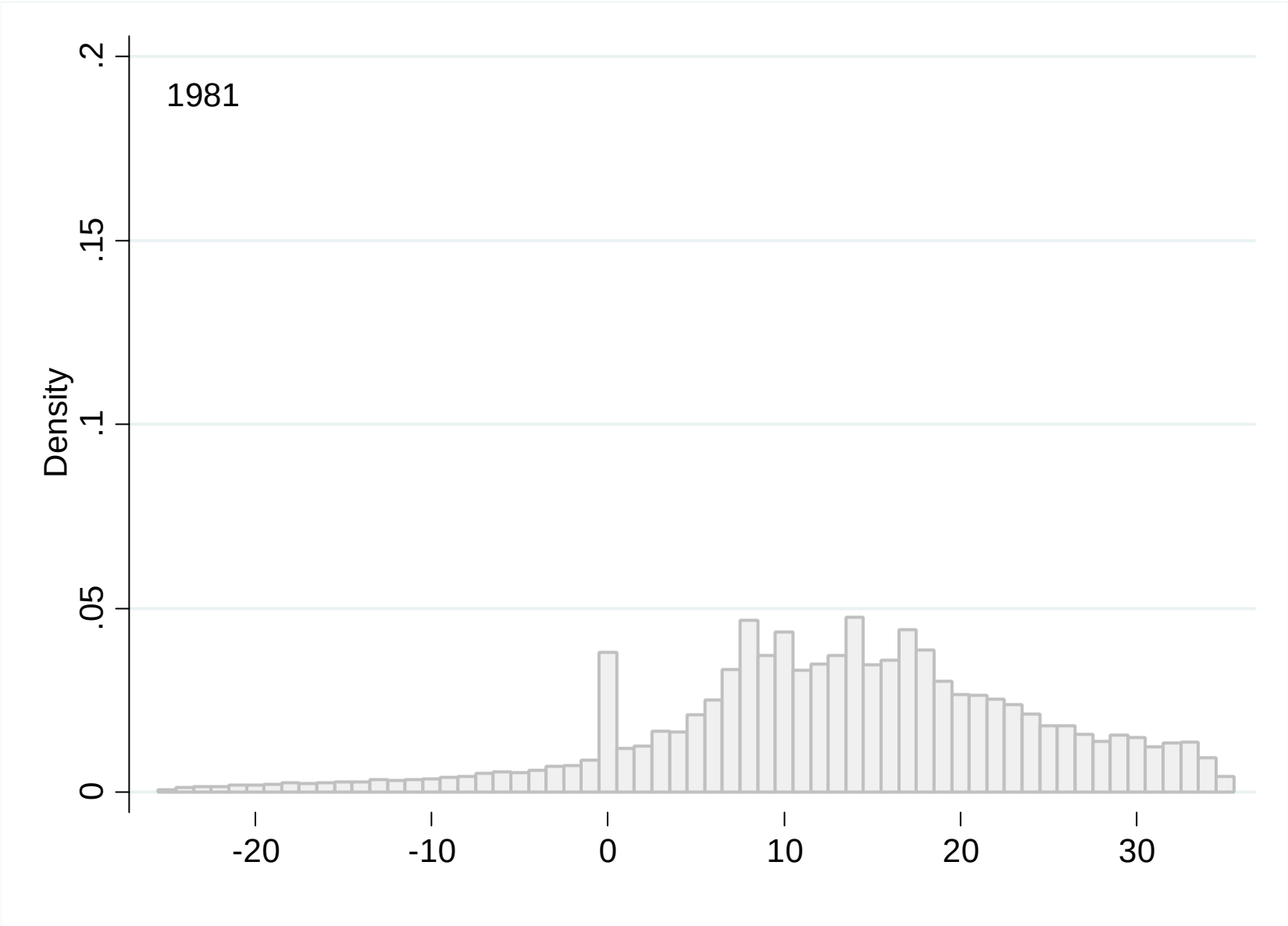

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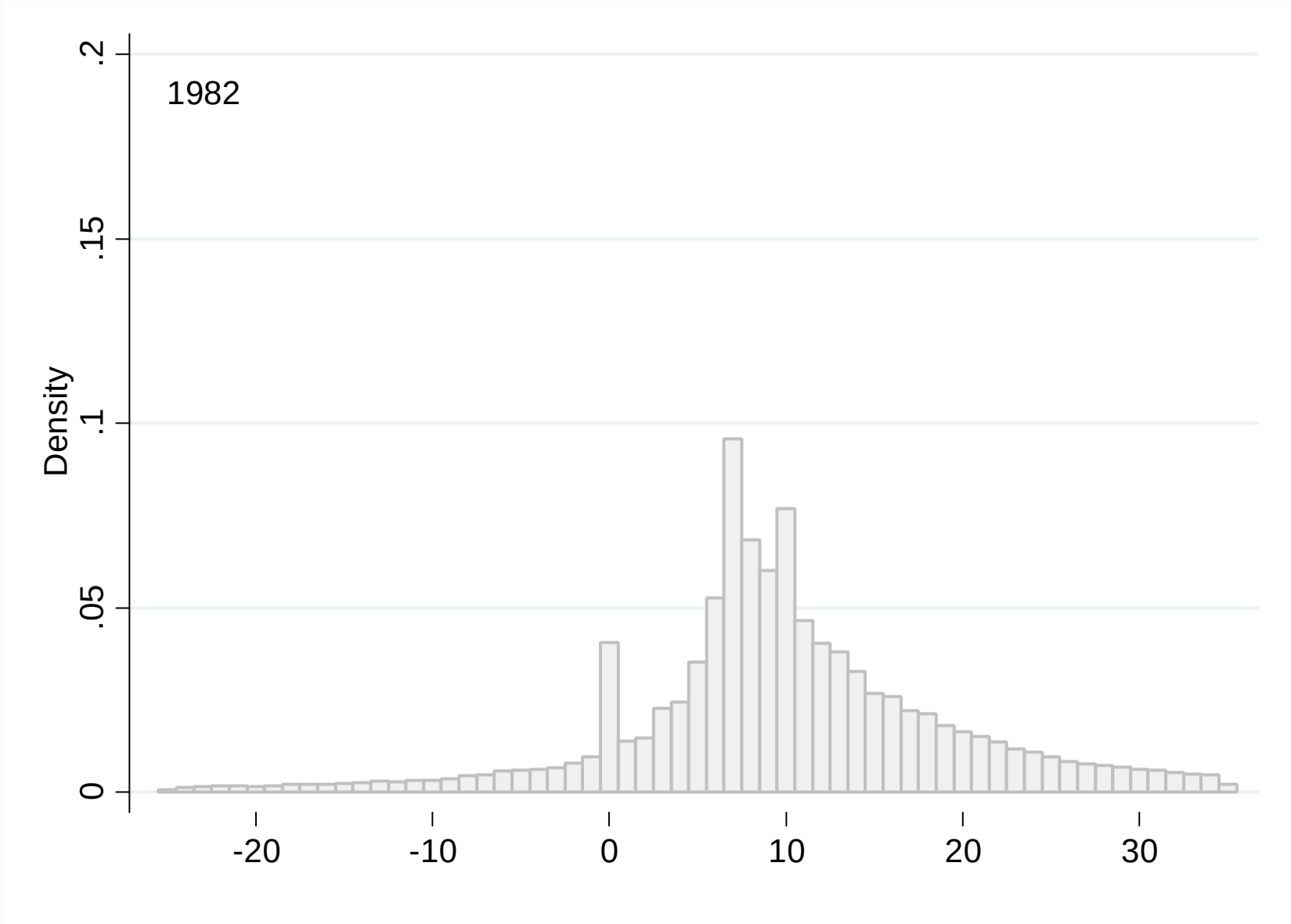

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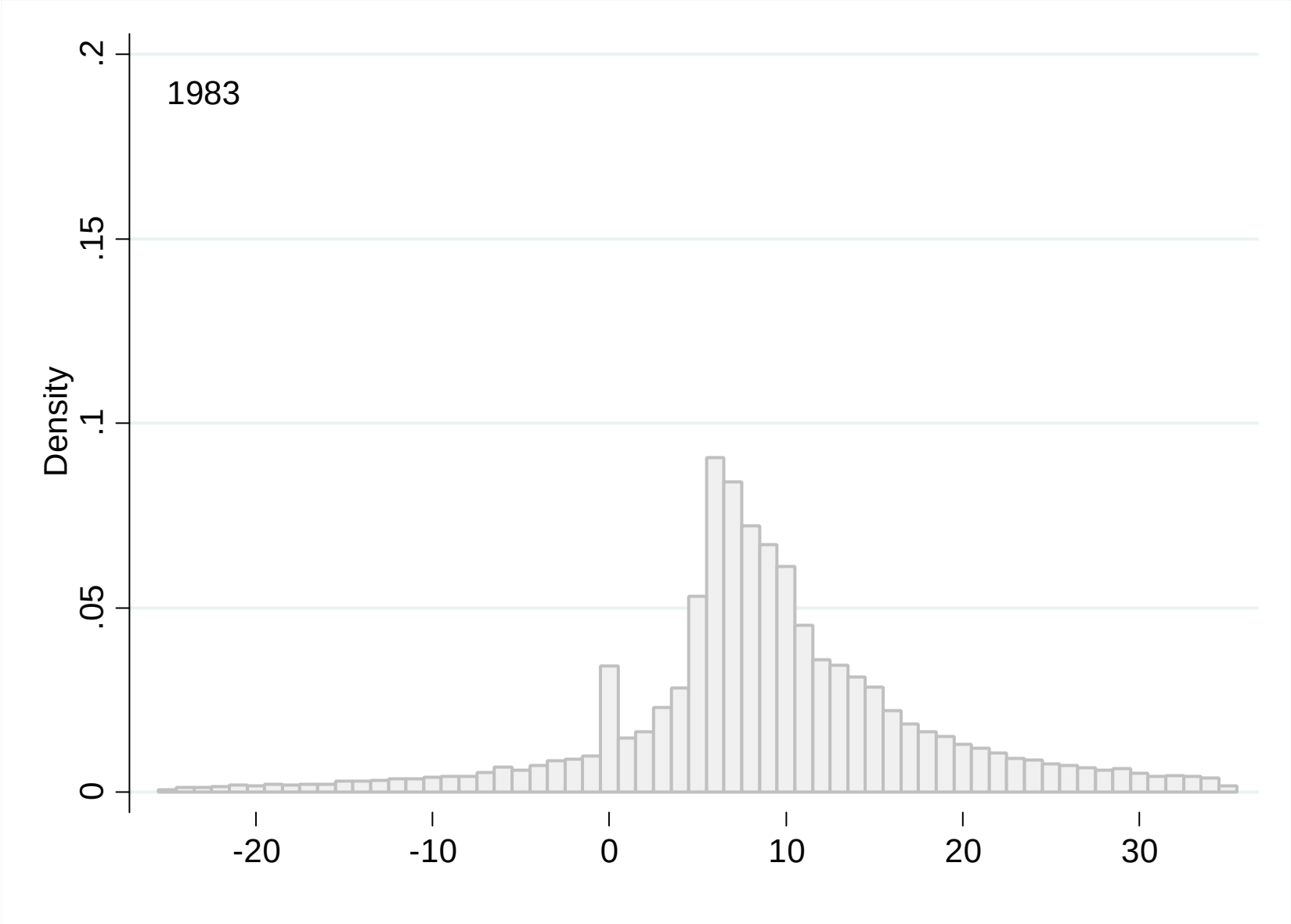

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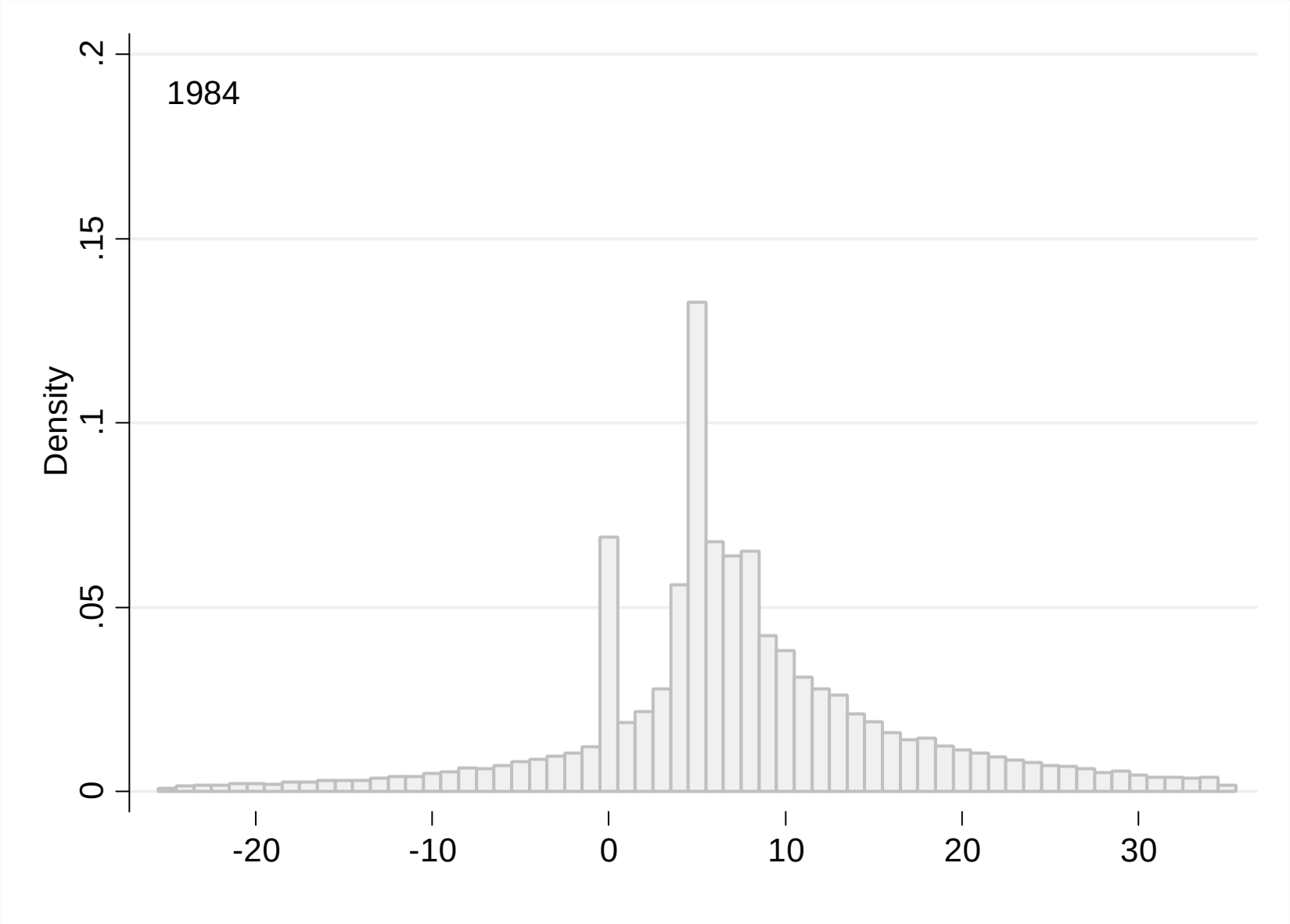

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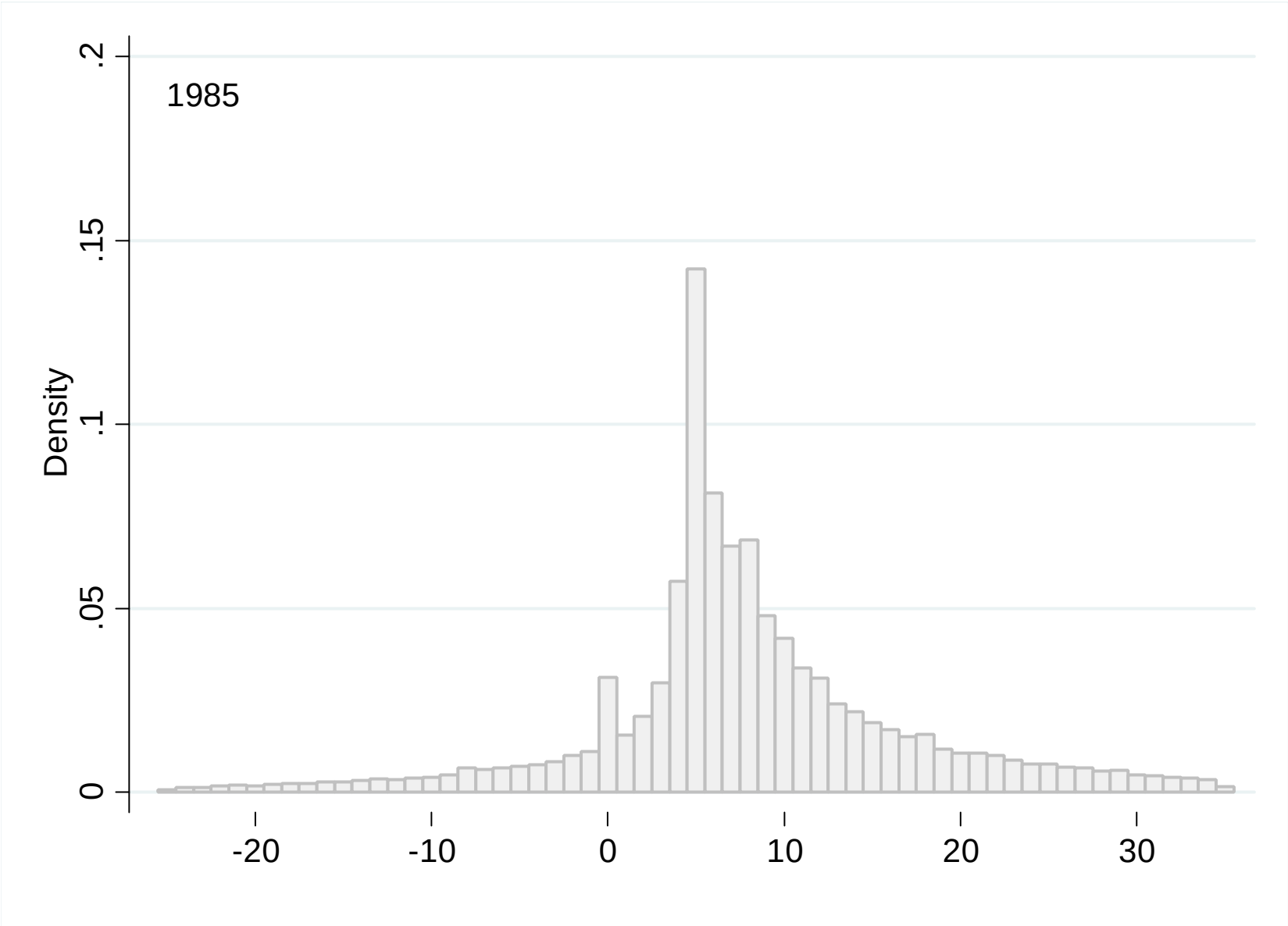

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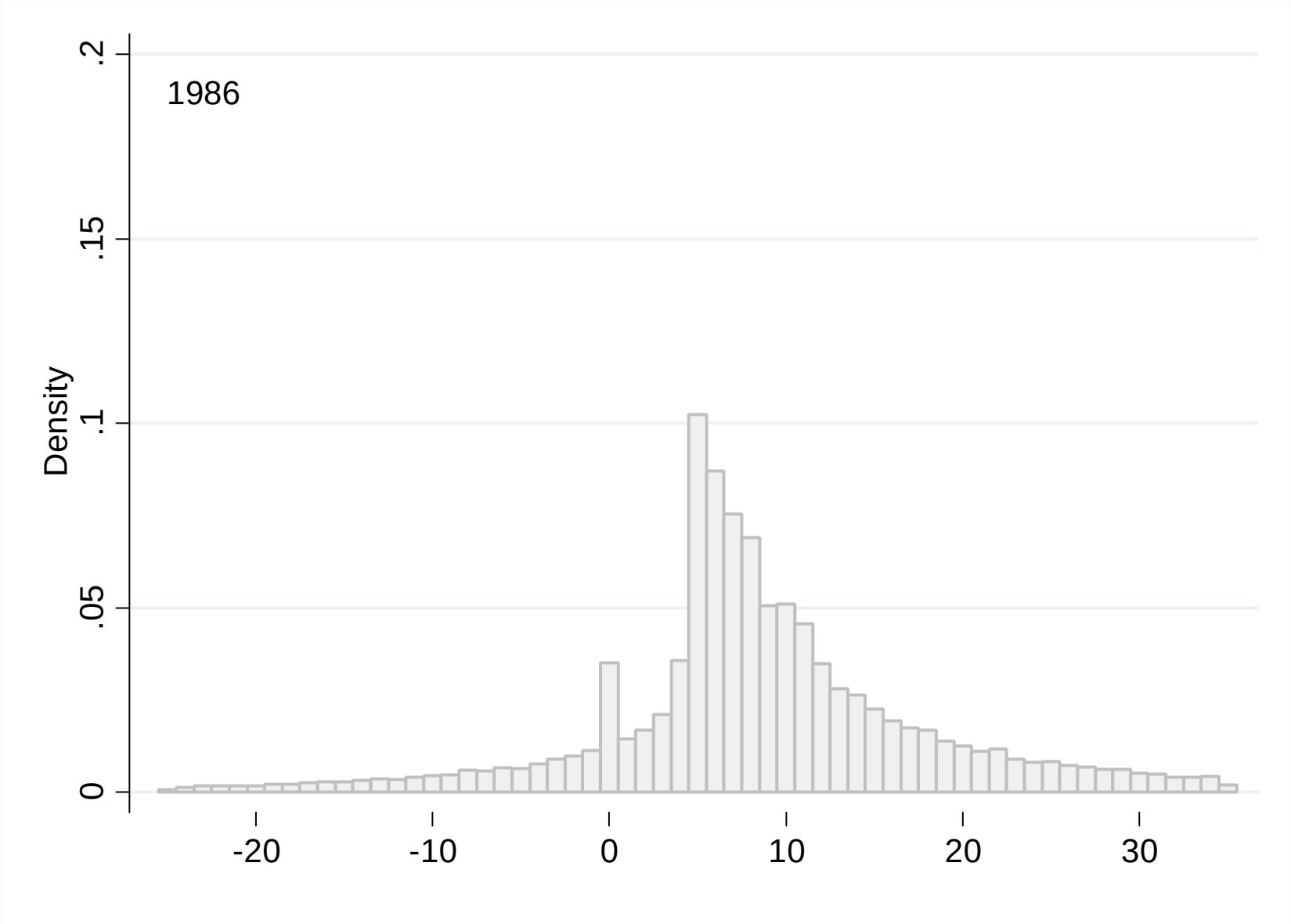

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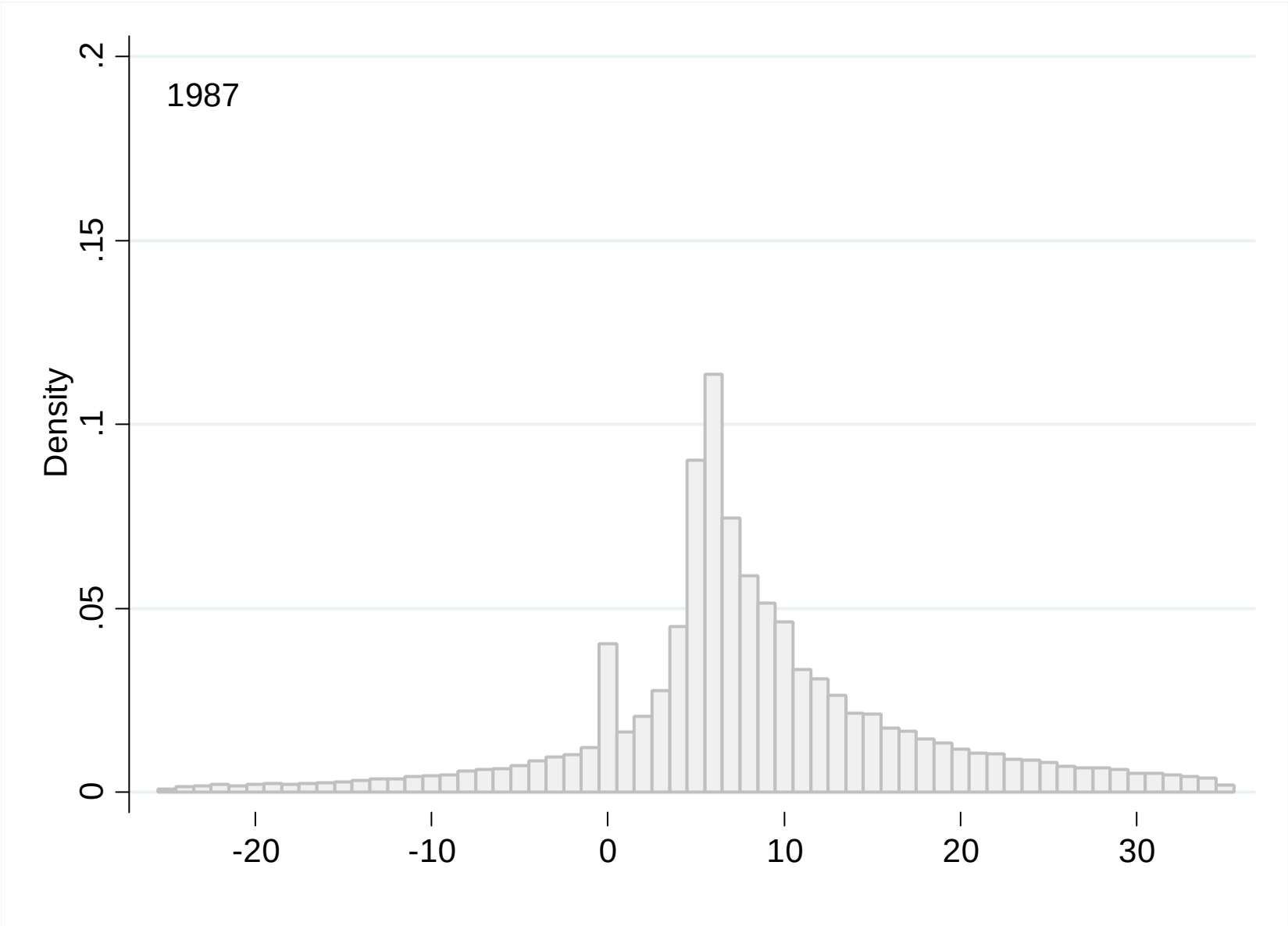

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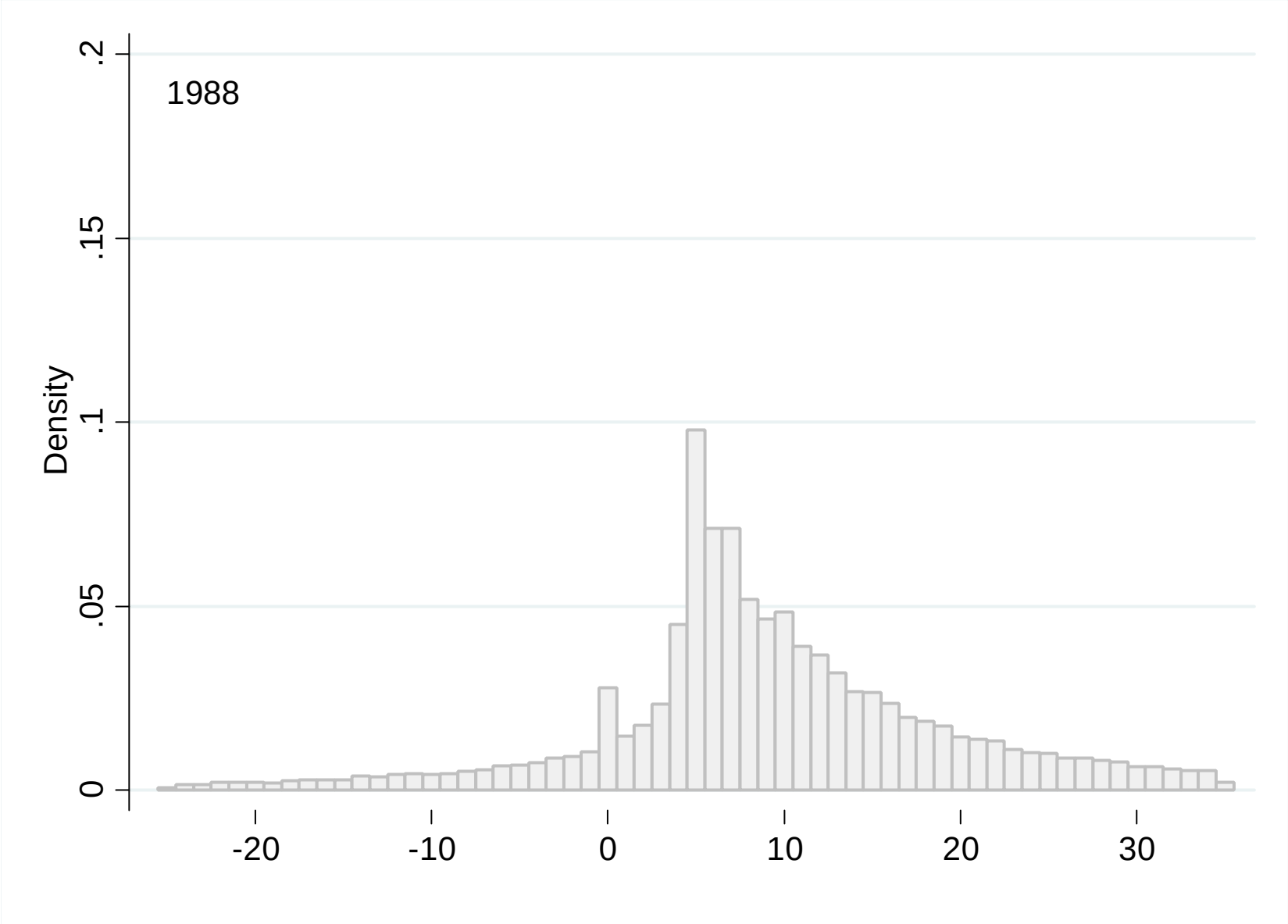

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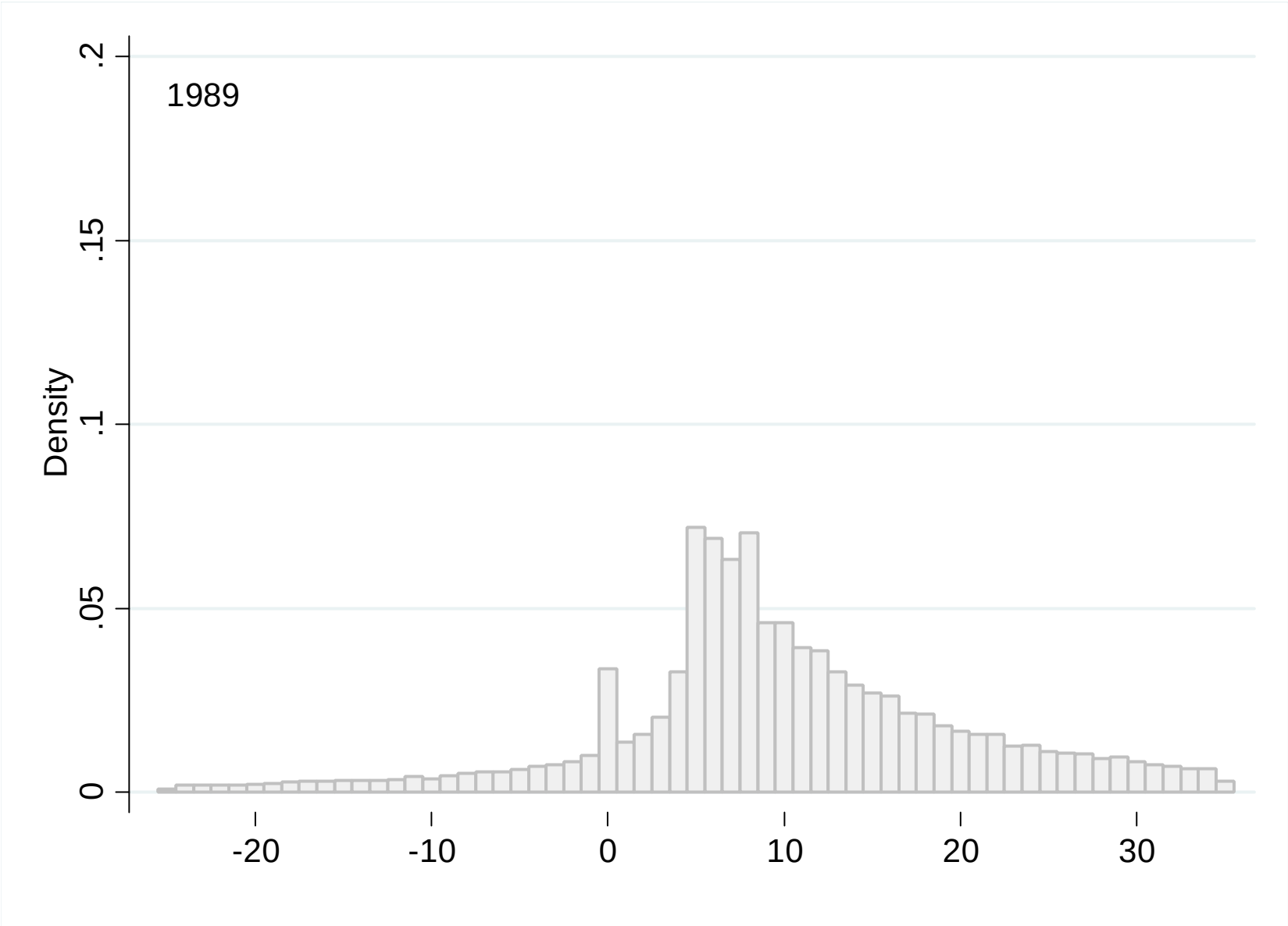

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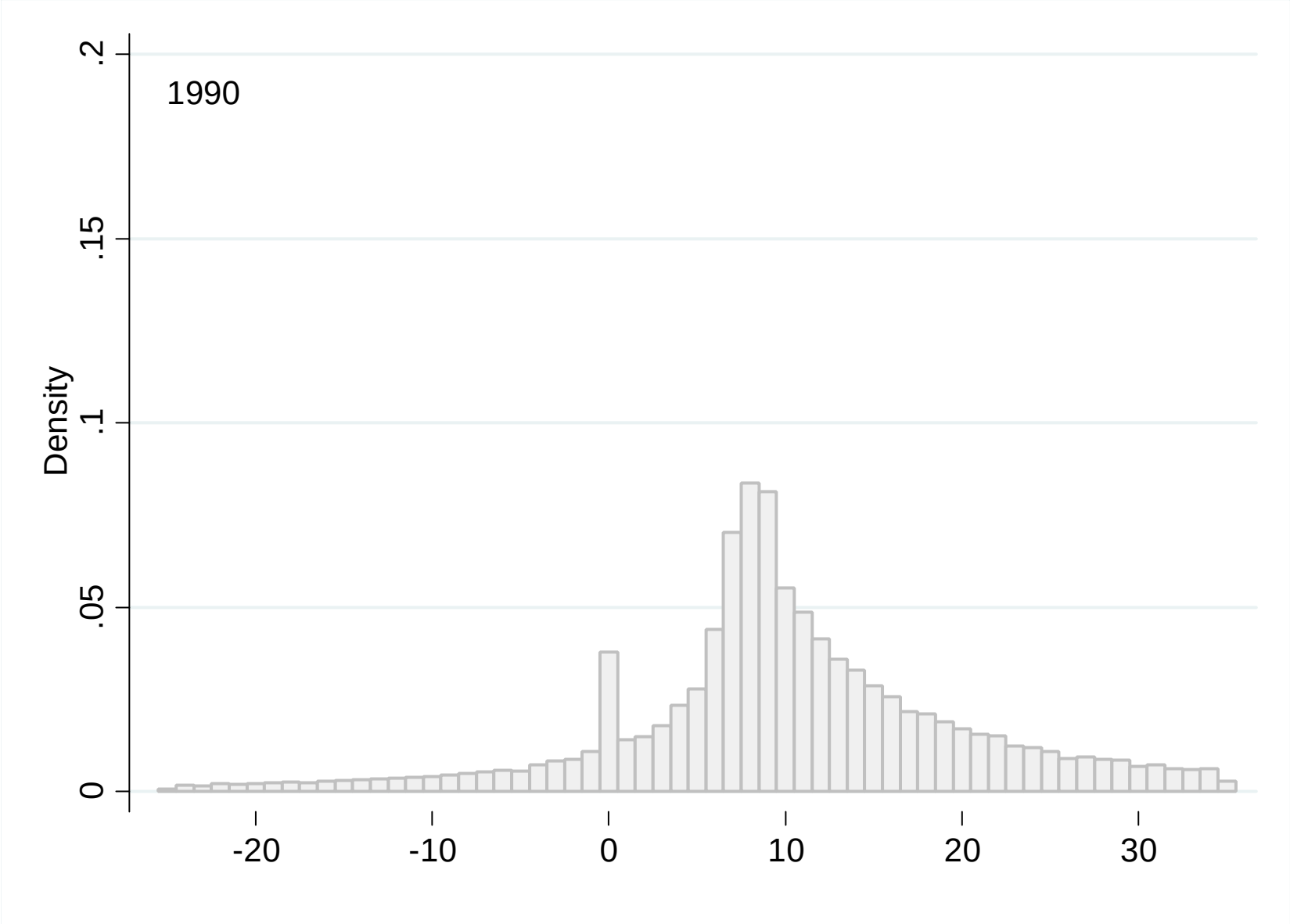

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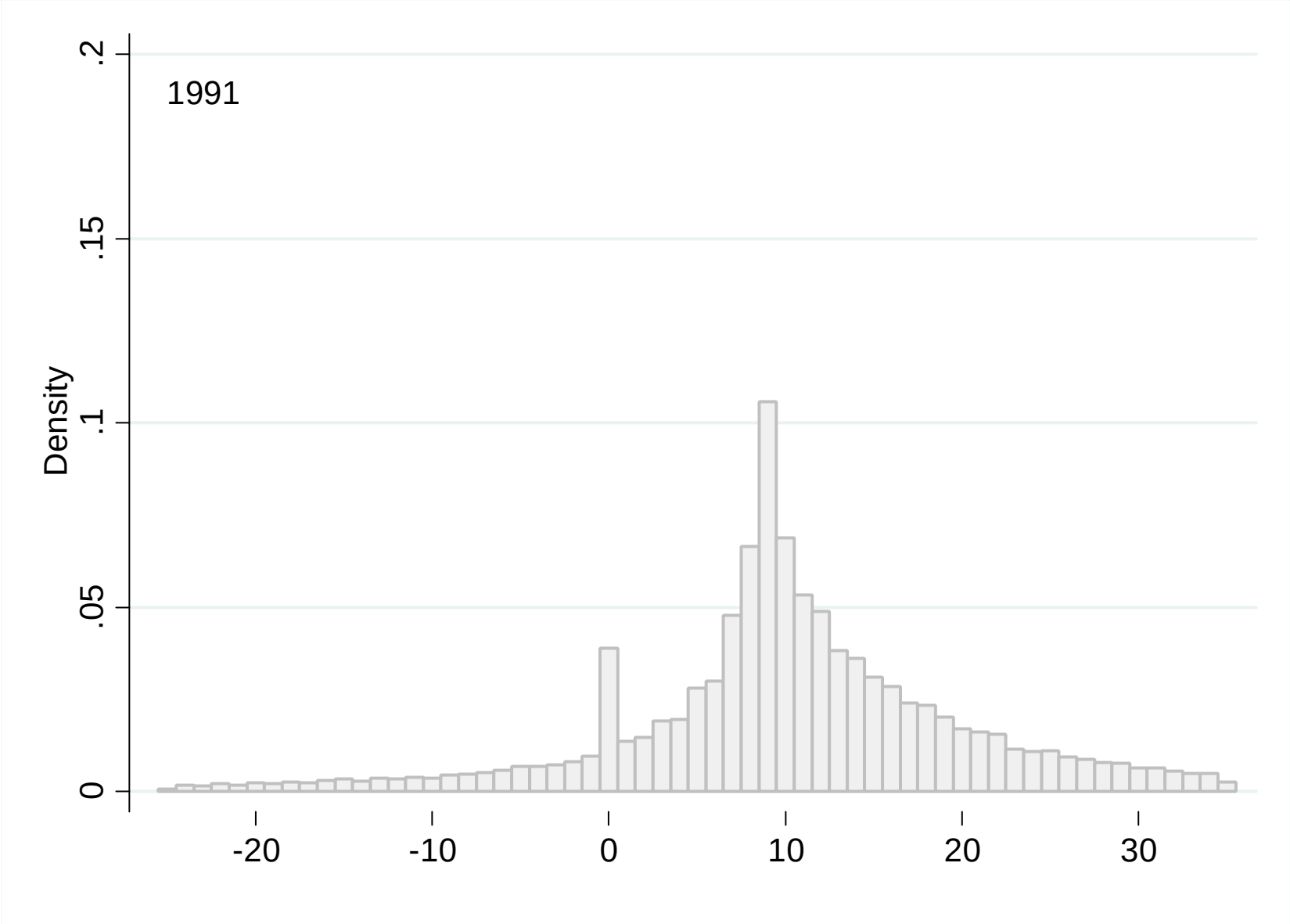

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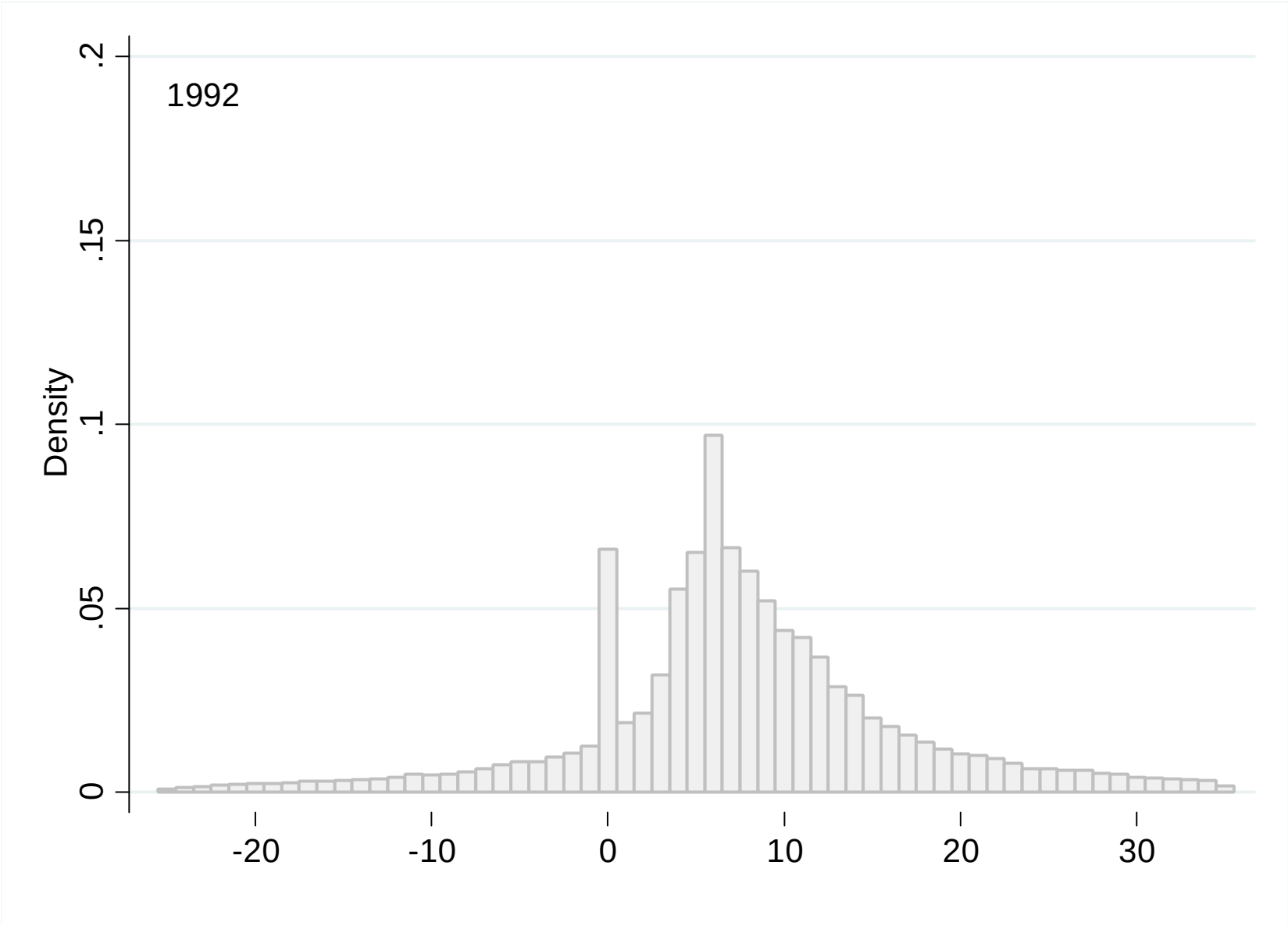

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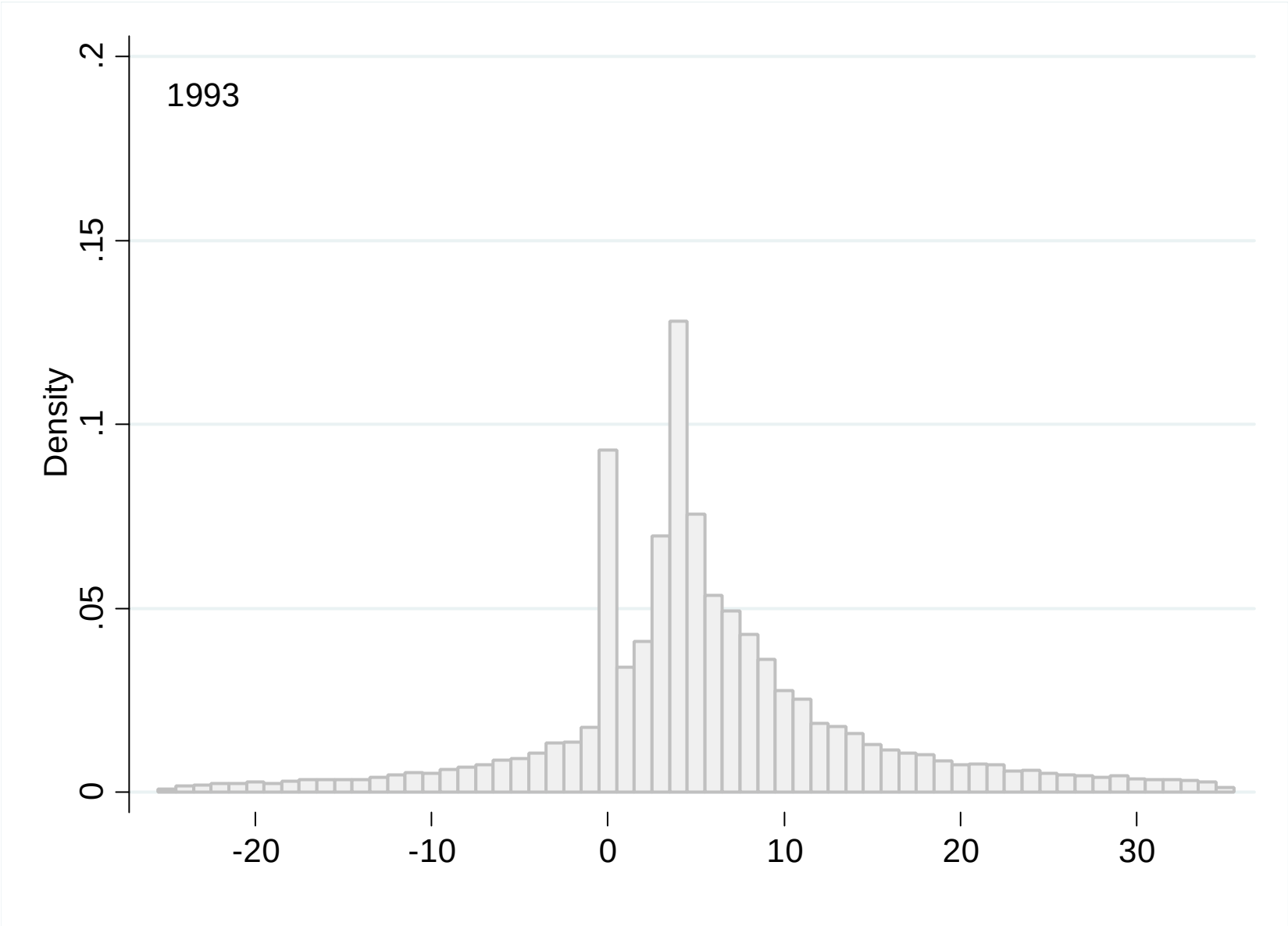

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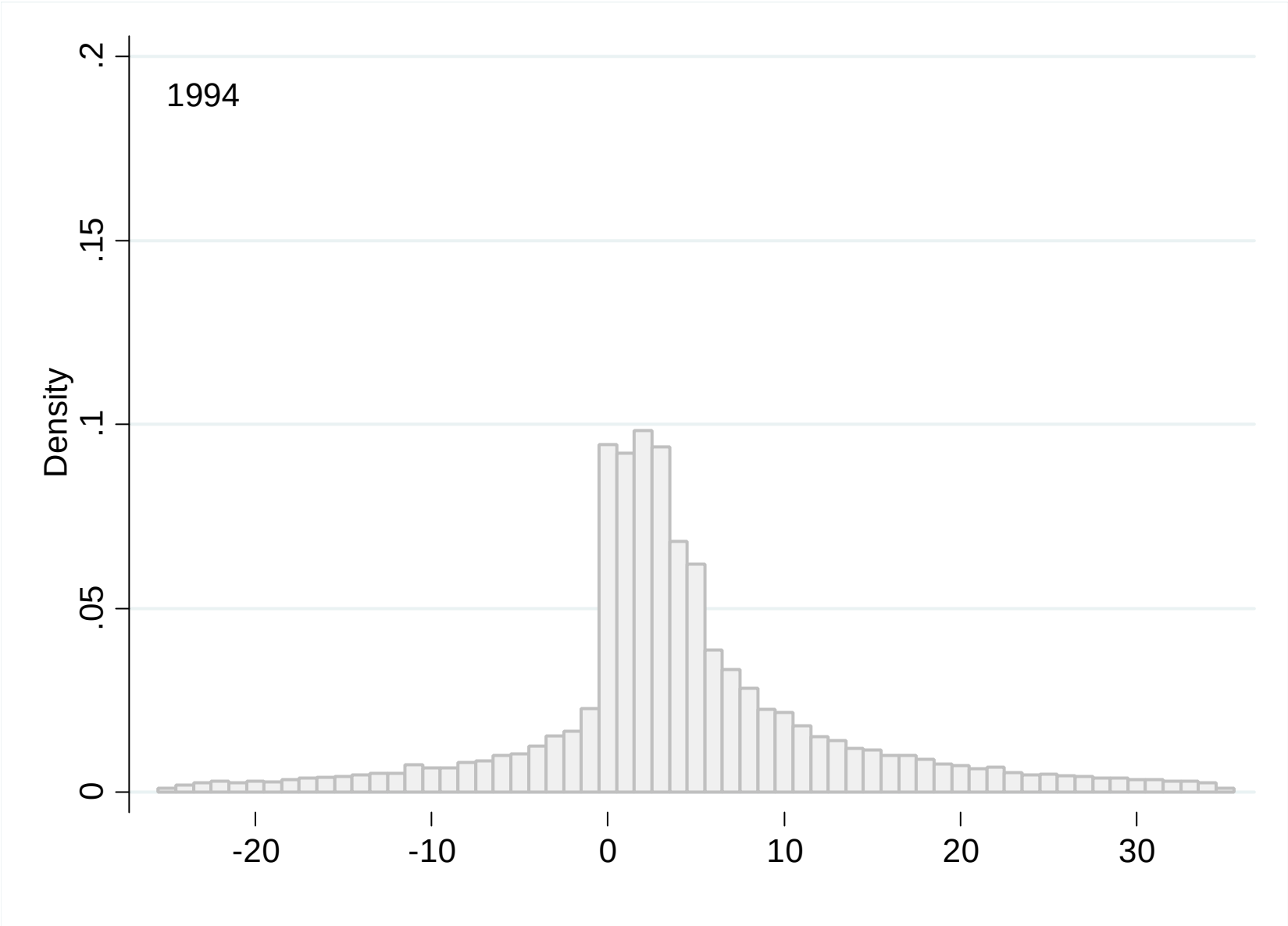

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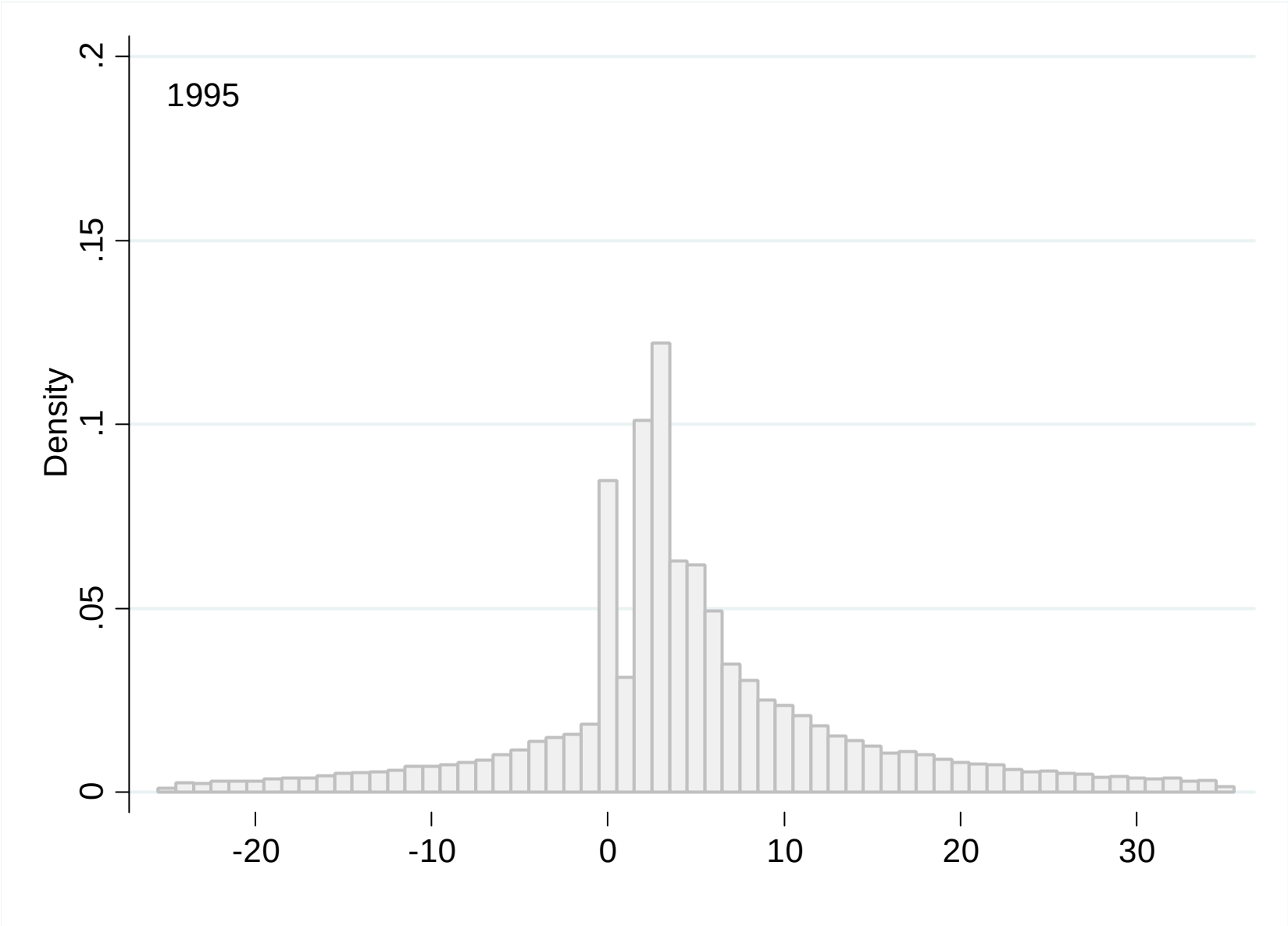

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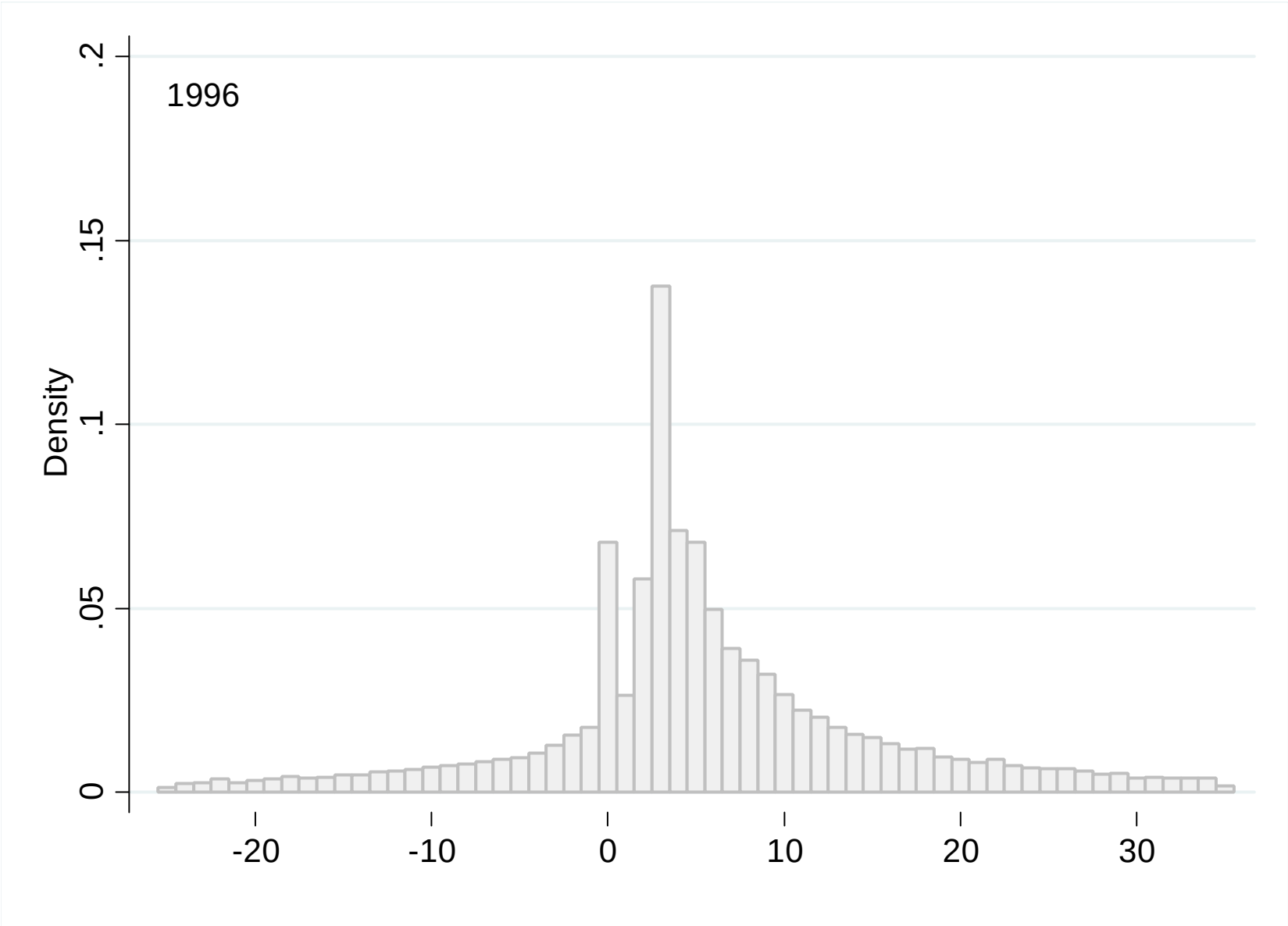

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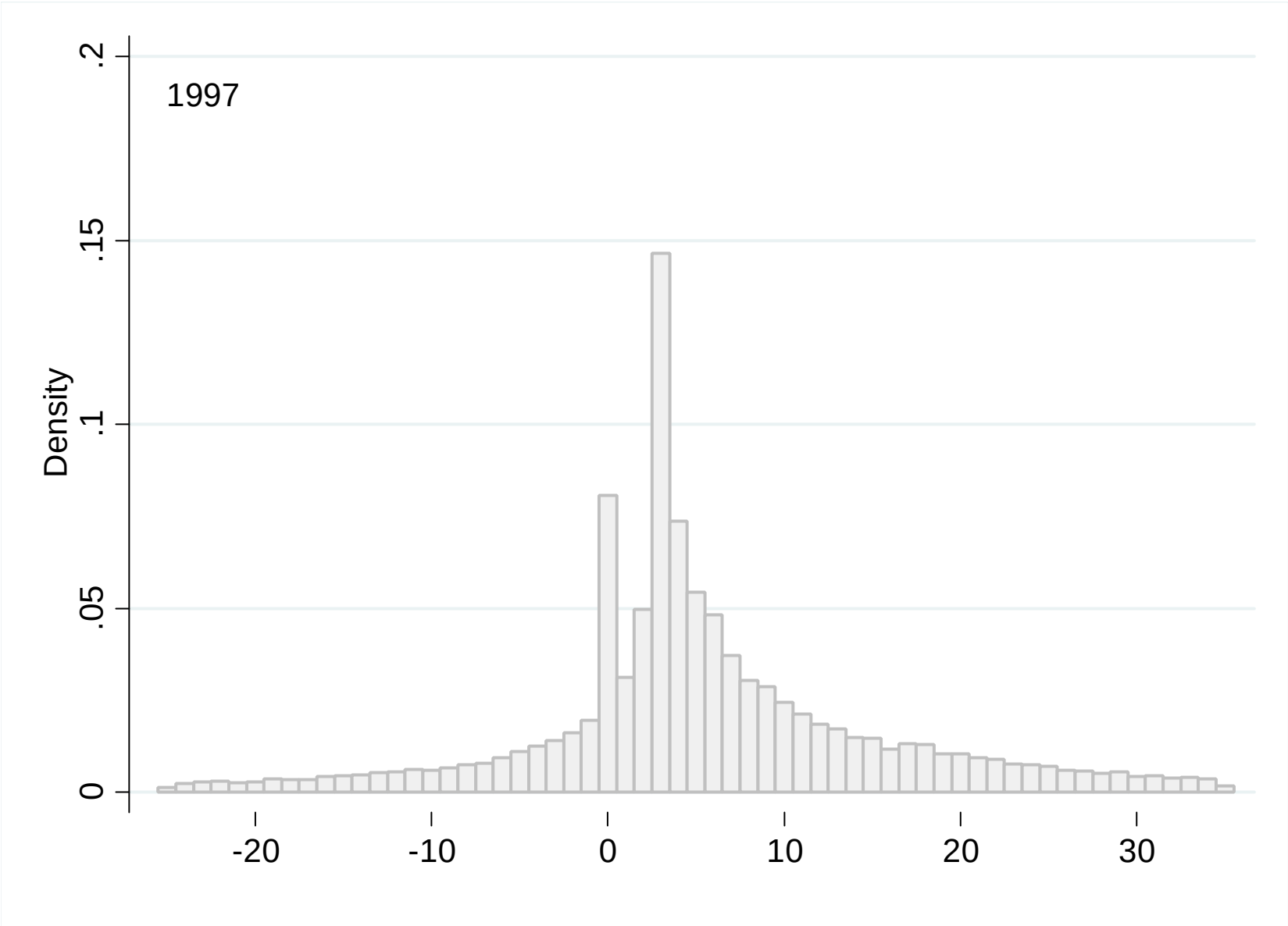

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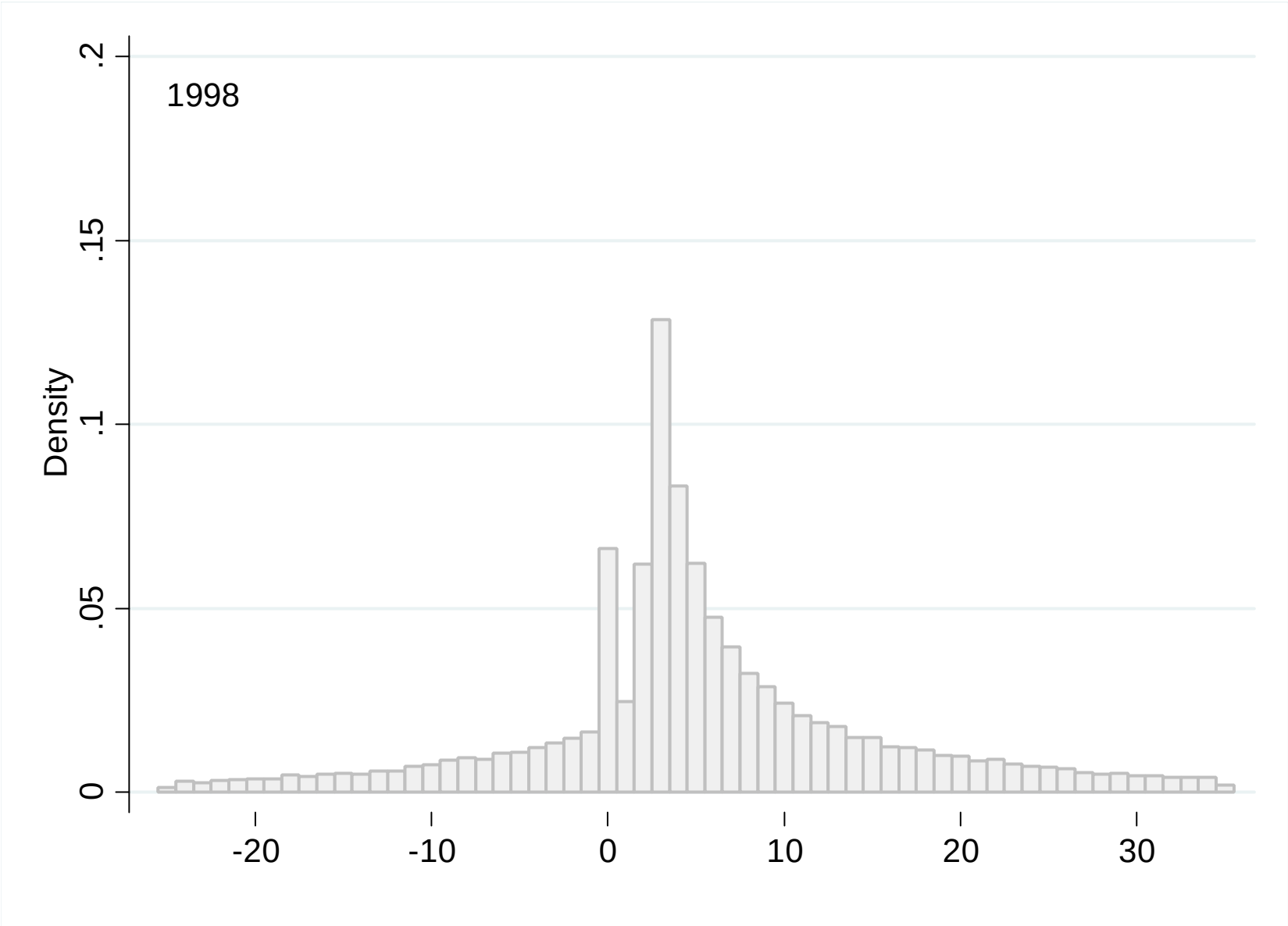

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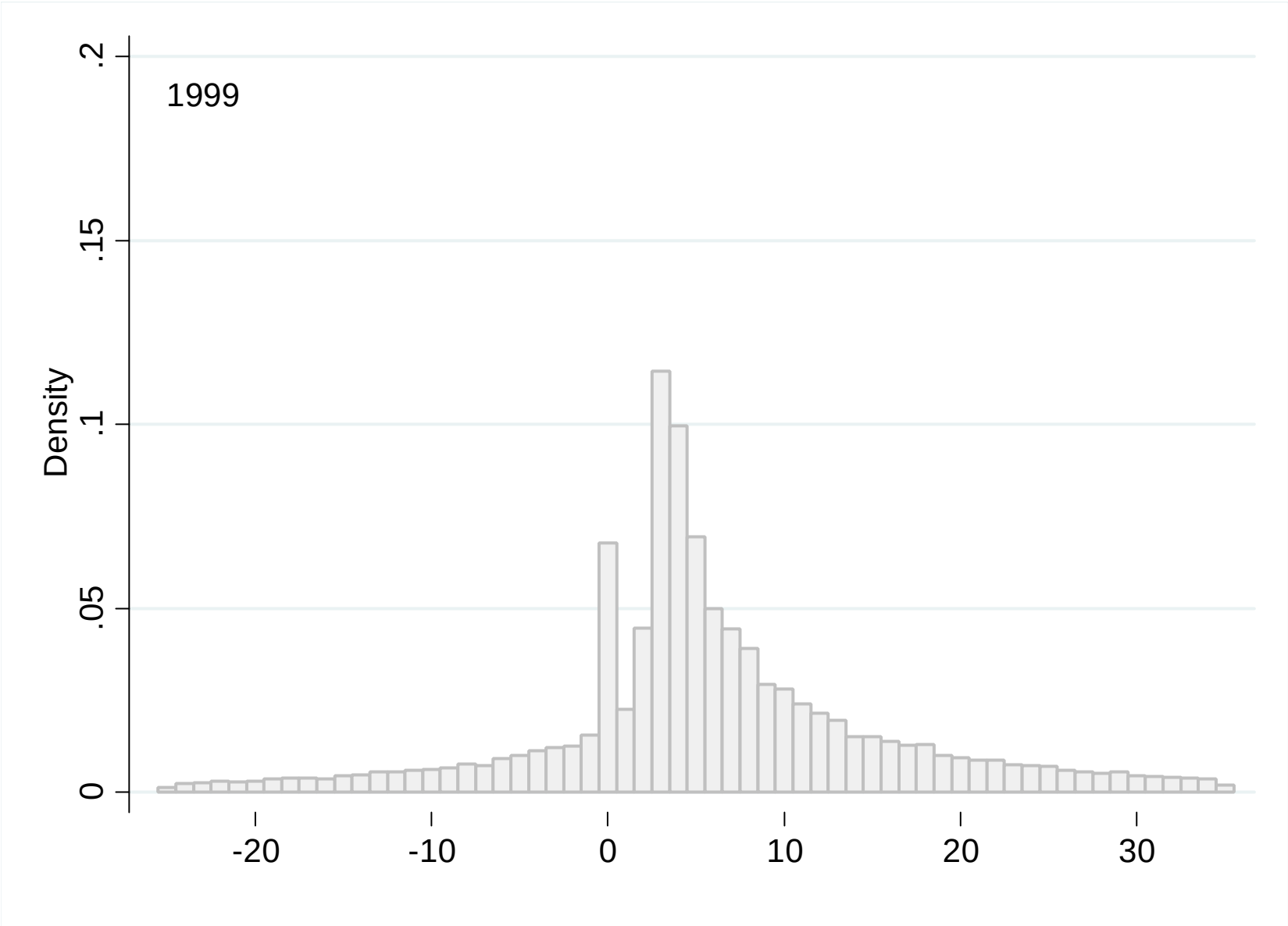

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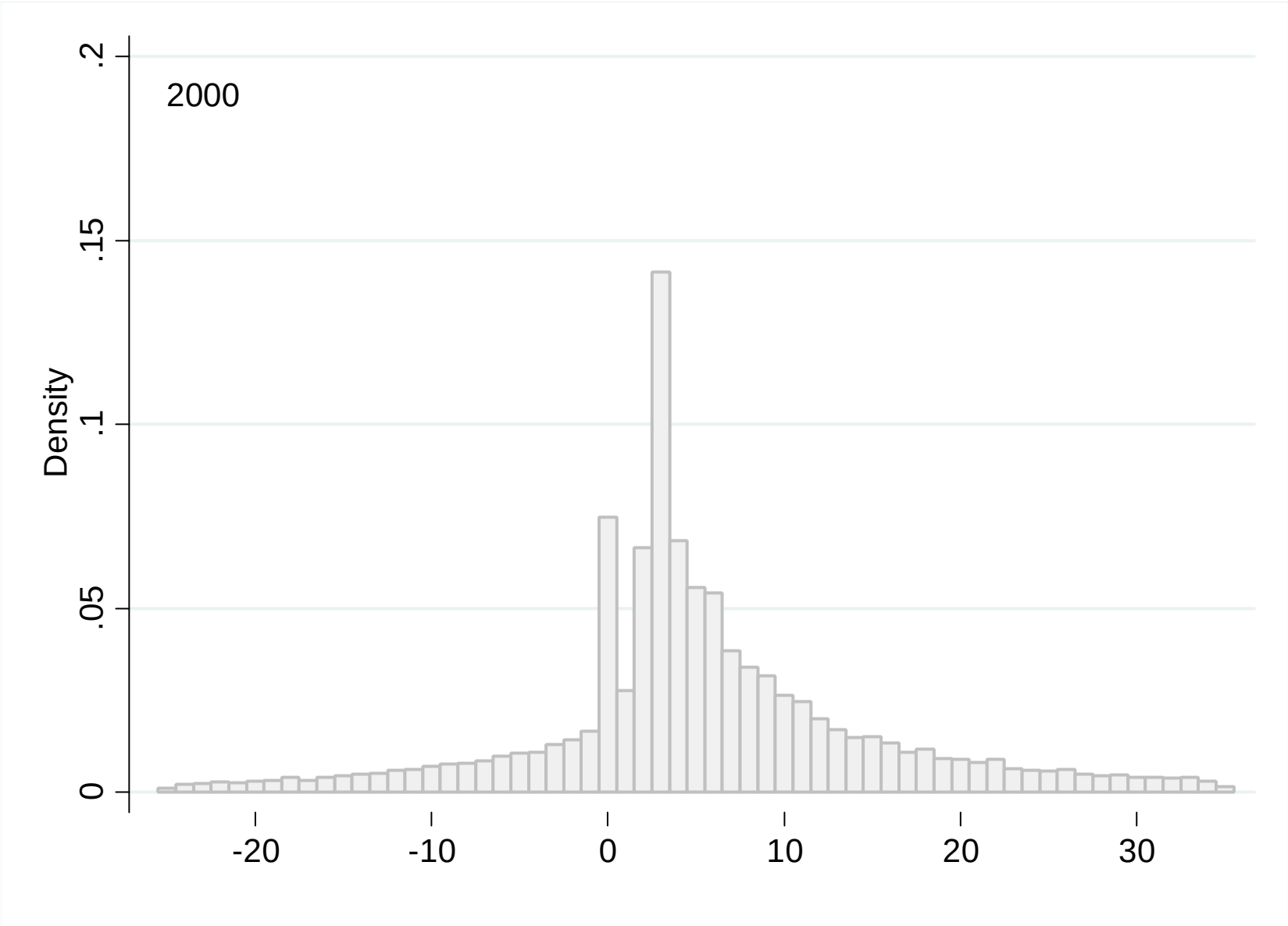

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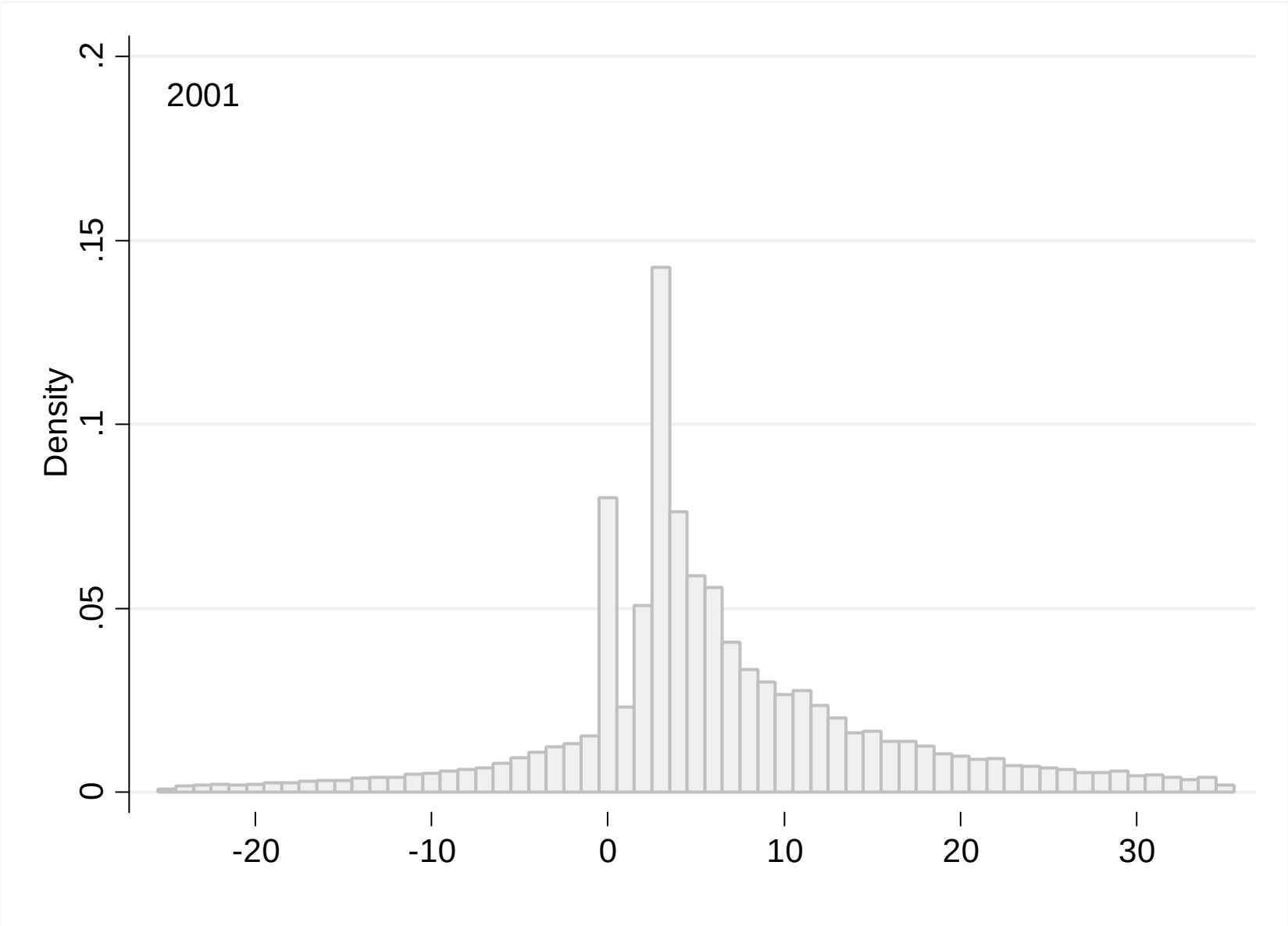

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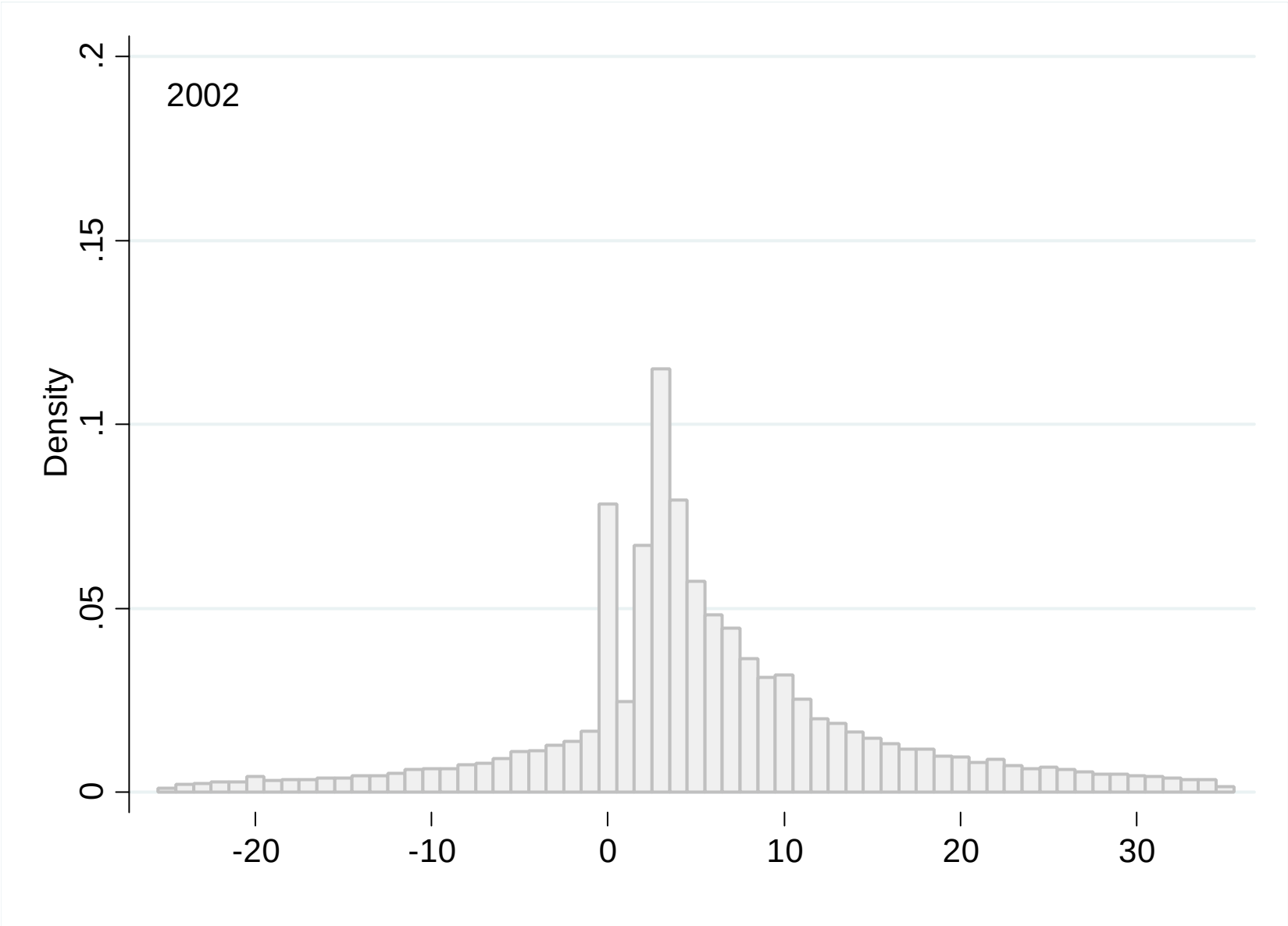

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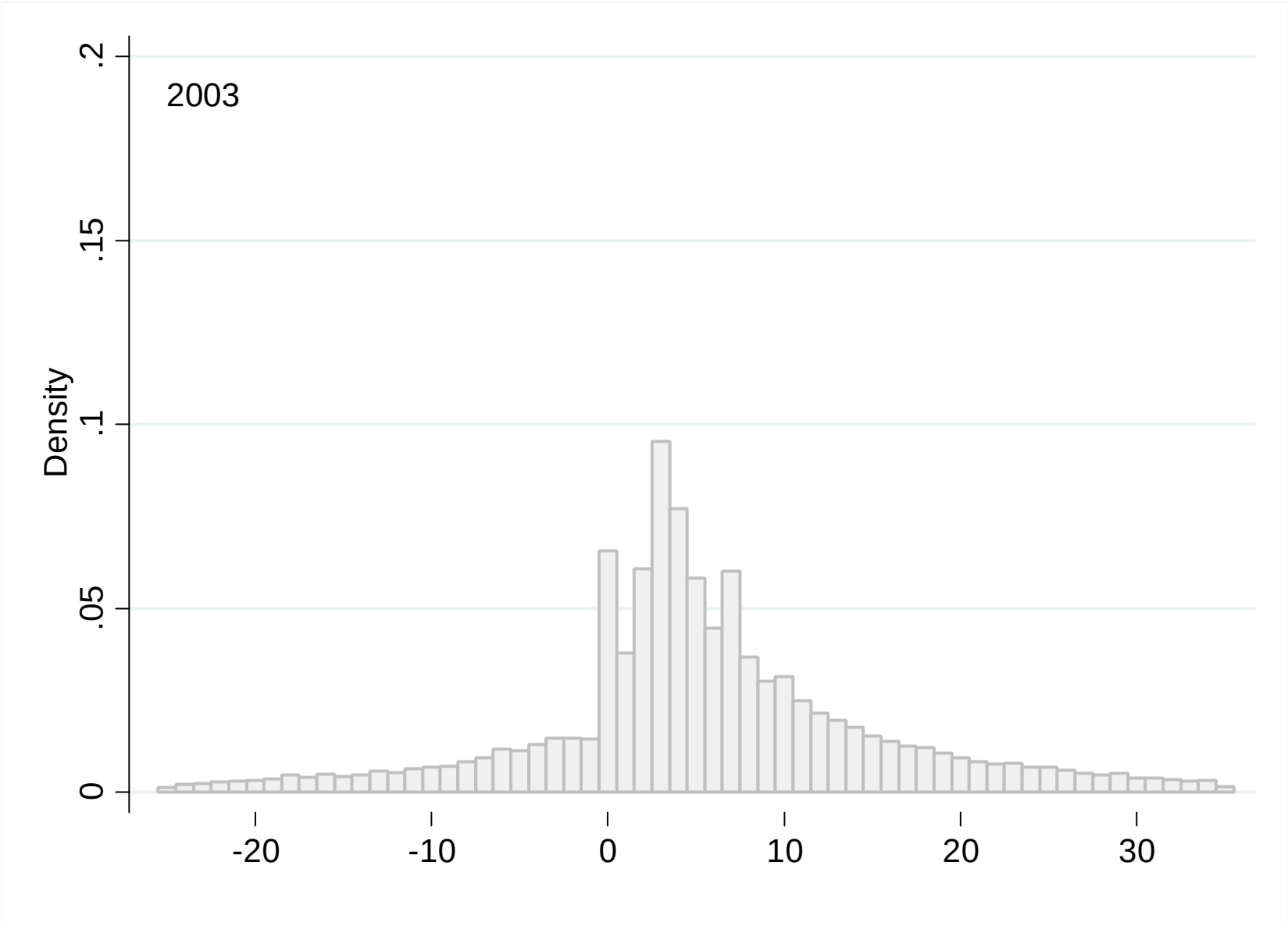

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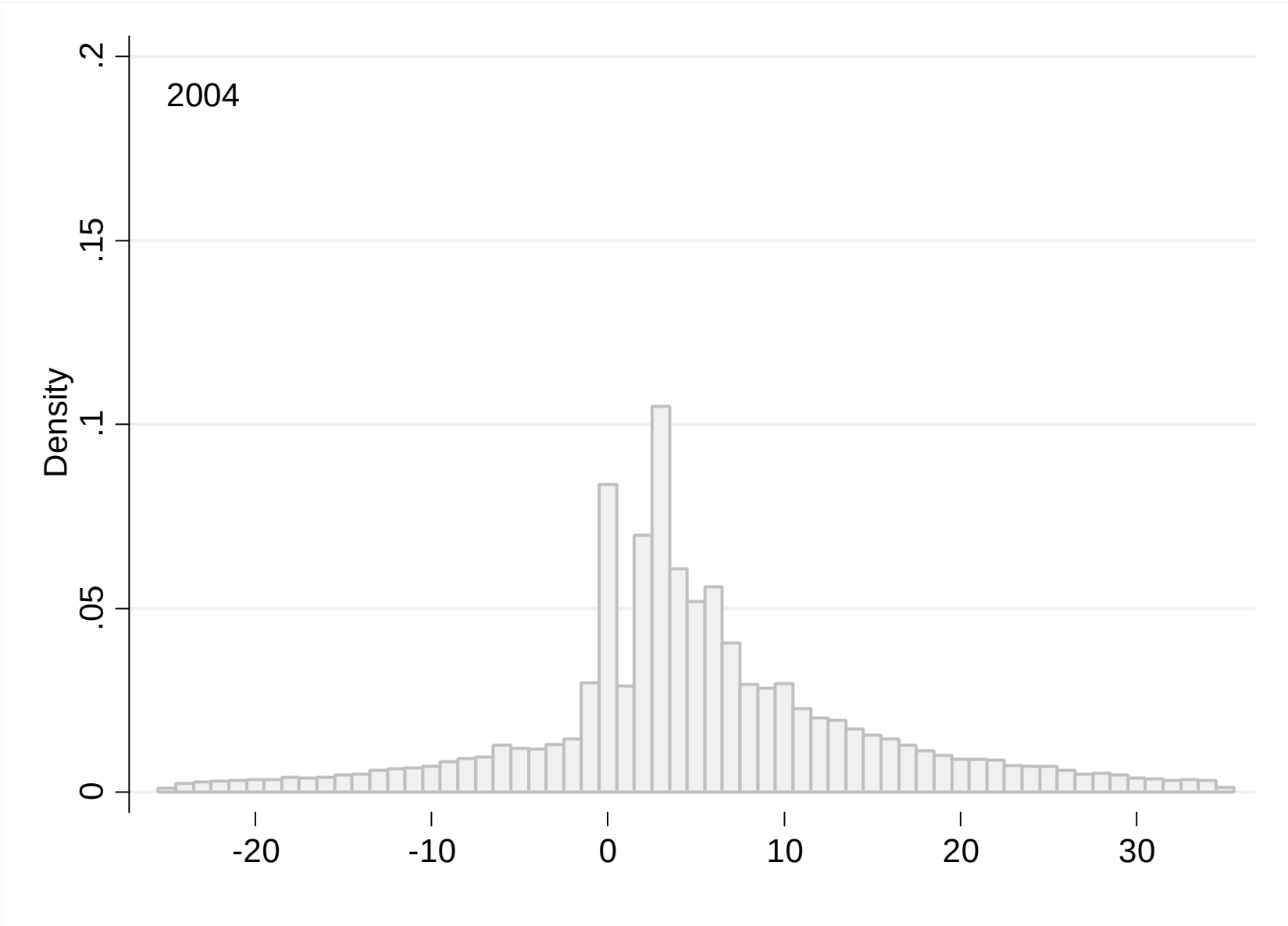

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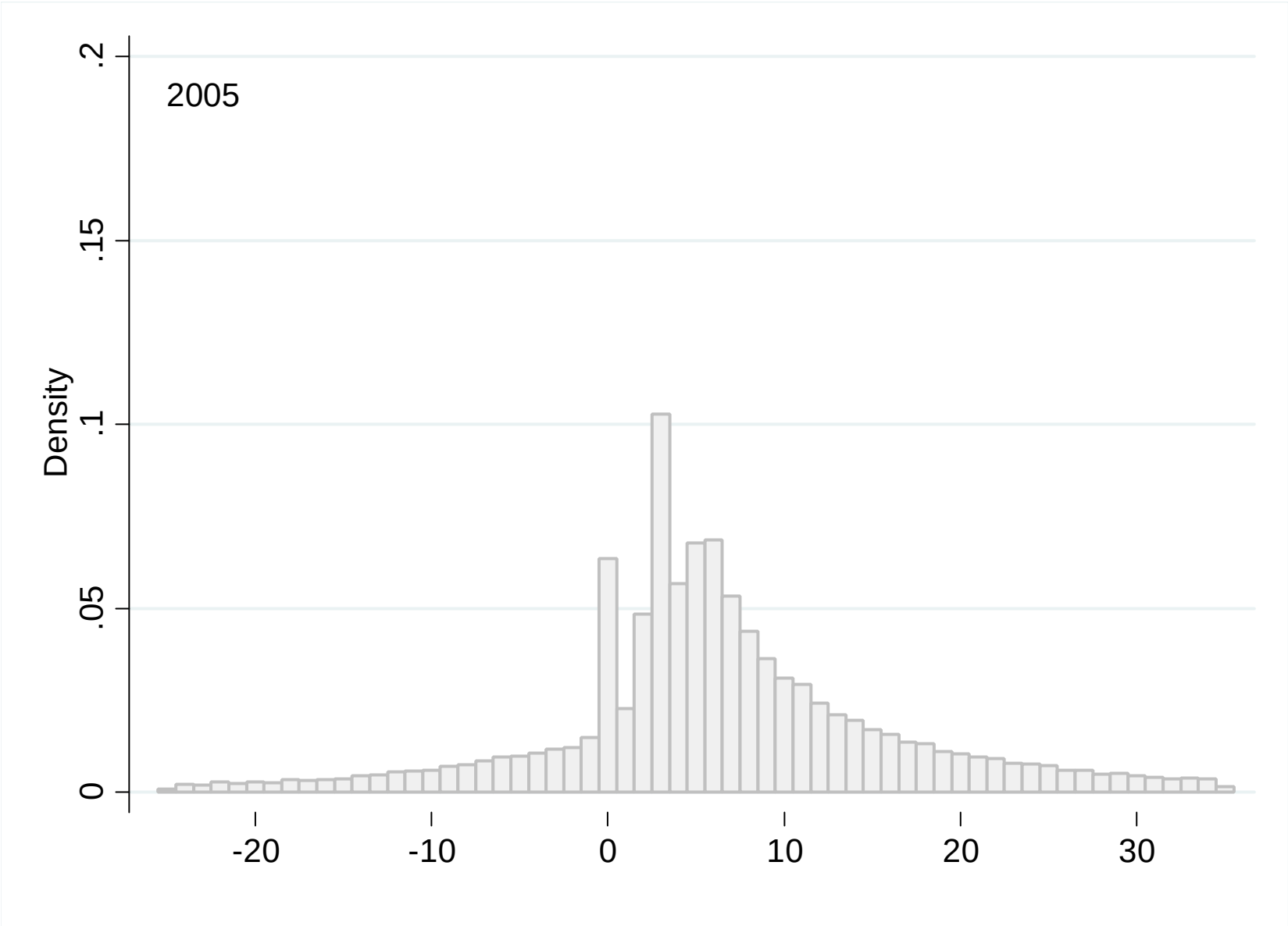

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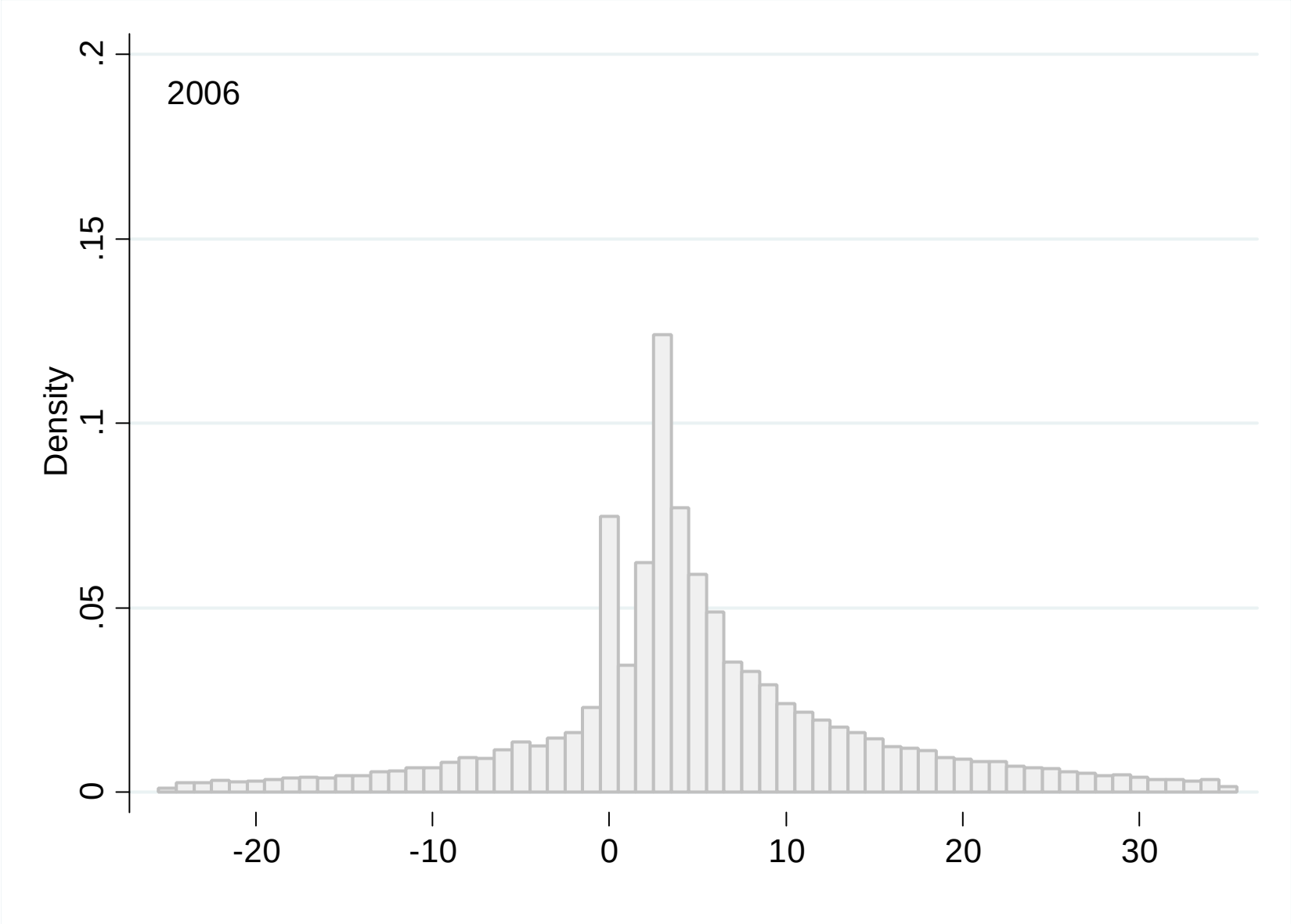

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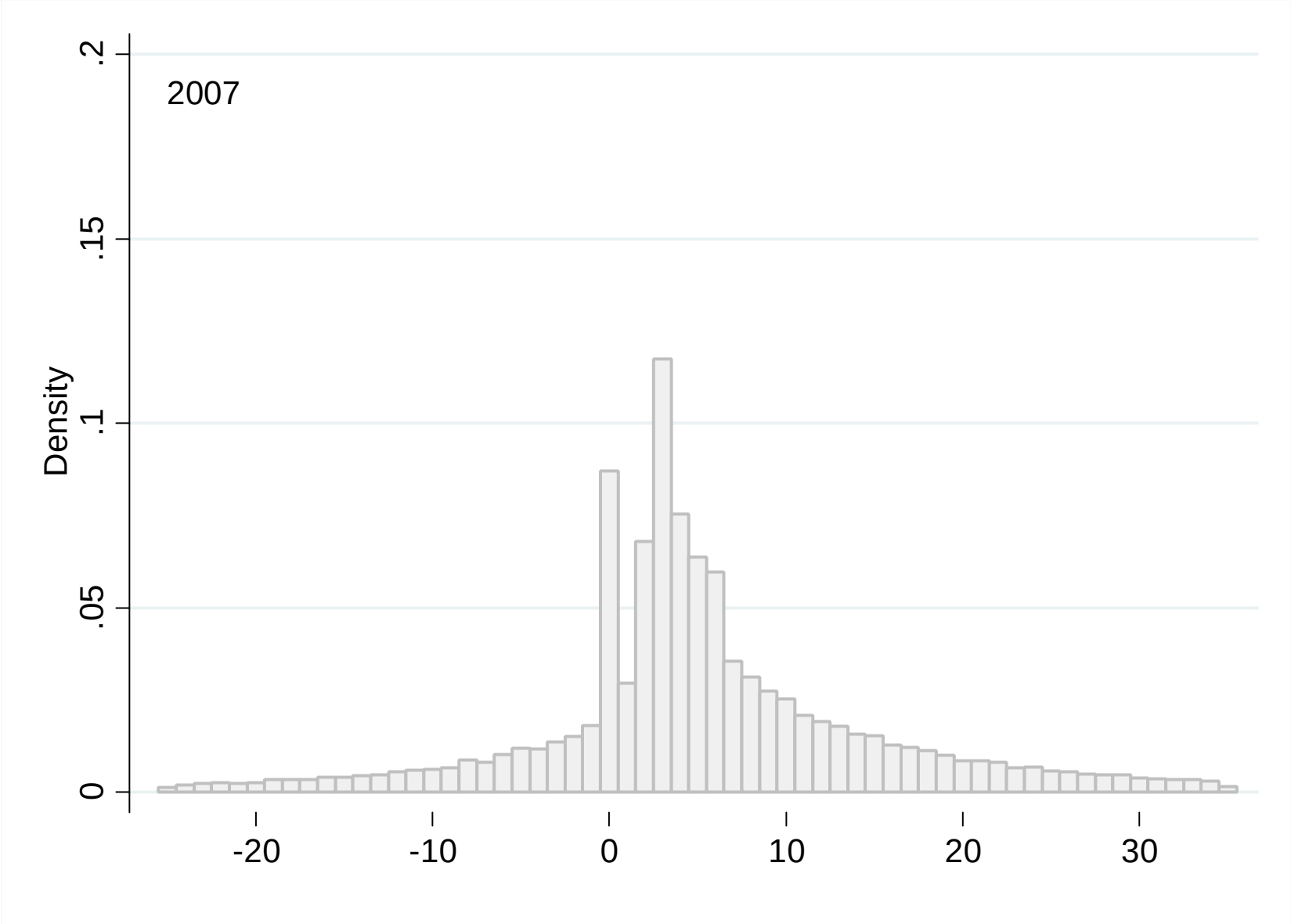

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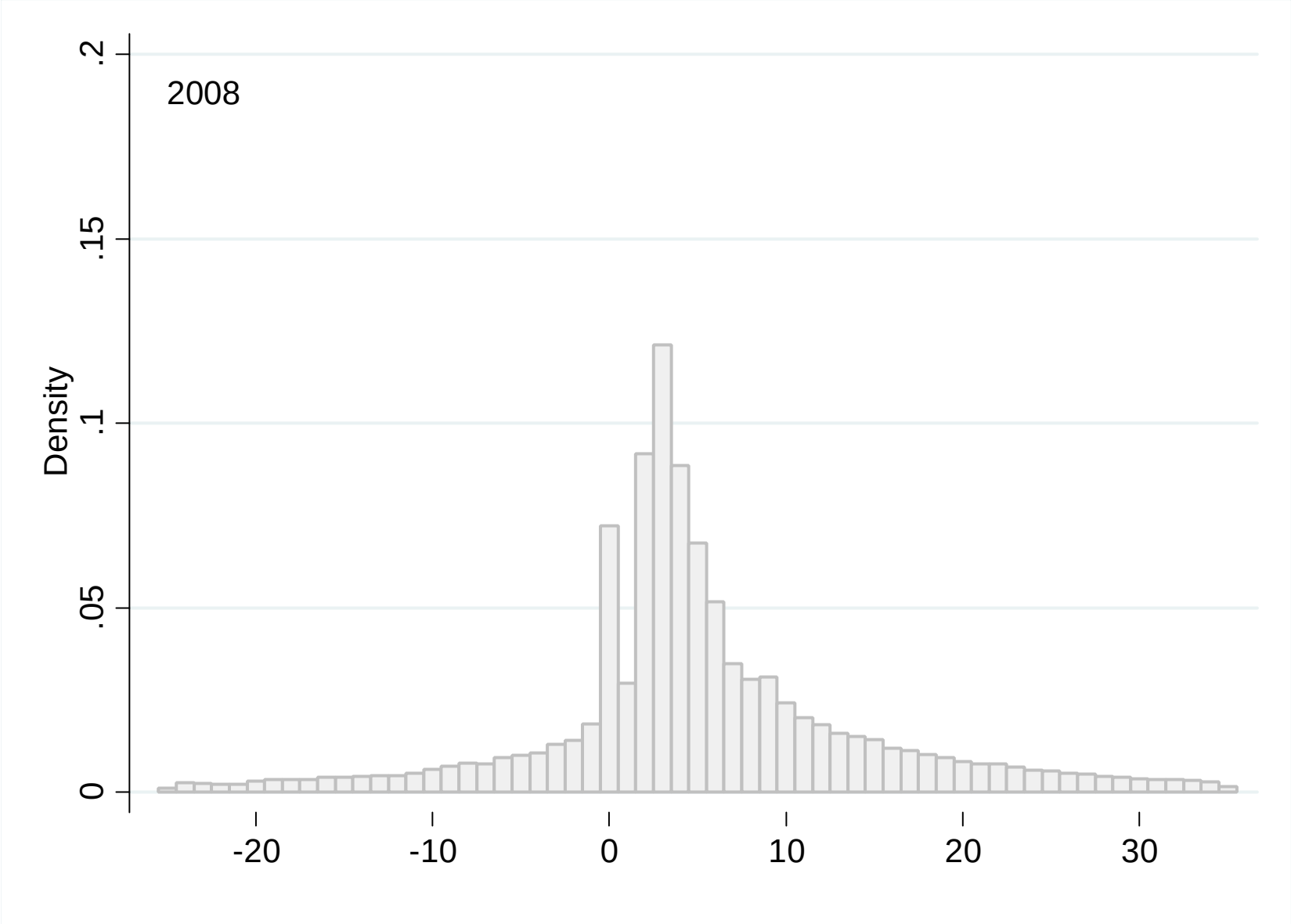

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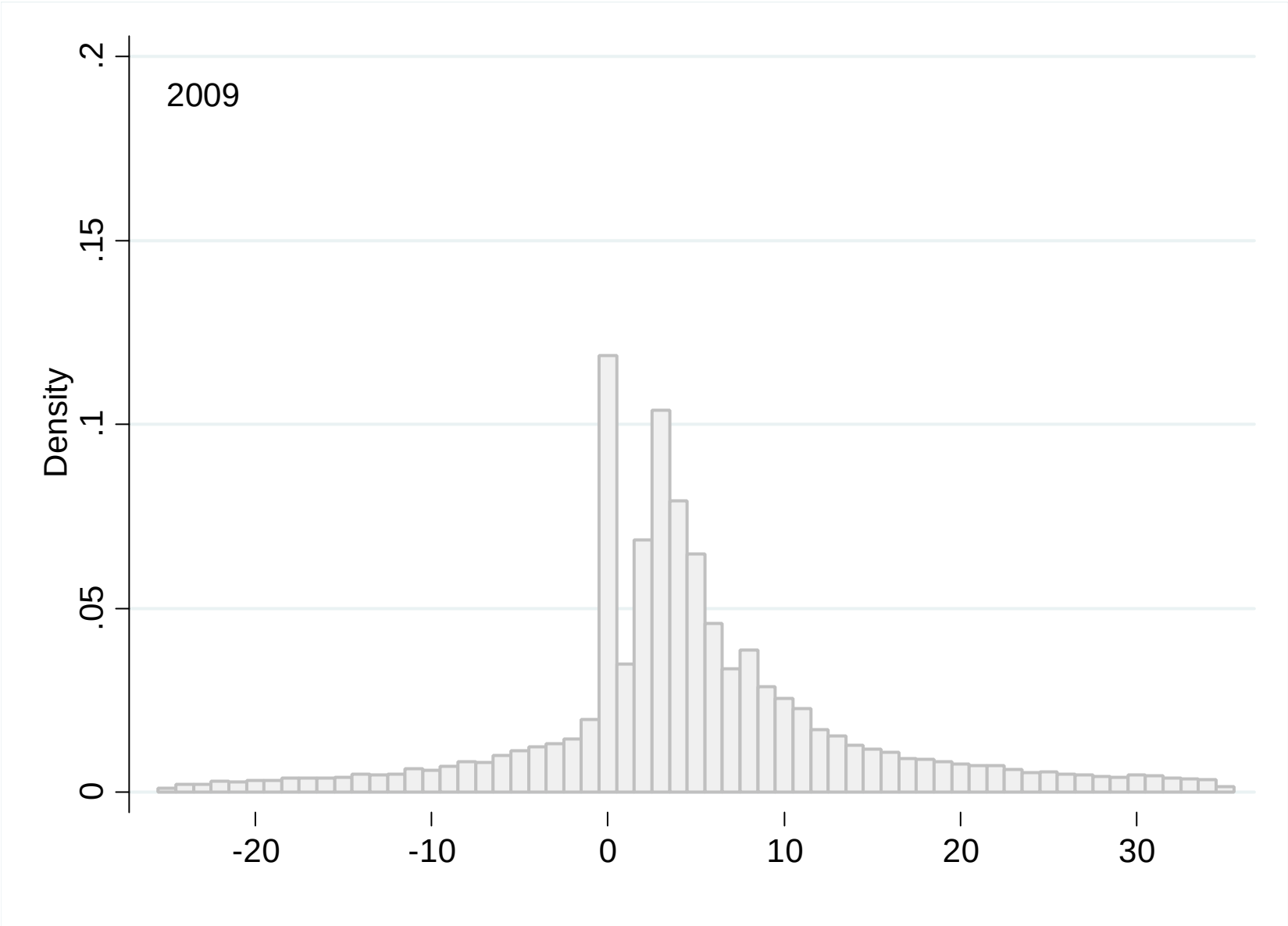

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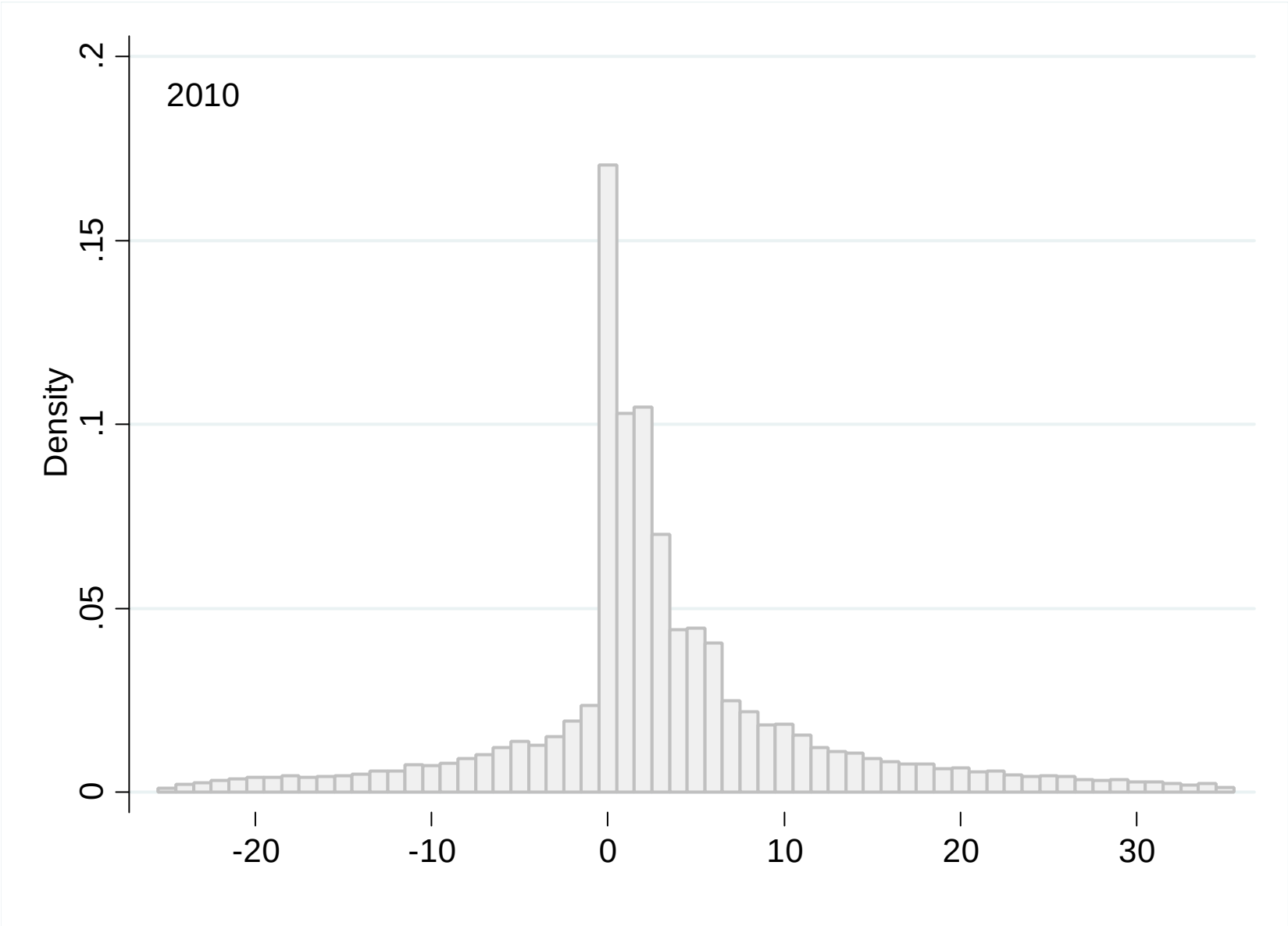

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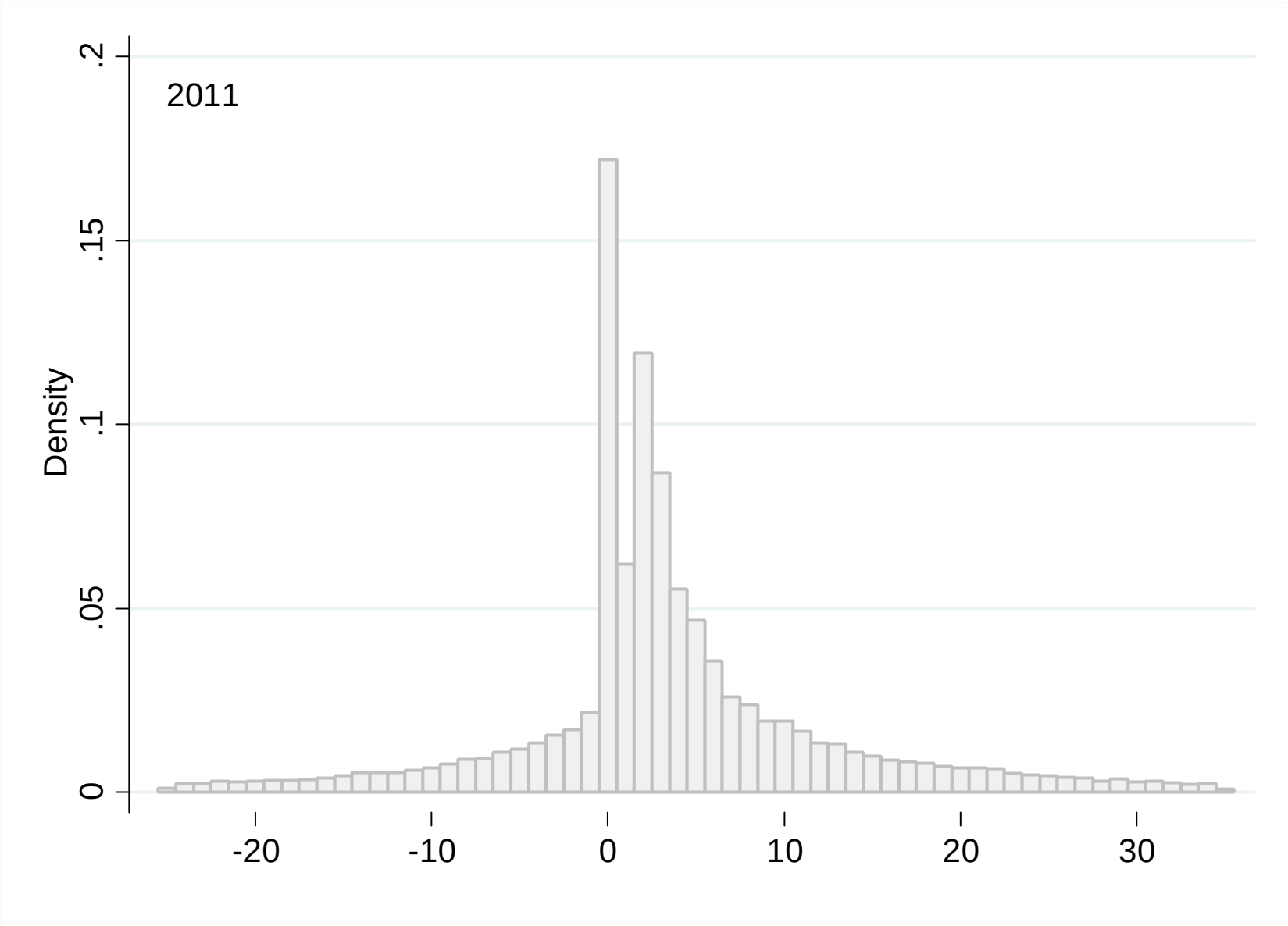

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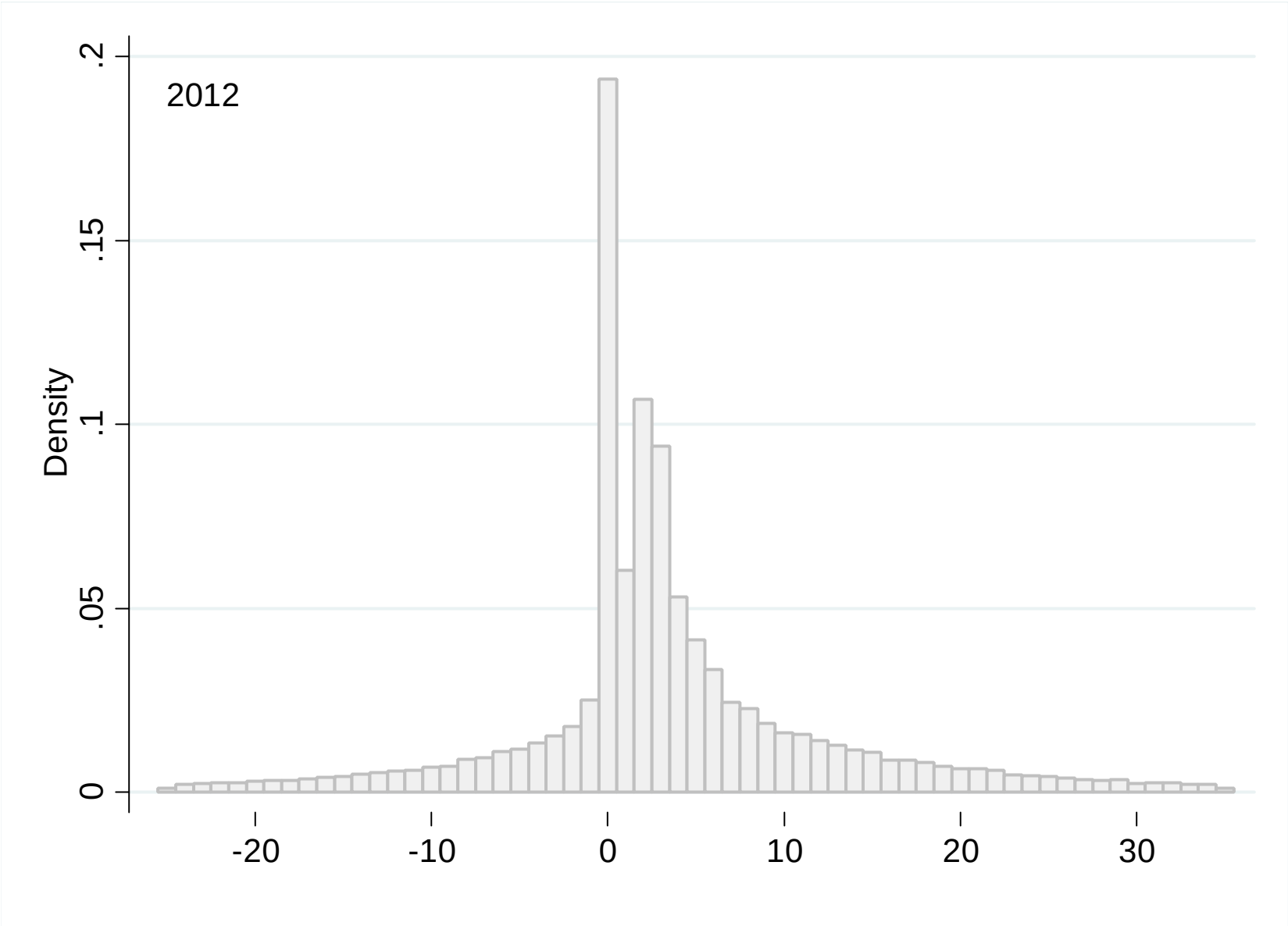
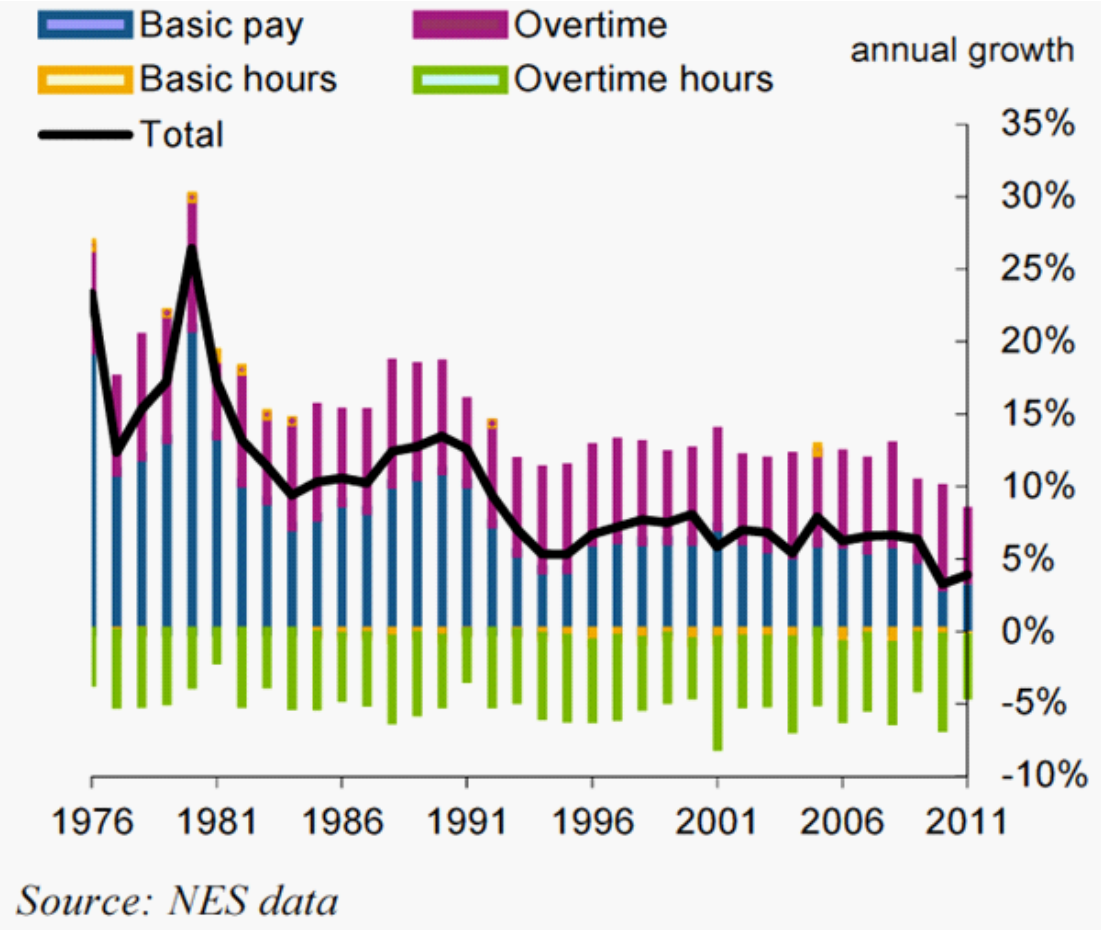


The importance of wage adjustment to overall labour costs

Changes in nominal total hourly pay are dominated by changes in basic pay (excluding overtime).



Key questions for the UK

- What are the prospects for UK real wage growth?

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- How is the UK's long period of low real wage growth related to wage flexibility?
- Has UK wage setting become more flexible?
- Or, despite large real wage falls affecting high-wage and low-wage workers, are UK wages nevertheless still subject to significant rigidity?
- (When) will wages (persistently and significantly) rebound?

Key questions for the UK

- Why?
- What is the role of variations in labour force composition?
- Have there been supply side changes, and will they persist?

Our answers

- We use simple and general methods to measure wage rigidity.
  - Nominal rigidity and real rigidity can both be quantified.
  - We discuss relevant measures for modern macro models.
- Our diagnosis of the current UK situation:
  - more nominal rigidity
  - less real rigidity
  - higher inflation (expectations) has enabled real wages to fall despite increased barriers to nominal wage falls
  - limited evidence of impact from composition changes

To come:

- Describe our preferred measure of nominal rigidity
- Explain how the distribution of inflation expectations can be used to measure real rigidity
- Measure rigidity for modern macro models
- Composition changes

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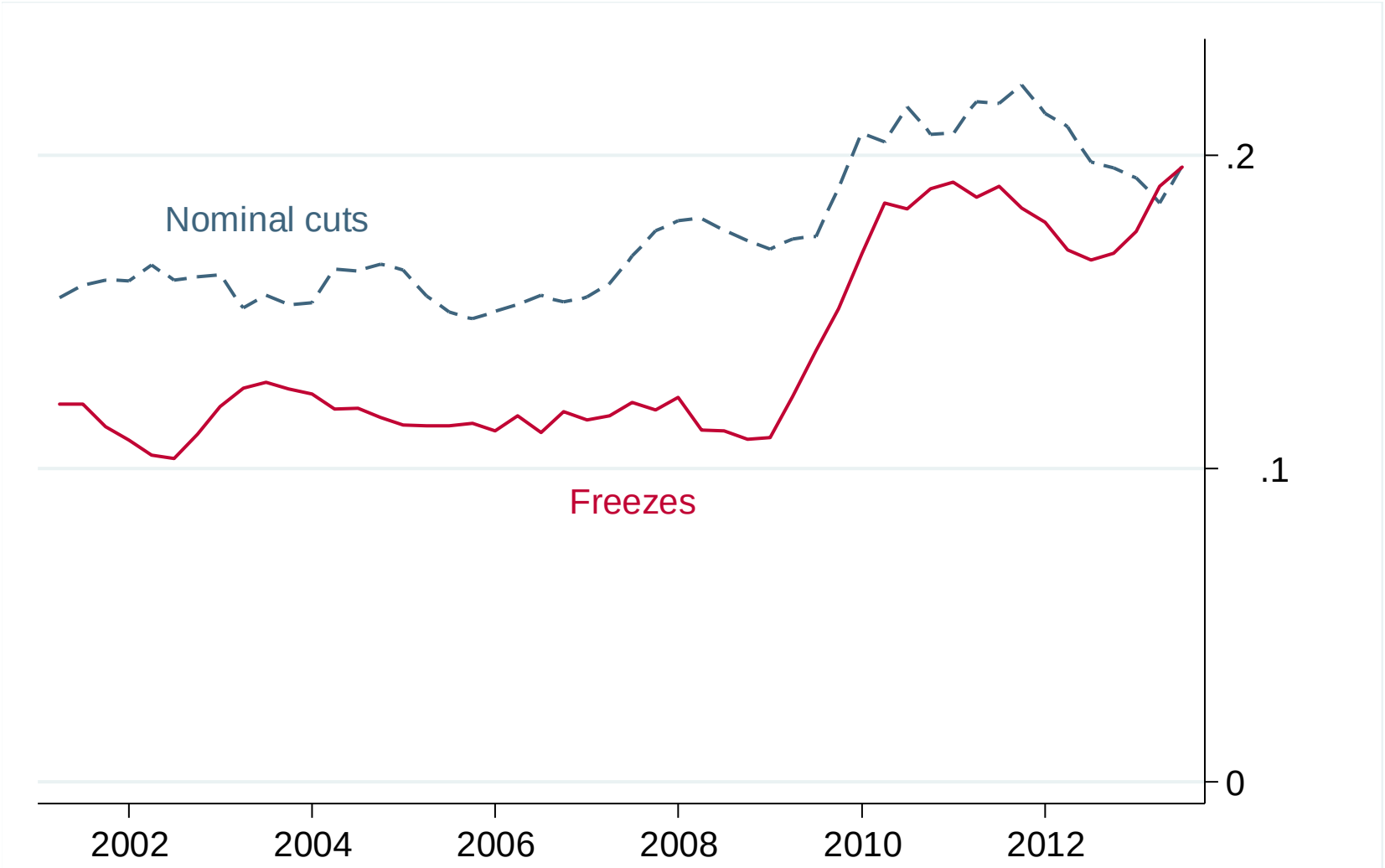
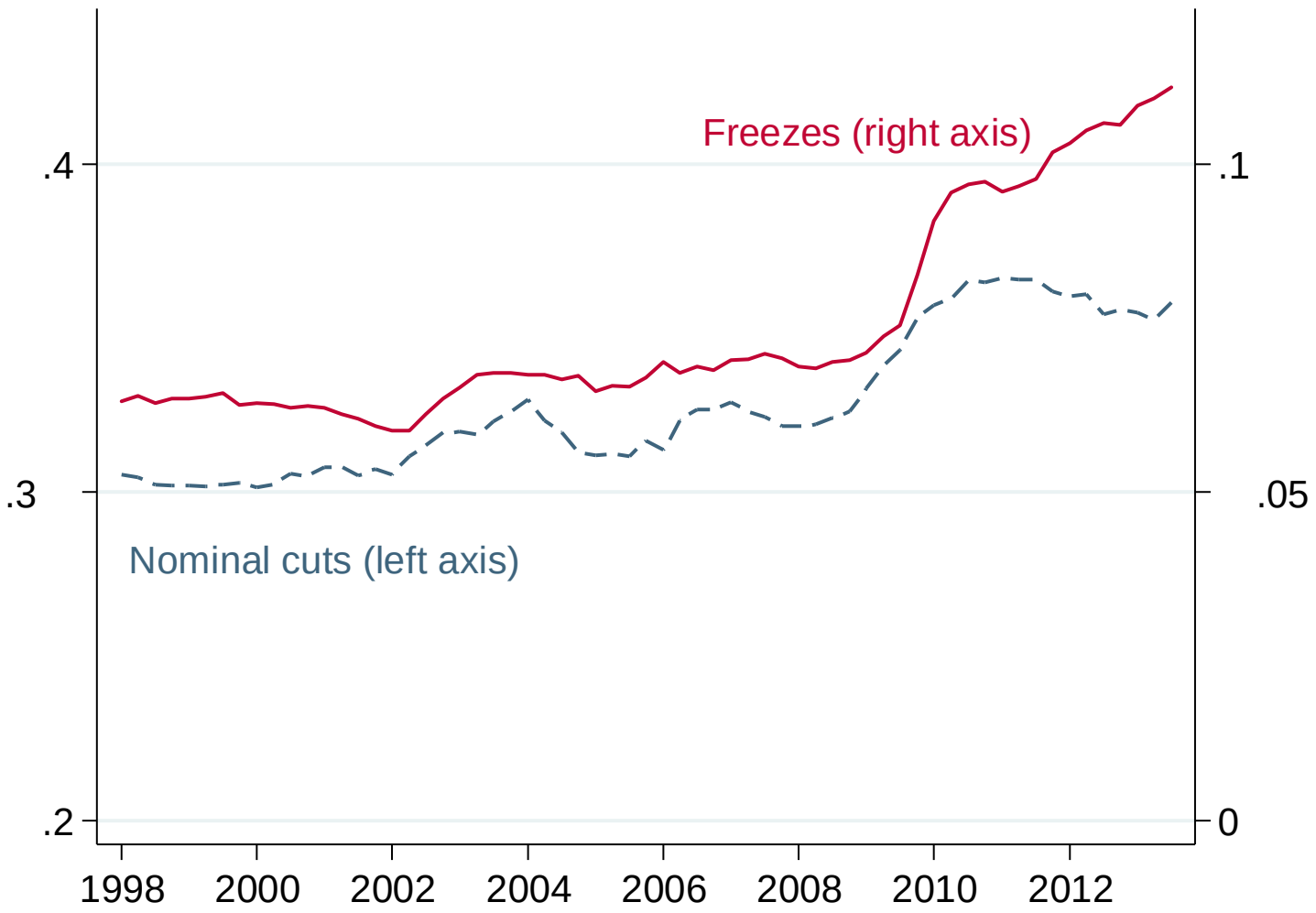
- But there are grounds for thinking that this measure is not a sufficient indicator of the degree of nominal rigidity:
  - In a downturn, productivity and labour market tightness fall for most individuals, so the whole wage growth distribution shifts left.
  - The proportion of workers suffering cuts should increase, as well as the proportion with wage freezes.

Freezes and cuts: Hourly basic wage rate



Source: LFS Hourly basic rate, whole economy.
Note: Nominal cuts and freezes as proportion of all wage changes.

Freezes and cuts: Weekly pay



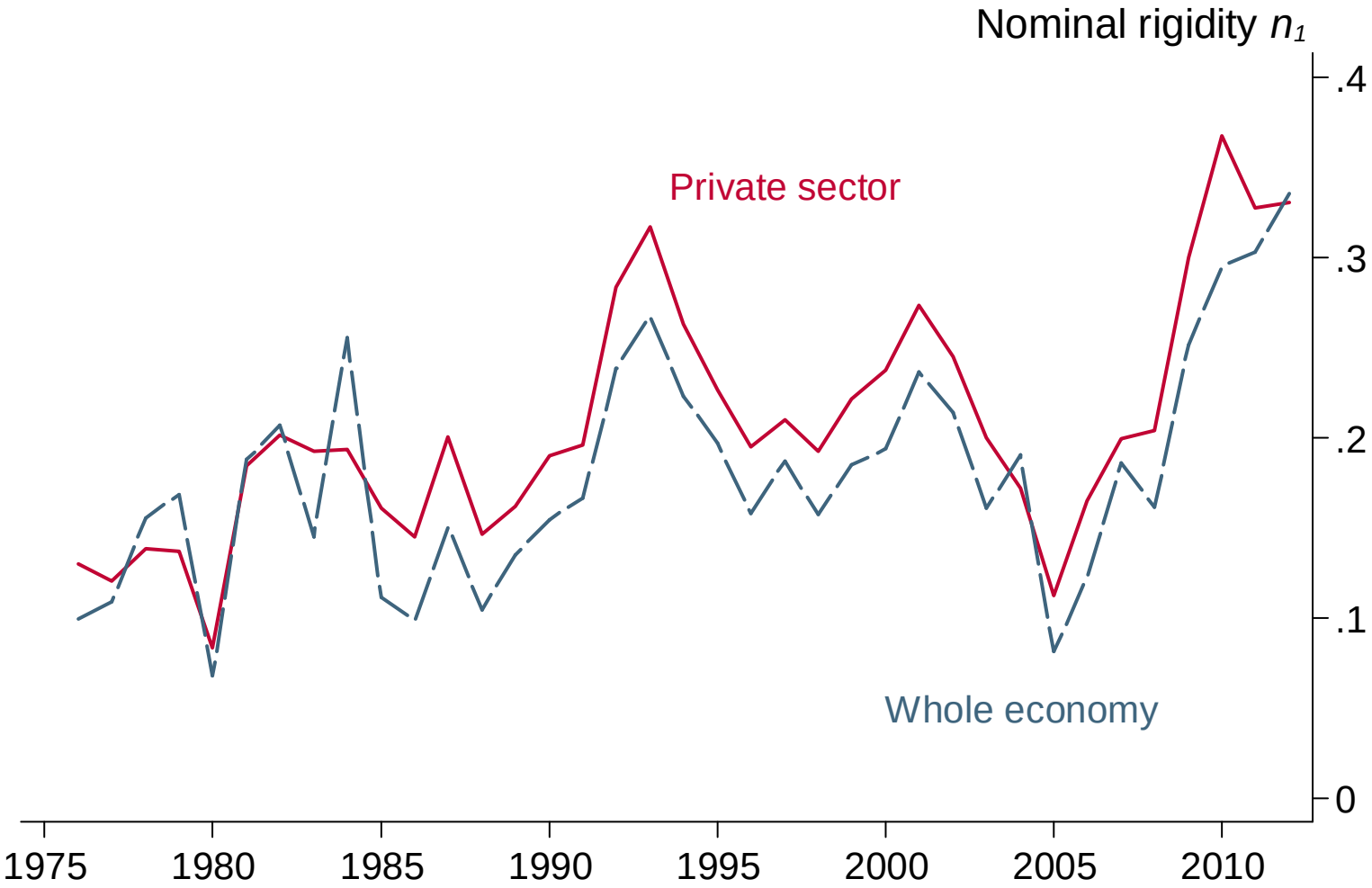
Source: LFS, Weekly pay, whole economy.
Note: Nominal cuts and freezes as proportion of all wage changes.

Interpretation of the zero spike

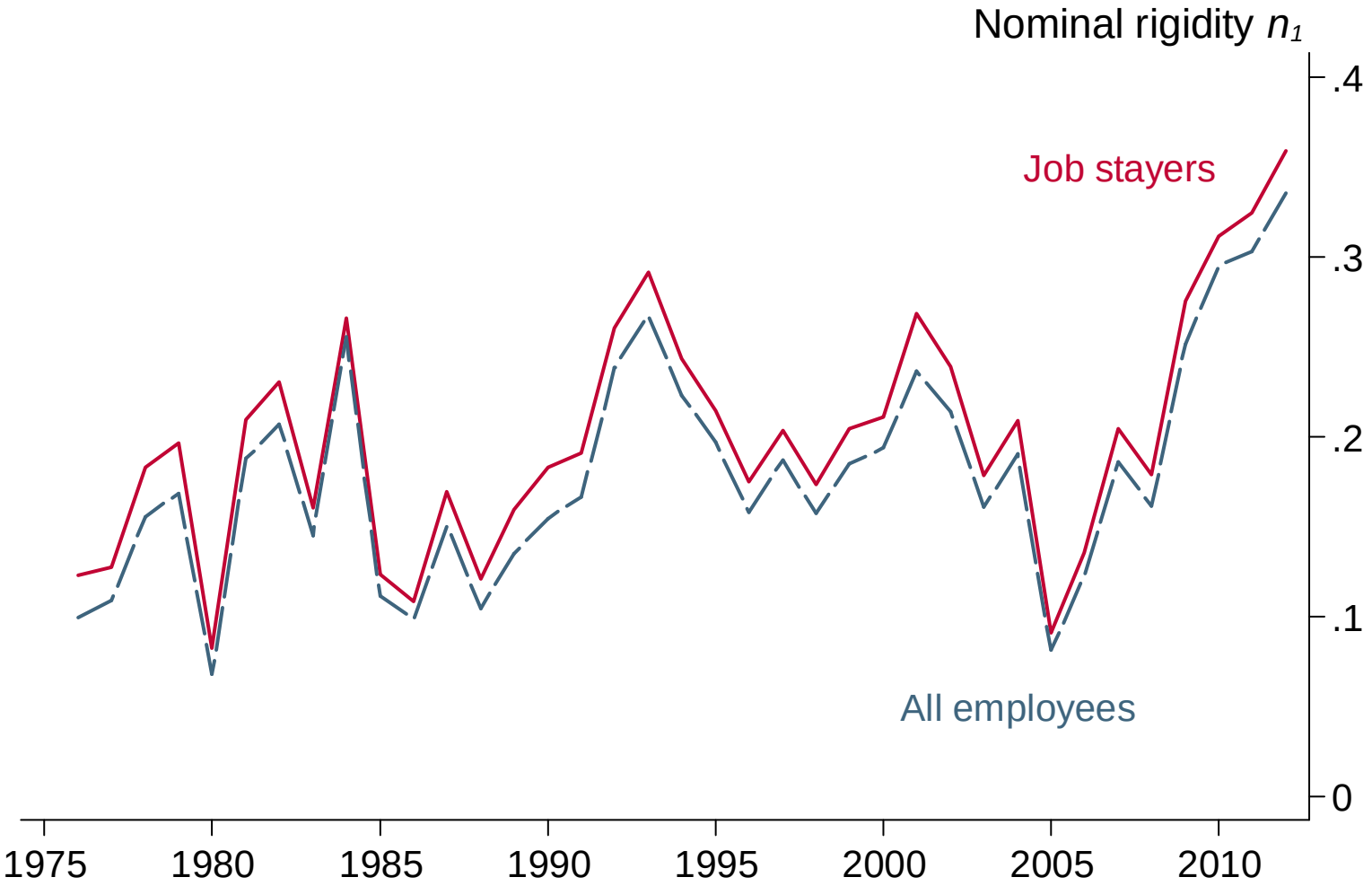
- We assume the zero spike includes individuals whose wage should have been cut on the basis of changes in their fundamentals ...
- ... but whose morale and productivity would have fallen so far if a cut had been implemented that it is not in their employer's interest to cut their pay.
- Alternative possibility: 'menu costs' might mean some workers who should have had a pay rise actually have no pay change (because it is not worth their employer or them paying the menu cost to change their wage). Ignore this: prior evidence indicates it is numerically small and we believe it would not show substantial cyclical variation.

Measuring nominal rigidity

- Workers who "should have had cuts" are those who did plus those with pay freezes.
- A good measure of rigidity is the proportion of freezes within this group who should have had cuts: $n_1 = \frac{\Pr(freeze)}{\Pr(freeze)+\Pr(cut)}$.
- The larger is n_1, the greater the proportion of wage freezes among individuals whose 'fundamentals' imply their wage should fall.



Source: NESPD, Gross hourly earnings excluding overtime.
Note: Nominal rigidity n_1 is proportion of freezes among freezes and nominal cuts.



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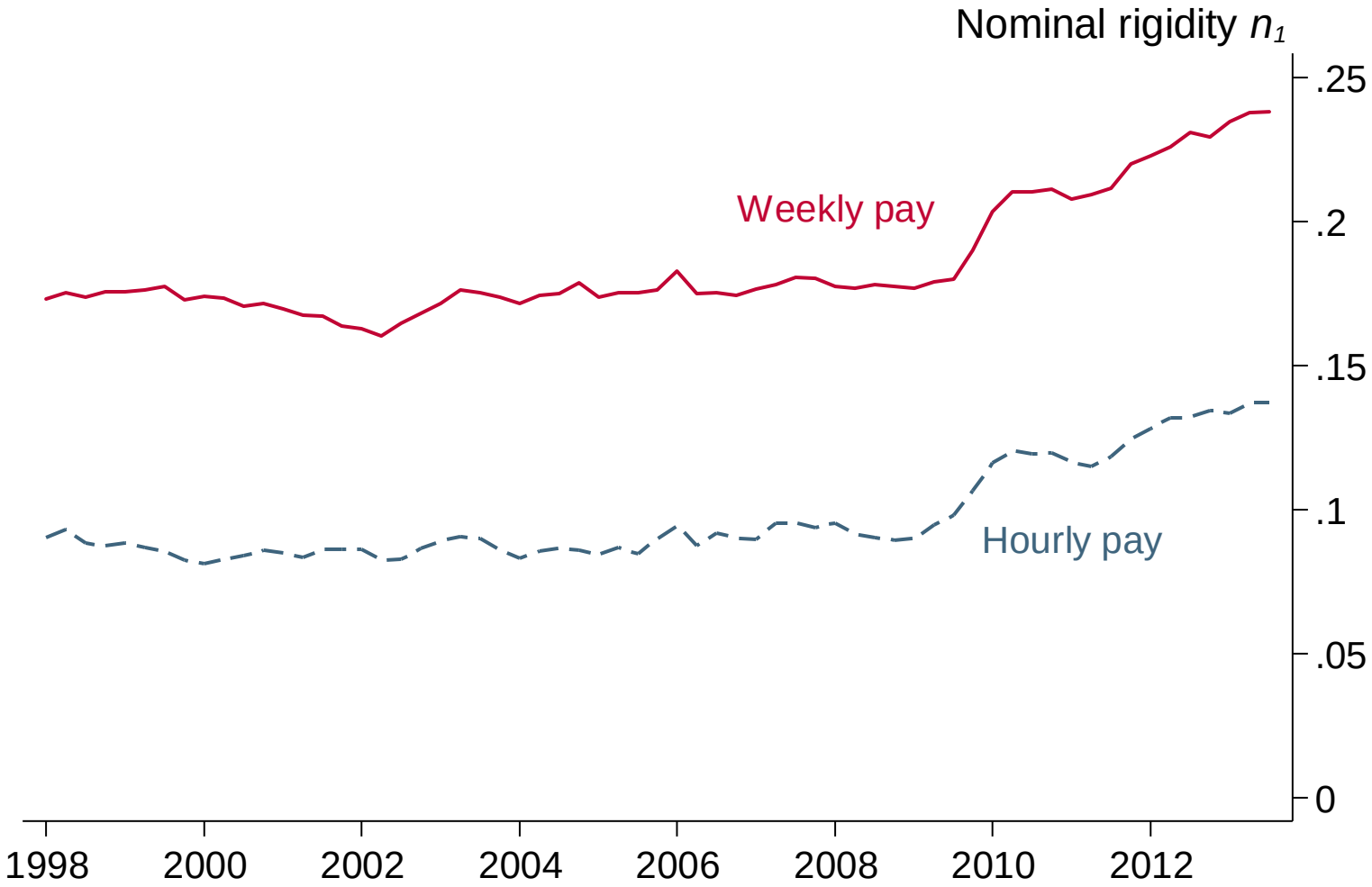

Source: LFS, Weekly and hourly pay, whole economy.
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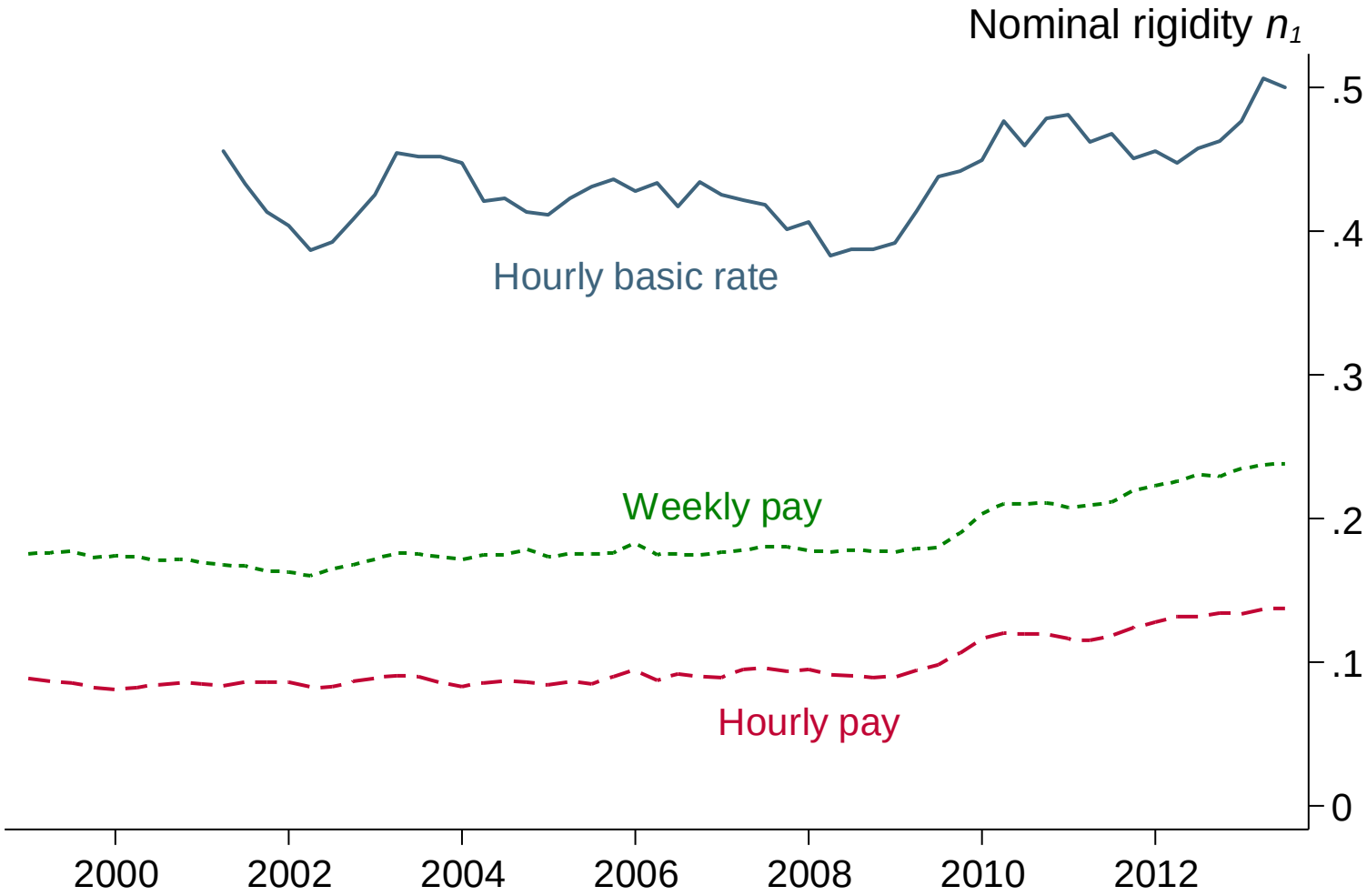


Source: LFS, Weekly and hourly pay and hourly basic rate, whole economy.
Note: Nominal rigidityn_1 is proportion of freezes among freezes and nominal cuts.

Measuring real rigidity

Measuring real rigidity

Two nominals make a real

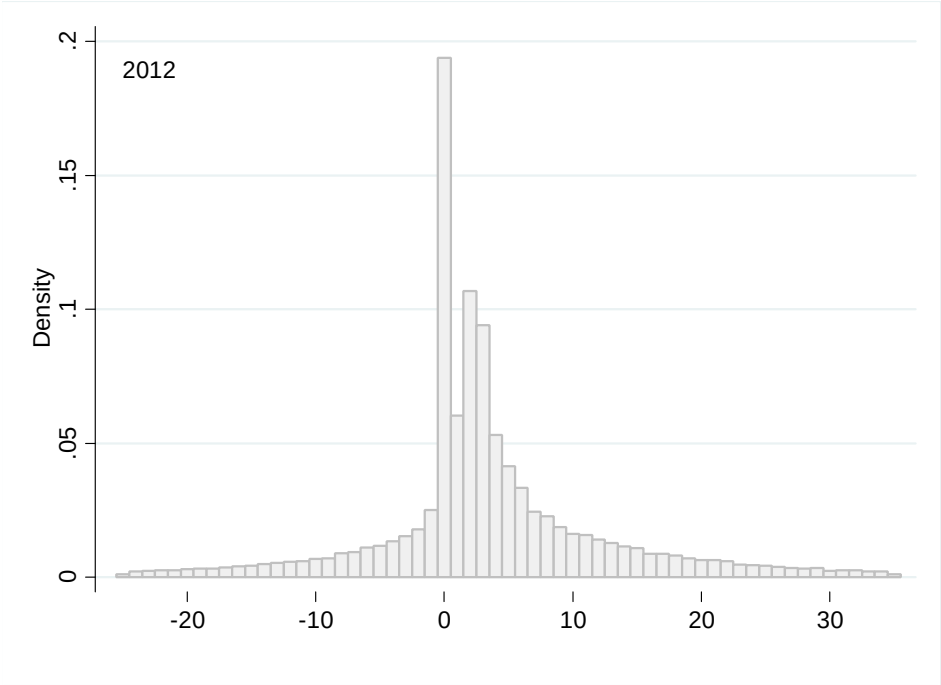
- Real wages are assumed to be what workers and firms care about: both sides will intend some real wage change in response to productivity, vacancies, unemployment, benefits, ...
- But wage setting involves nominal – not real – wages, so
- (expected) real wage changes are the outcome of a nominal wage change and the (expected) change in the price of goods.

Which inflation measure?

- It is common to measure real wage growth by subtracting a single number ("inflation"): $\Delta \ln w_t \approx (\ln W_t - \ln W_{t-1}) - \pi_t$
- This is fine when working with average pay measures W_t.
- A single inflation measure has also often been used even for disaggregated pay data, due to lack of disaggregated inflation data.

Measuring the real wage growth distribution using a single inflation measure

The April 2012 UK nominal annual wage growth distribution

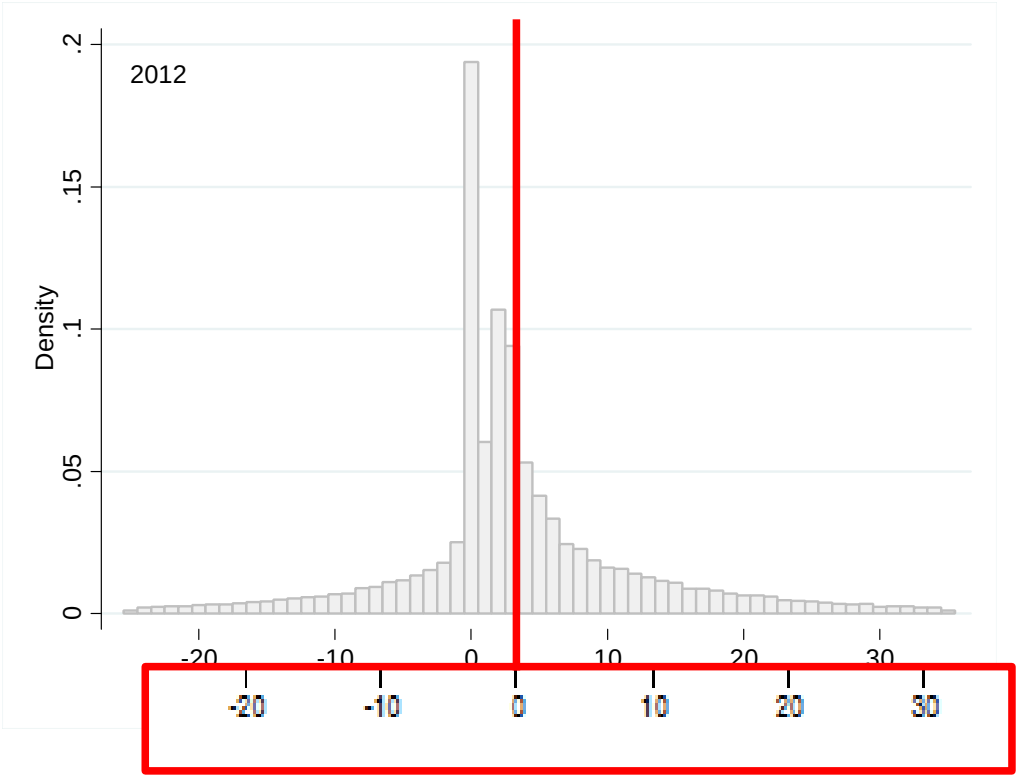


Wage growth is change between April 2011 and April 2012 in log nominal hourly gross earnings excluding overtime, main job, for employees in Great Britain whose pay was not affected by absence. Source: New Earnings Survey Panel Dataset (NESPD).

Memo: Price inflation in April 2012 was 3.5% (RPI); 3.0% (CPI).

Measuring the real wage growth distribution using a single inflation measure

The corresponding April 2012 real wage growth distribution



- If we assume a single inflation rate applies to all individuals, real wage growth is just nominal wage growth minus inflation (e.g. minus 3.5% RPI).
- Nominal zero spike is at minus inflation rate in the real wage growth distribution.

Which inflation measure?

- With disaggregated data – with large actual cross-sectional variation in nominal wages W_{it} – it is less obvious that we can rely on the idea of a single inflation rate, since $\pi_{it} \lessgtr \pi_t$.
- Also: Forward-looking behaviour? Subtracting RPI or CPI inflation captures ex post real wage growth – typically not the real wage growth that either firm or worker expected when they set the nominal wage W_{it-1}. Arguably, we should instead look at inflation expectations and ex ante real wage growth.

$$E_{it-1}\Delta \ln w_{it} \approx (\ln W_{it} - \ln W_{it-1}) - E_{it-1}\pi_{it}$$

Measuring real rigidity

We measure real rigidity by comparing the nominal wage to the distribution of inflation expectations:

- if the nominal wage is the same as the inflation expectation, the real wage is classed as rigid.

Why is this a good measure of real wage rigidity? Take this in steps:

1. Think of a simple model in which wage setters all aim to set nominal wages in relation to a single inflation measure.

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Why is this a good measure of real wage rigidity? Take this in steps:

1. Think of a simple model in which wage setters all aim to set nominal wages in relation to a single inflation measure.
2. Add in forward-looking behaviour.
3. Allow for dispersed inflation expectations.

Measuring real rigidity

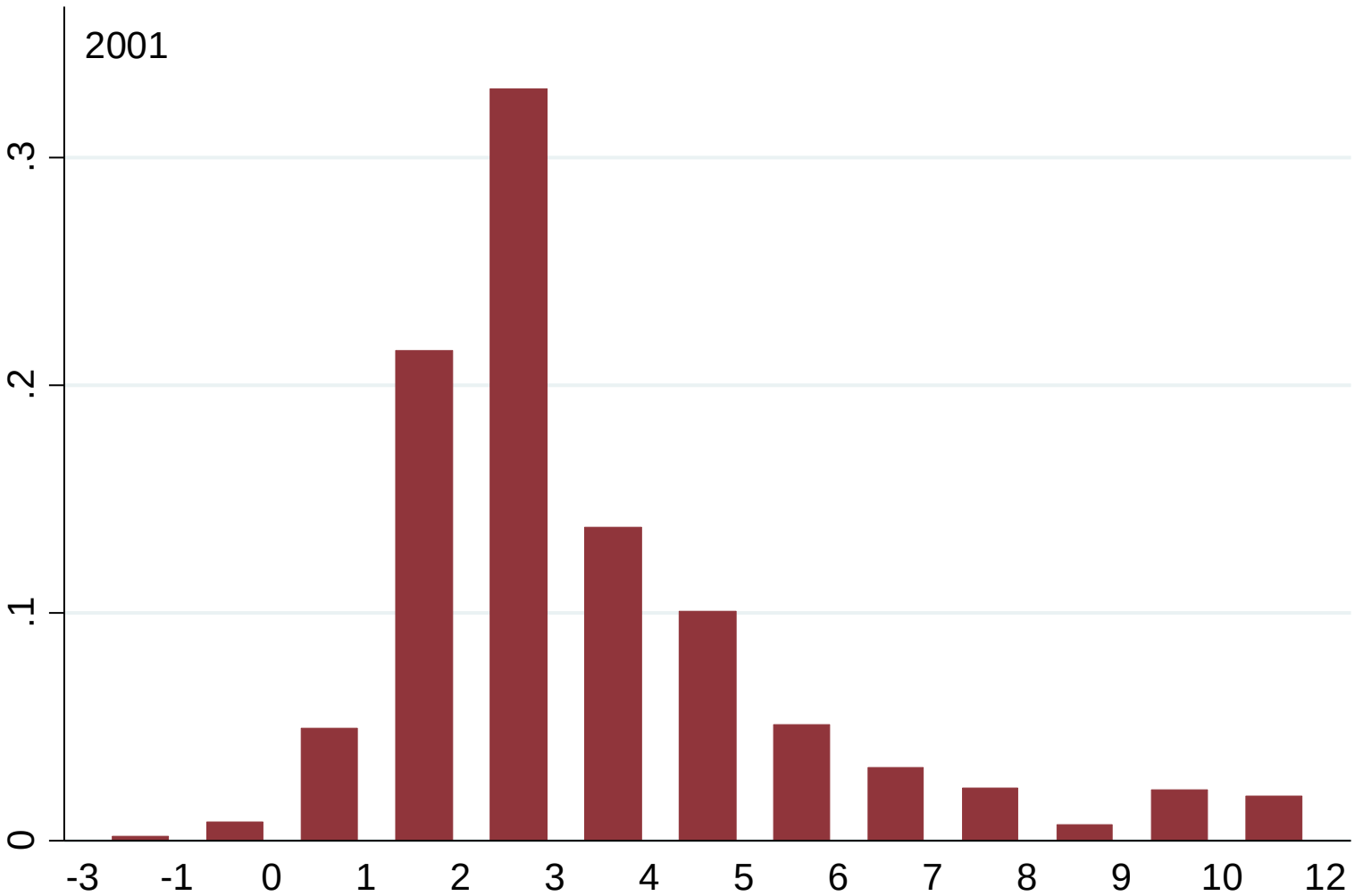
- Background – why real rigidity matters: If the real wage does not respond to labour market tightness / productivity / benefits, employment will adjust instead.

- Hypothesis: Because real-side factors do change over time, real wage growth should typically not be zero – so it is unlikely that nominal wage growth "should" exactly equal price inflation.
- Thus the extent of "nominal wage growth equal to inflation" should detect excessive real wage rigidity and lack of responsiveness of real wage to real-side factors.

Measuring real rigidity

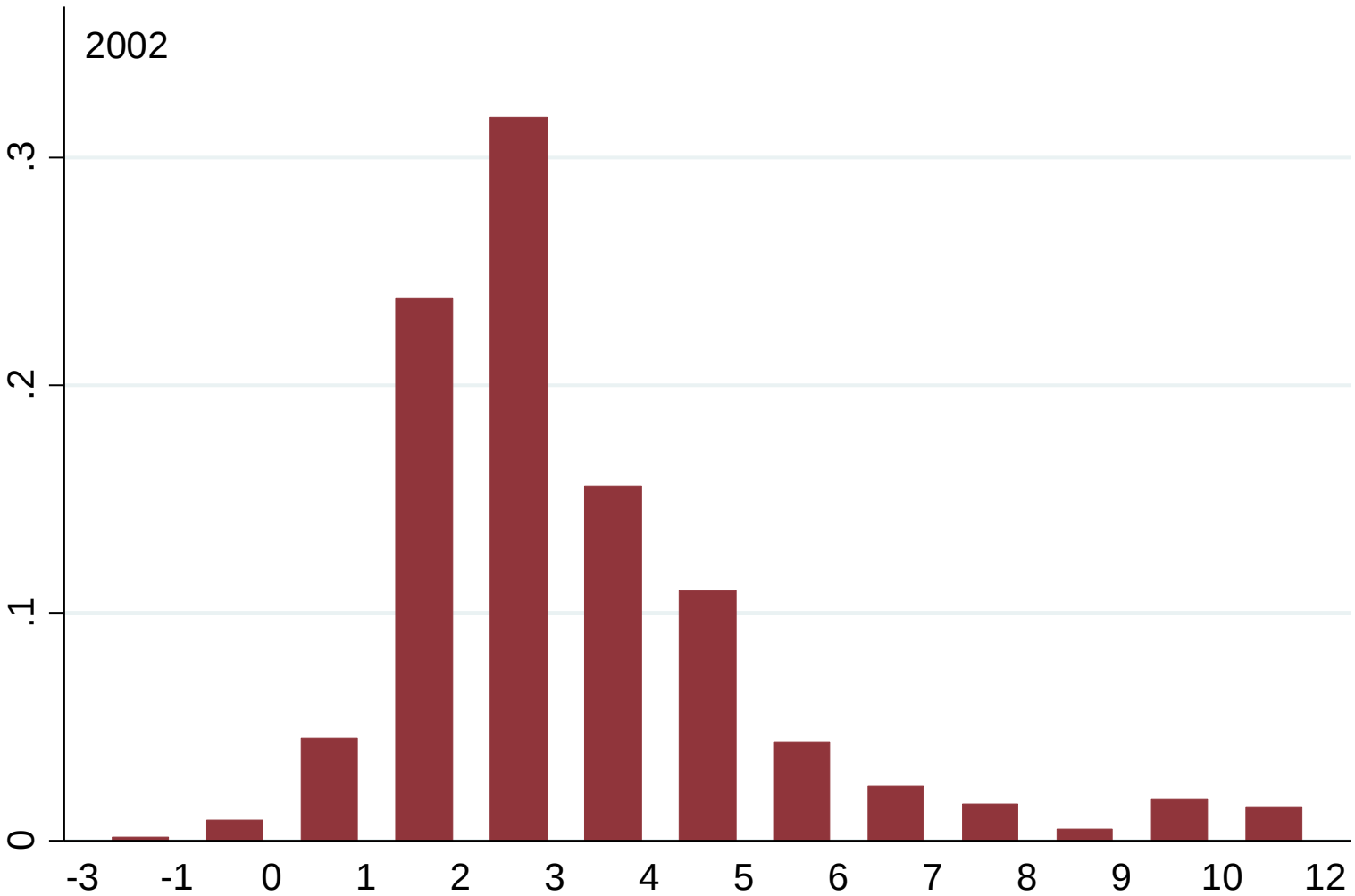
- So, a good measure of real wage rigidity would be the extent of correspondence between nominal wage and inflation ...
- ... but forward-looking wage setters will take account of inflation over the period of the wage contract.
- So we would like to take account of the facts that:
  - nominal wages are set in relation to expected inflation.
  - and expected inflation (even more than realised inflation) varies across individuals.

Inflation expectations distribution



Source: Barclays Basix inflation expectations.
Note: Bar heights show fraction of all inflation expectations
in range from lower to upper horizontal axis value and inclusive of upper value.

Inflation expectations distribution



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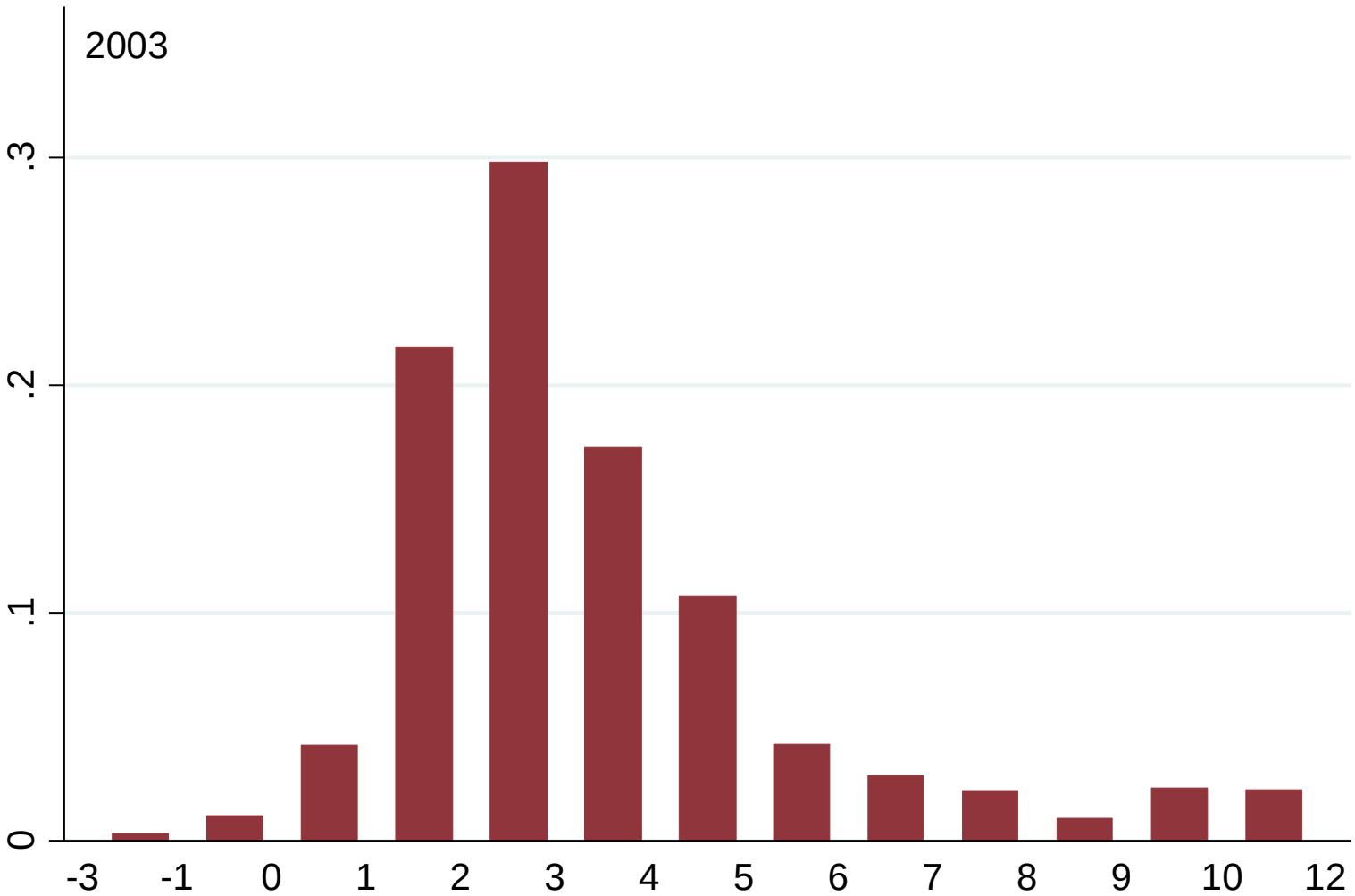

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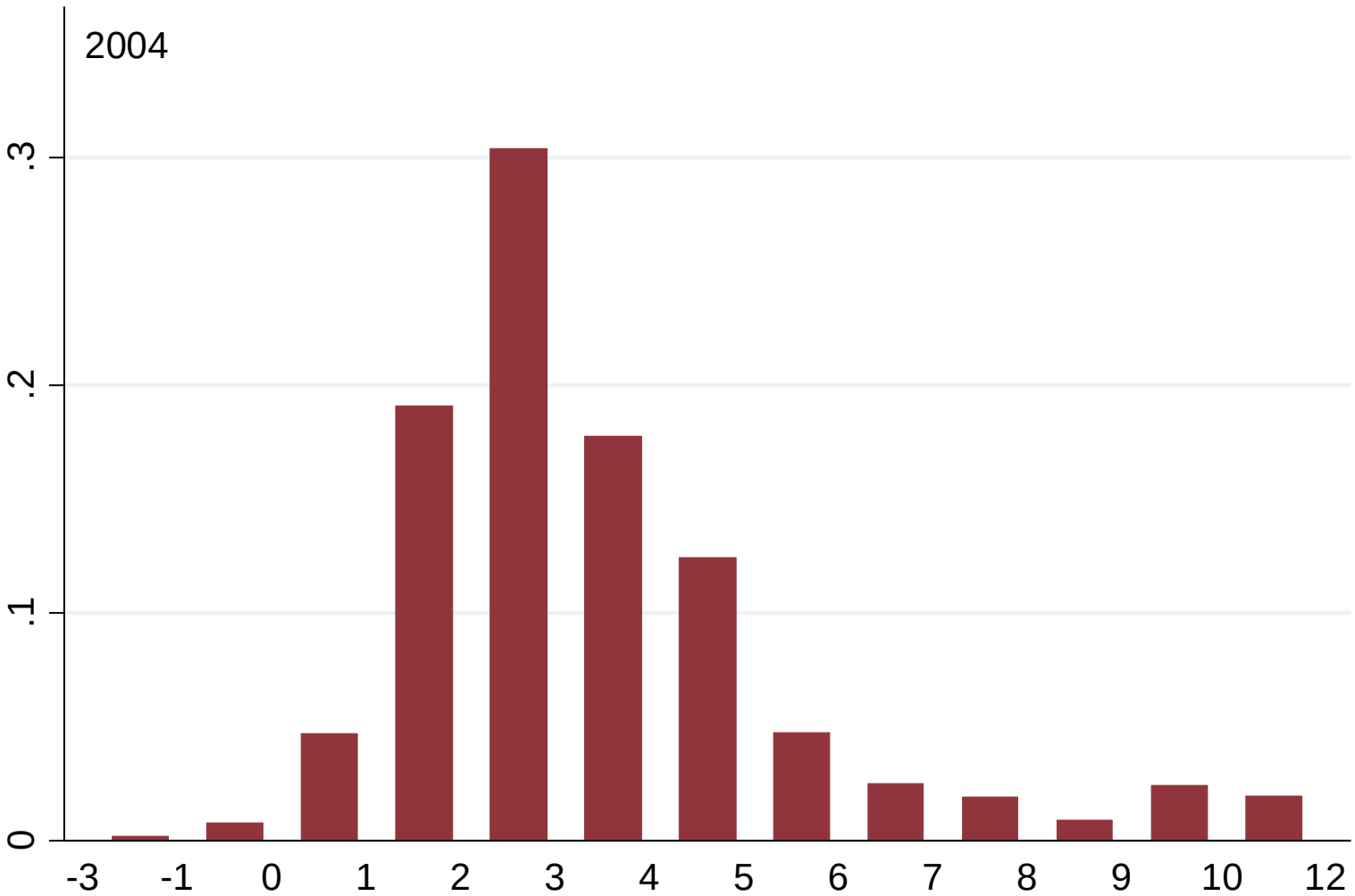

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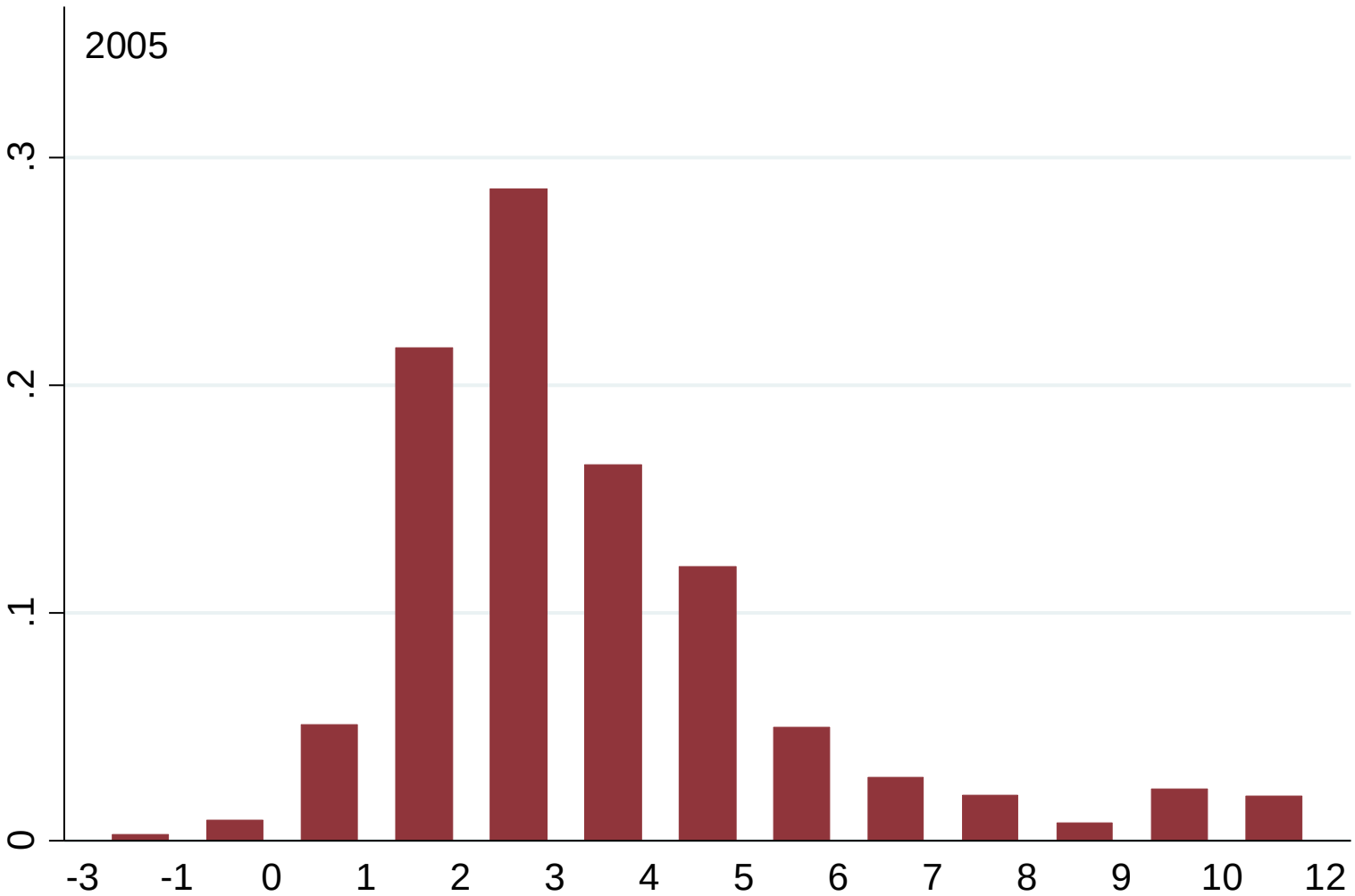
Inflation expectations distribution



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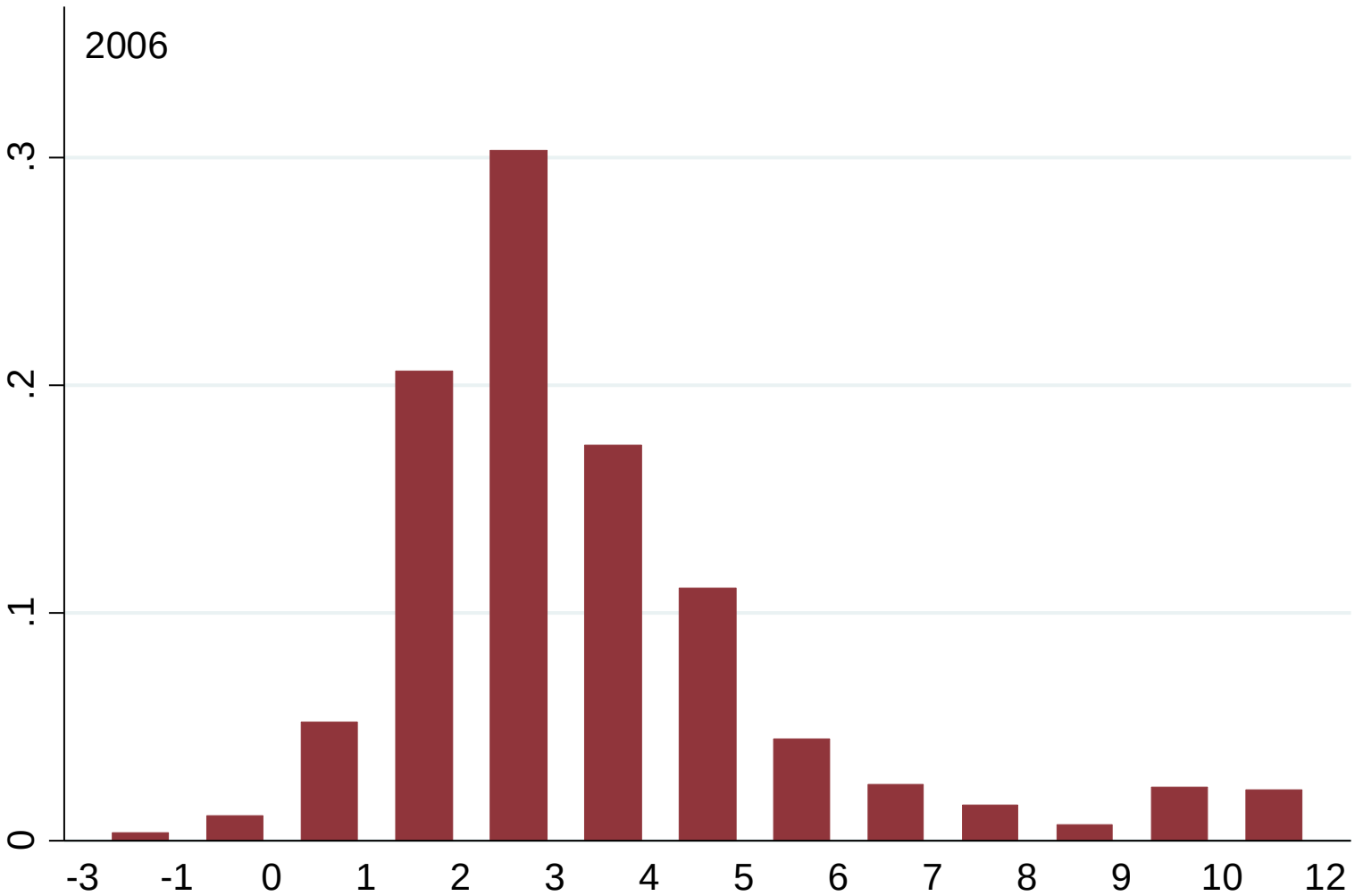

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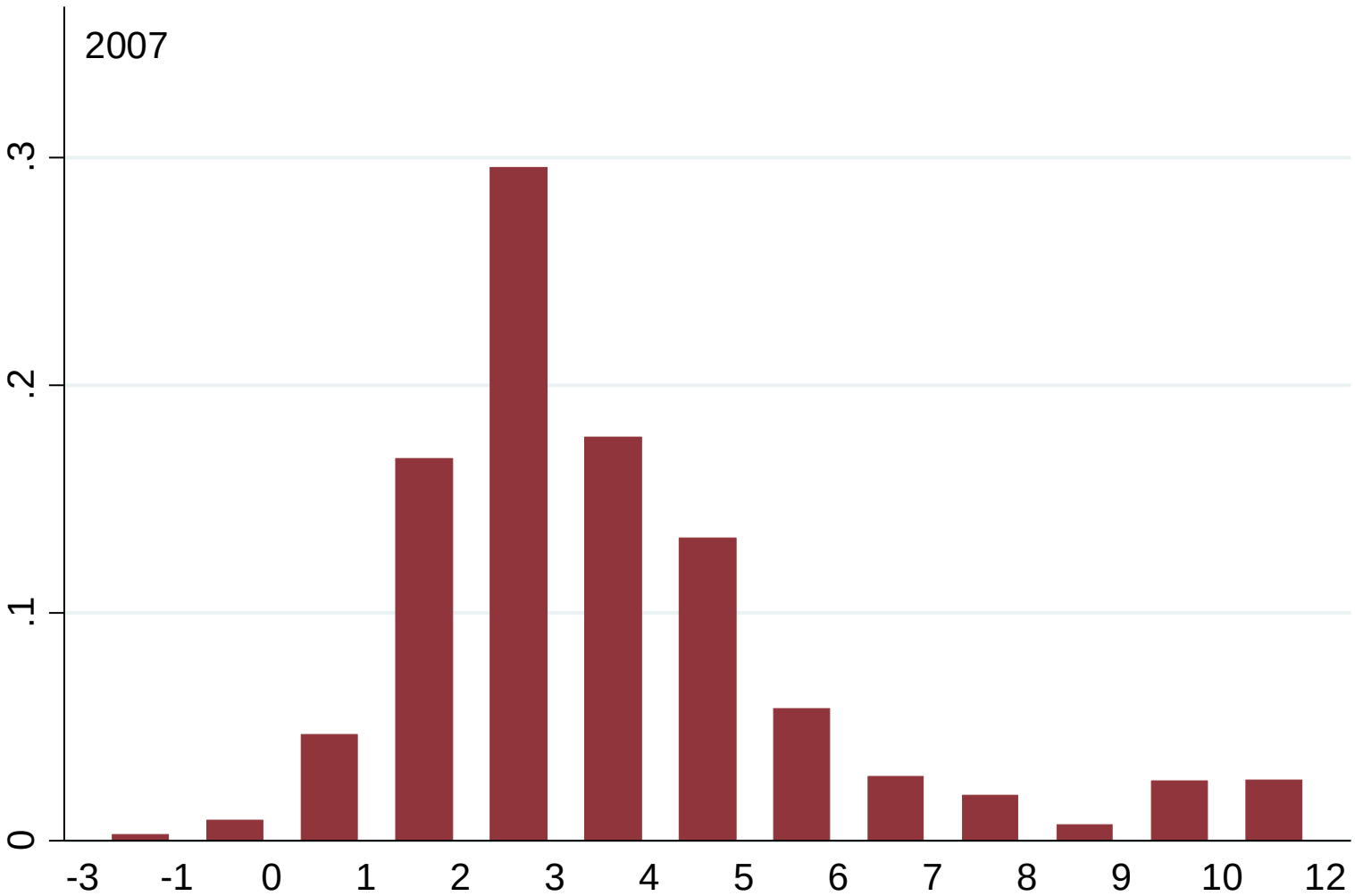

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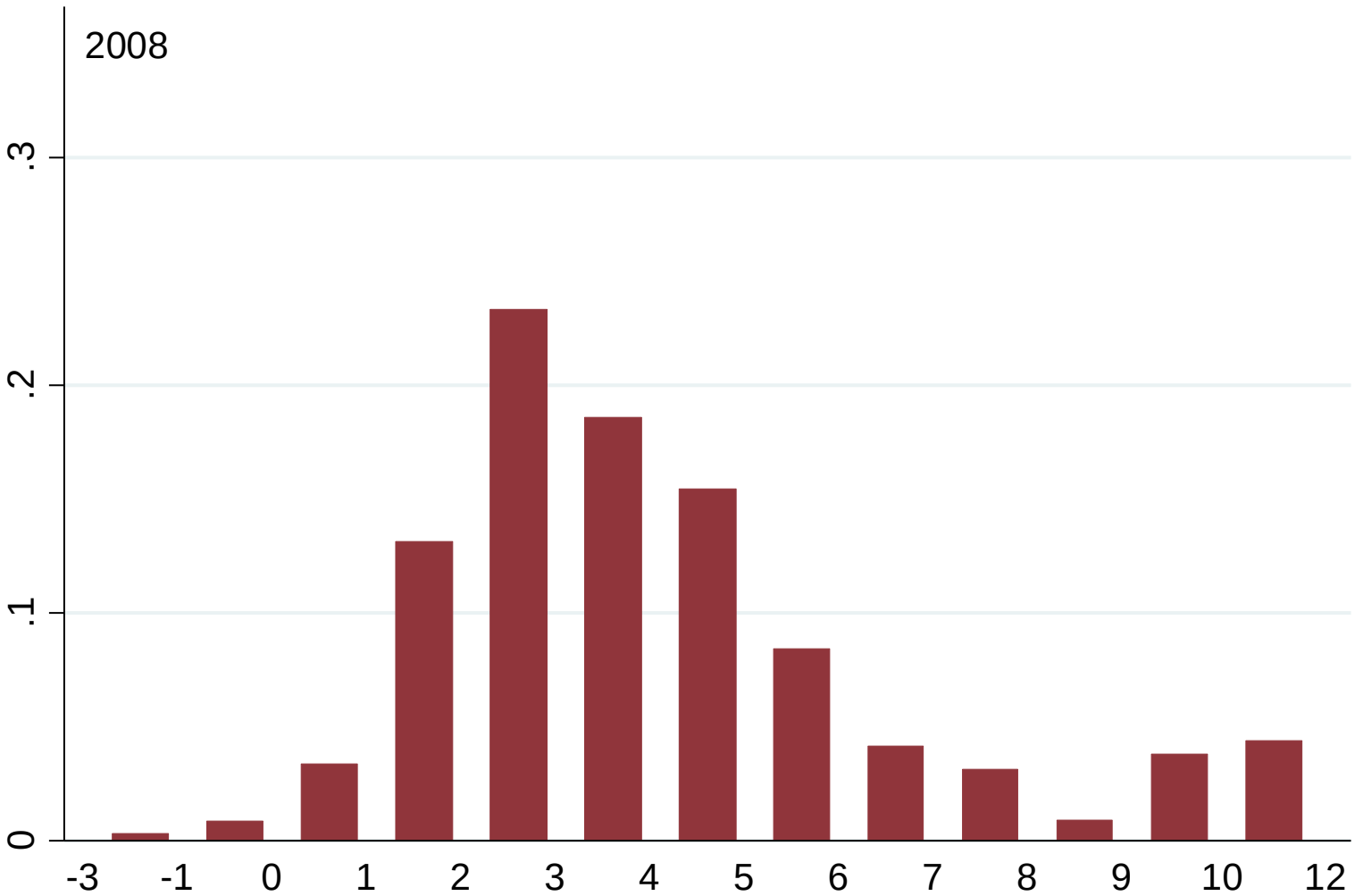

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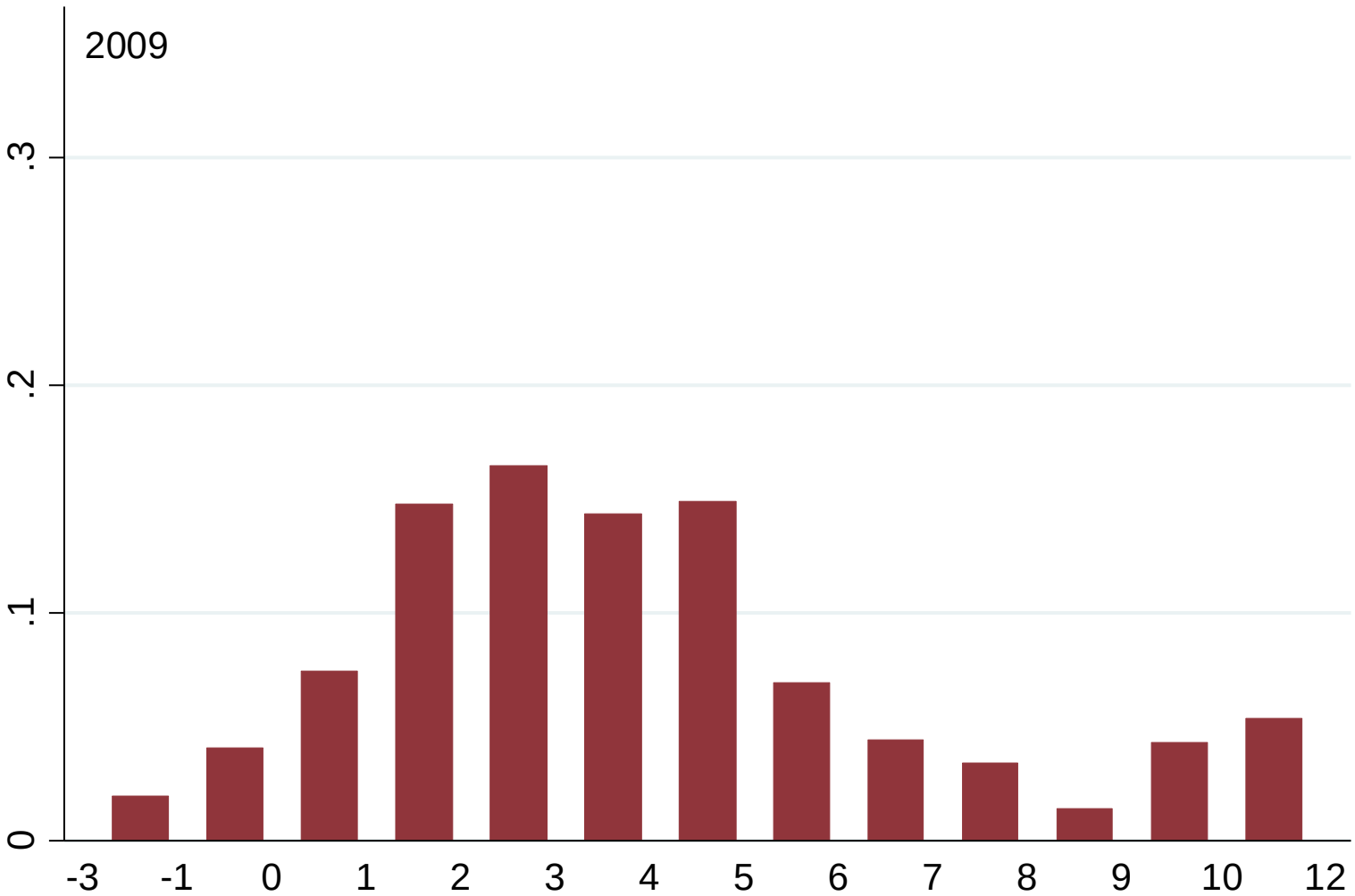

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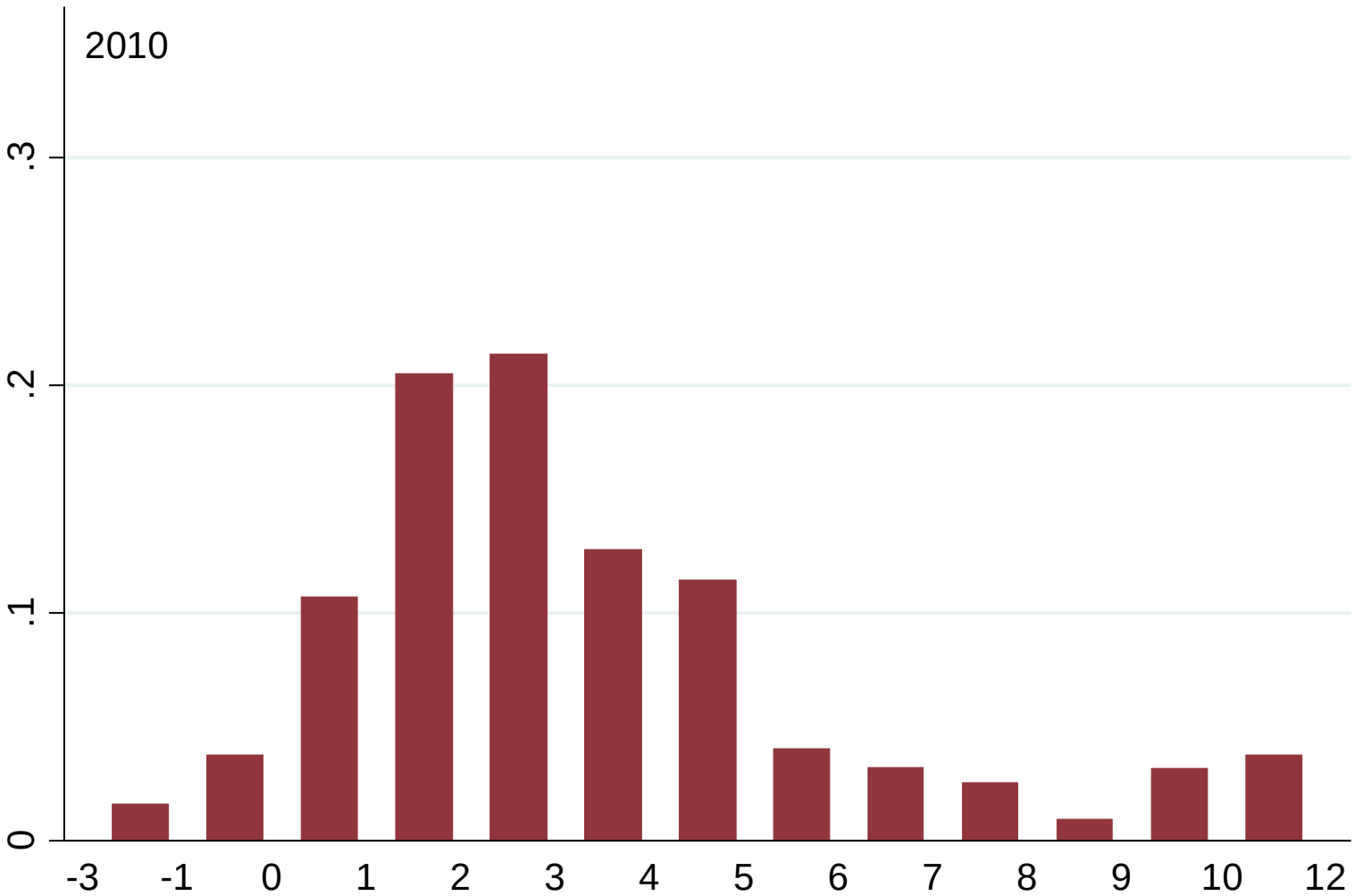

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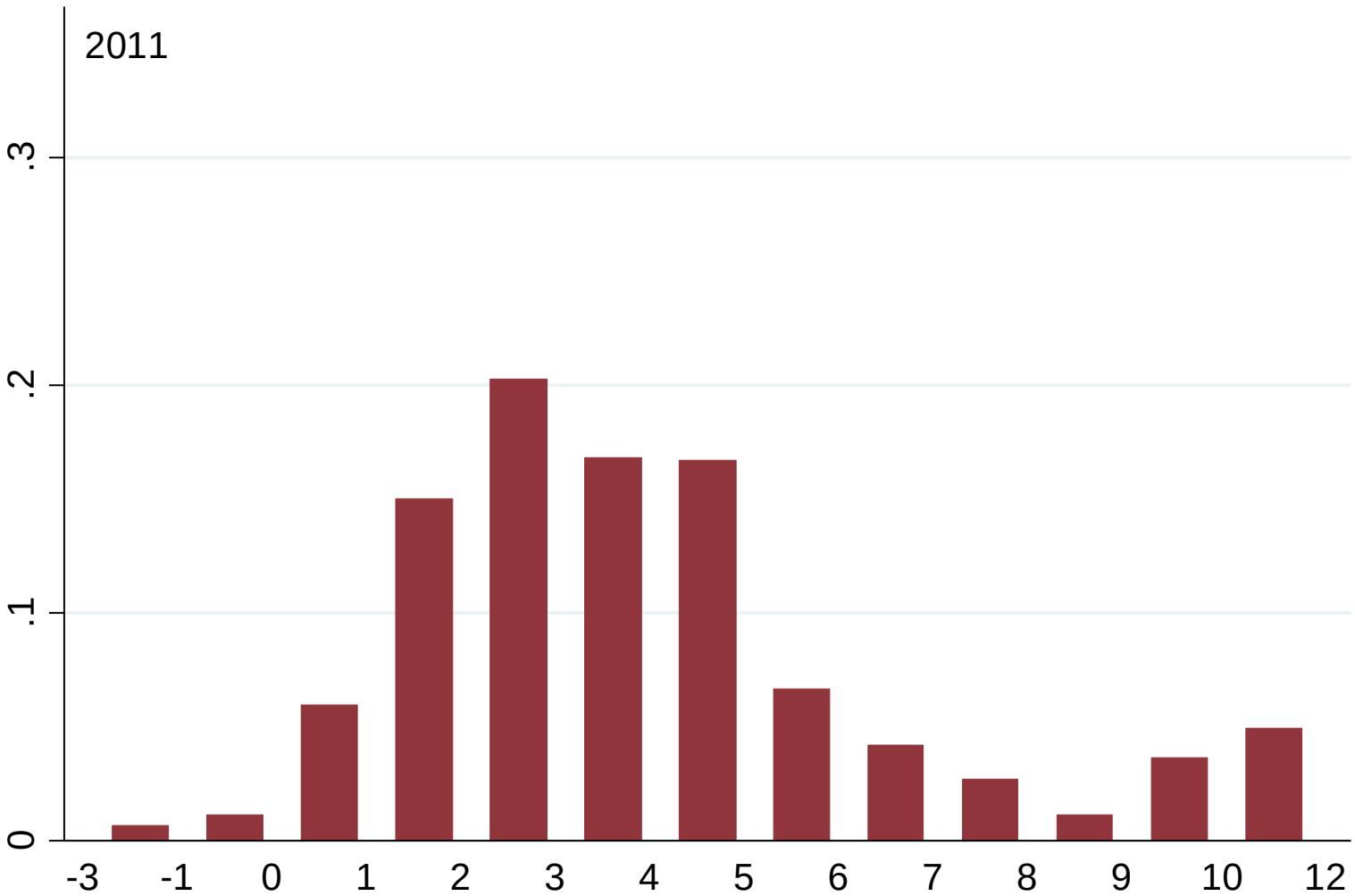

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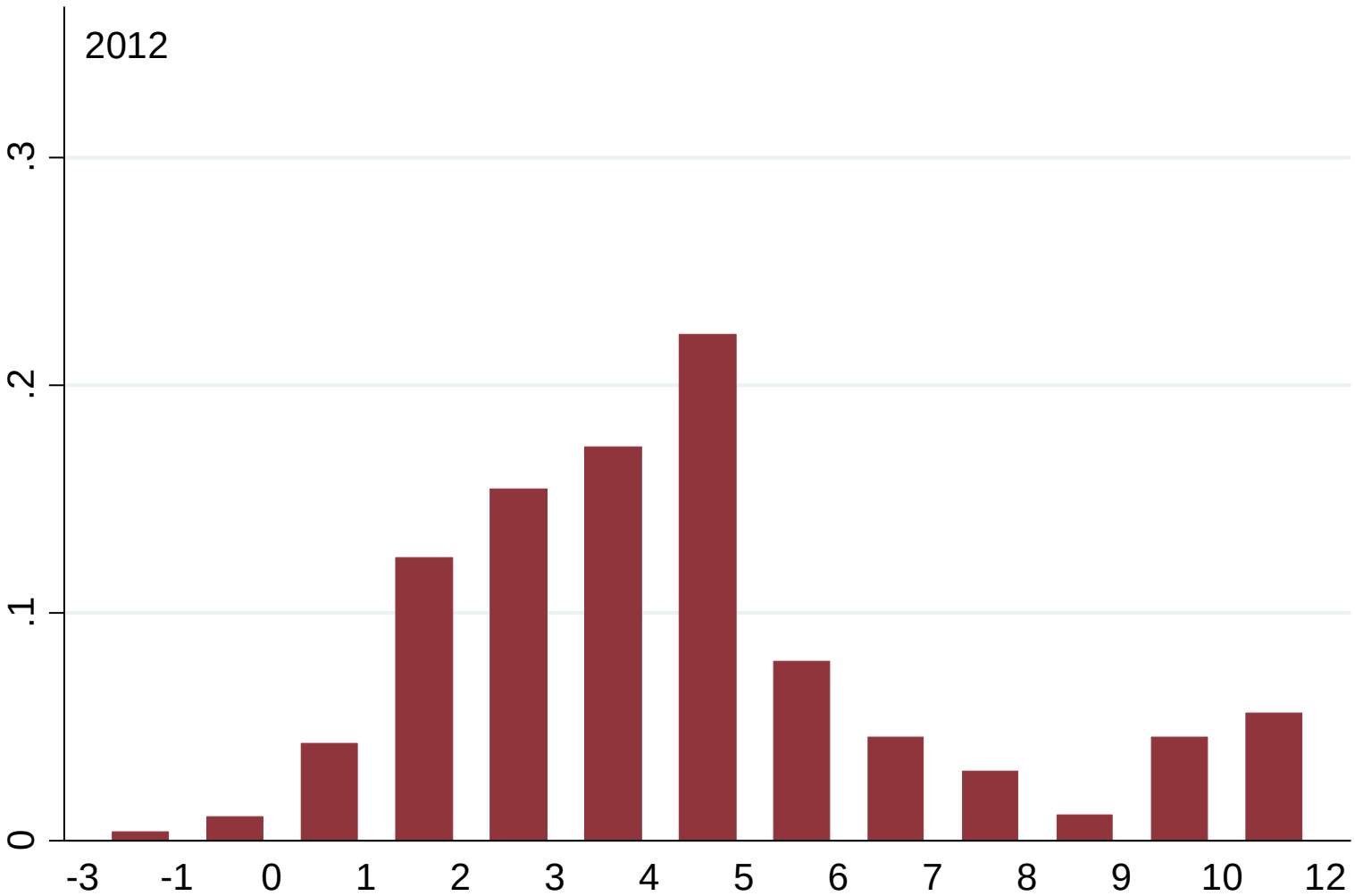

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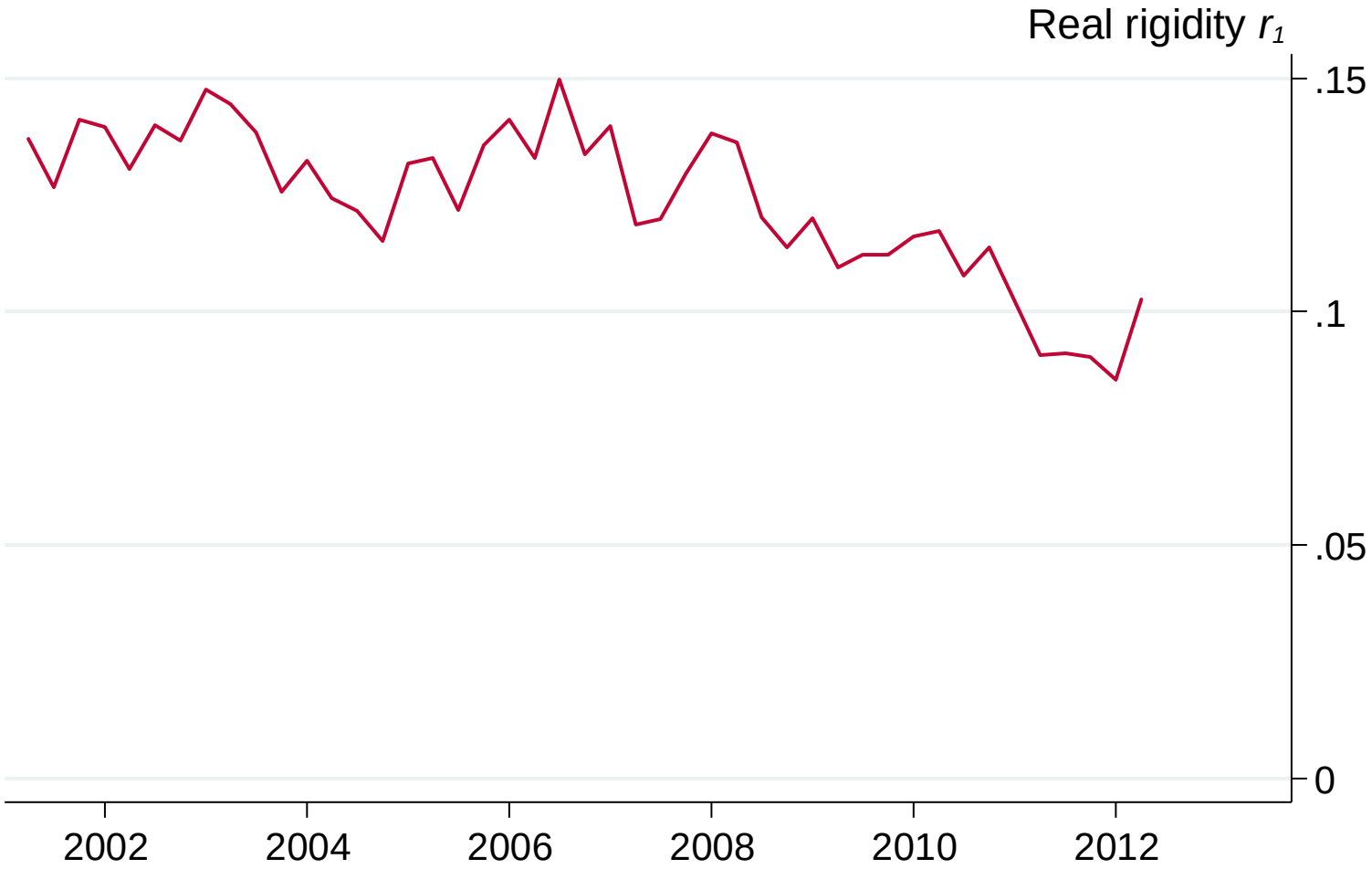
Measuring real rigidity

- If an individual's nominal wage growth is below the lowest observed inflation expectation, they definitely have an expected real wage cut.
- If an individual's nominal wage growth is above the highest observed inflation expectation, they definitely have an expected real wage raise.

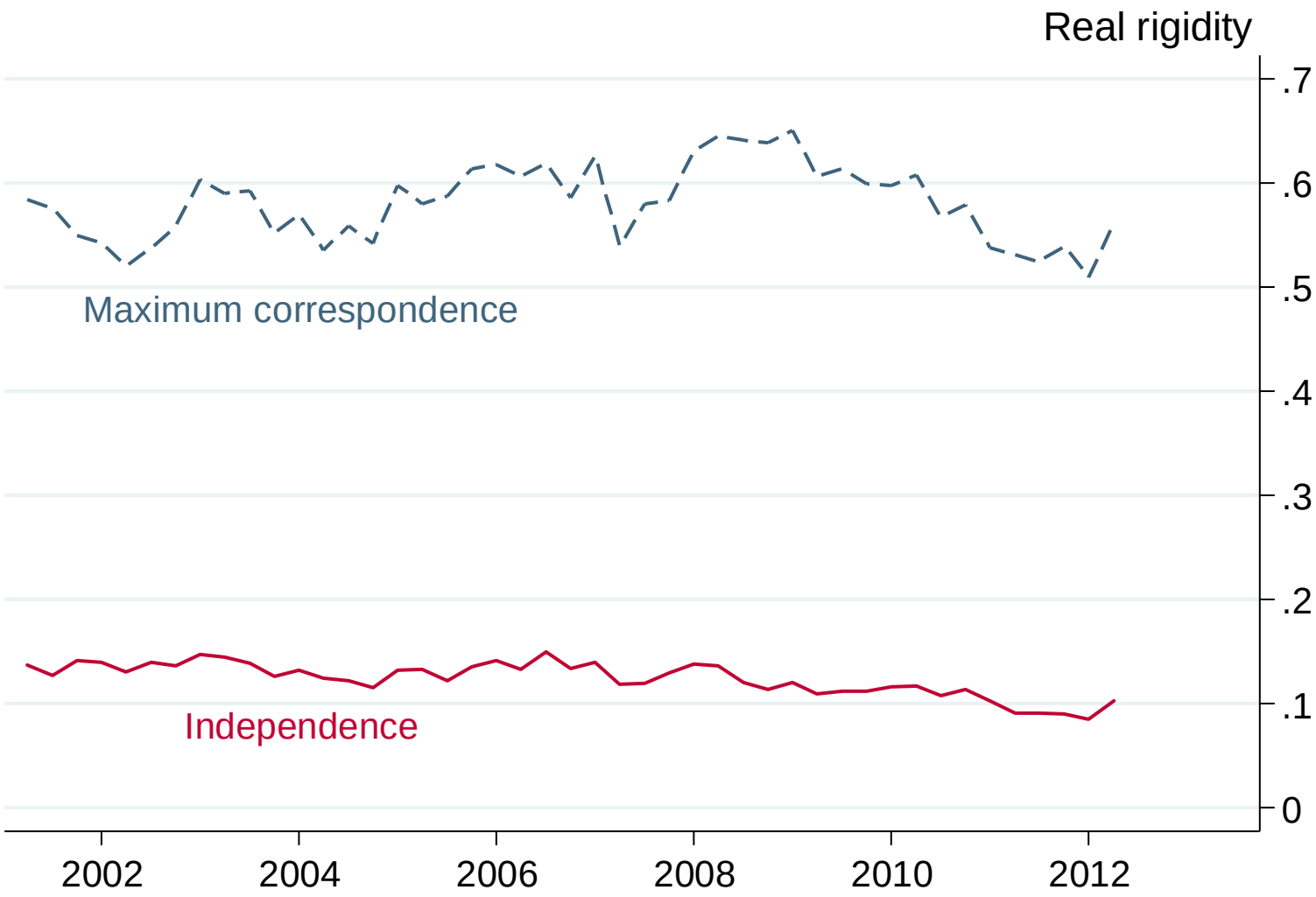
Measuring real rigidity

Making some assumptions about how nominal wage growth and inflation expectations are related sets bounds on the extent and path of real wage rigidity.

- "Independence": assumption that all individuals, whatever their wage growth, have probability of inflation expectation $x\%$ equal to the overall probability of observing inflation expectation $x\%$.
  - This is likely to give a lower bound to real rigidity:
  - any positive correspondence of wage growth and inflation expectation will lead to higher wage rigidity than this.
- "Maximum correspondence": assumption that individuals with nominal wage growth of $x\%$ are most likely to have inflation expectation of $x\%$.
  - This gives an upper bound to real wage rigidity.



Source: LFS, Hourly basic rate, whole economy.
Note: Real rigidityr_1 is proportion of expected constant real pay among expected constant real pay and real cuts (assuming independence).



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Measuring nominal rigidity for modern macro models

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- Macro models based on Calvo (1983) require an estimate of the probability of changing price each period ρ_t. ρ_t is treated as a random variable following a Poisson distribution. ρ_{it} is assumed to be the same for all agents i, no matter when they last changed price.

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- Estimates of price rigidity based on micro data are calculated on the assumption that proportion $1 - \rho_t$ of prices that do not change can be drawn from anywhere in the price change distribution. $\pi_{it} = 0$ is the counterfactual to $\pi_{it} \neq 0$.

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- This is a different assumption from the assumption underlying nominal wage rigidity measures such as n_{1t}, which assume that the counterfactual to a rigid nominal wage $\Delta W_{it} = 0$ is a nominal wage cut $\Delta W_{it} < 0$.

Measuring nominal rigidity for modern macro models

- To parallel empirical work based on micro price data, we could calculate the probability that a nominal wage changes over the year between $t-1$ and t as

$$\rho_t = P\left(\Delta W_{it} \neq 0\right) = P\left(t-1 < T \leq t\right) = 1 - e^{-\lambda_t}$$

where T is the date that the nominal wage changes and $\lambda_t = -\ln\left(1-\rho_t\right)$ is the hazard of a nominal wage change during year t, assuming a constant per-period hazard.

Measuring nominal rigidity for modern macro models

Comment

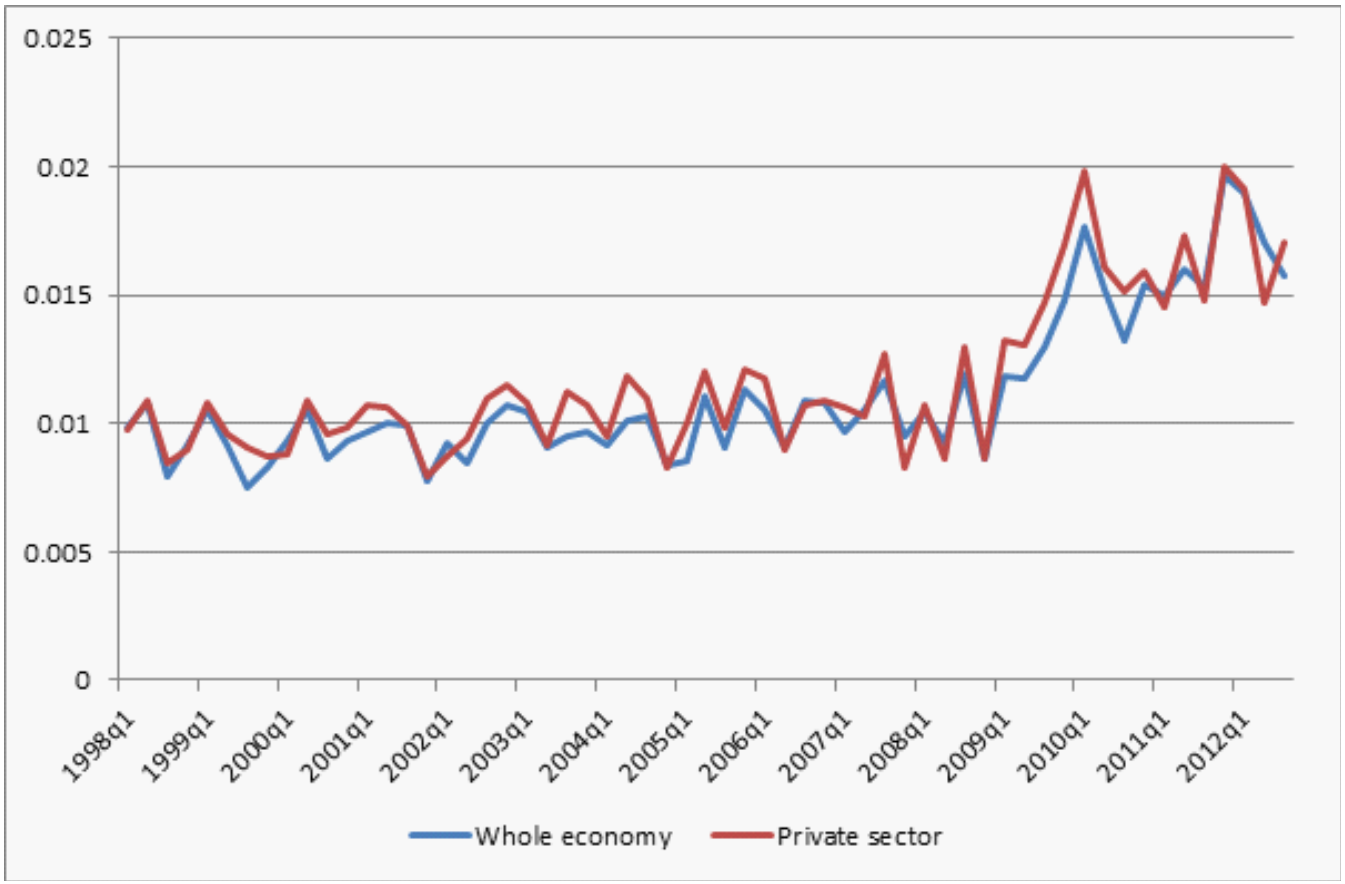
$$\rho_t = P\left(\Delta W_{it} \neq 0\right) = P\left(t-1 < T \leq t\right) = 1 - e^{-\lambda_t}$$

T is the date that the nominal wage changes; λ_t is the hazard of a nominal wage change during year t.

- Strictly: Hazard function is the conditional probability $P\left(t-1 < T \leq t \mid T > t-1\right)$.
- Censoring issue: Labour market datasets do not generally include data to calculate the probability that the nominal wage has survived until t, $P\left(T > t-1\right)$.
- Assume $P\left(T < t\right) = 0$ so $P\left(T > t-1\right) = 1$.
- Extra nominal rigidity during t.

Measuring nominal wage rigidity for modern macro models

Quarterly homogeneous Poisson hazard rate for nominal hourly pay rigidity implied by the extent of nominal freezes vs any change



Source: LFS, Hourly earnings.

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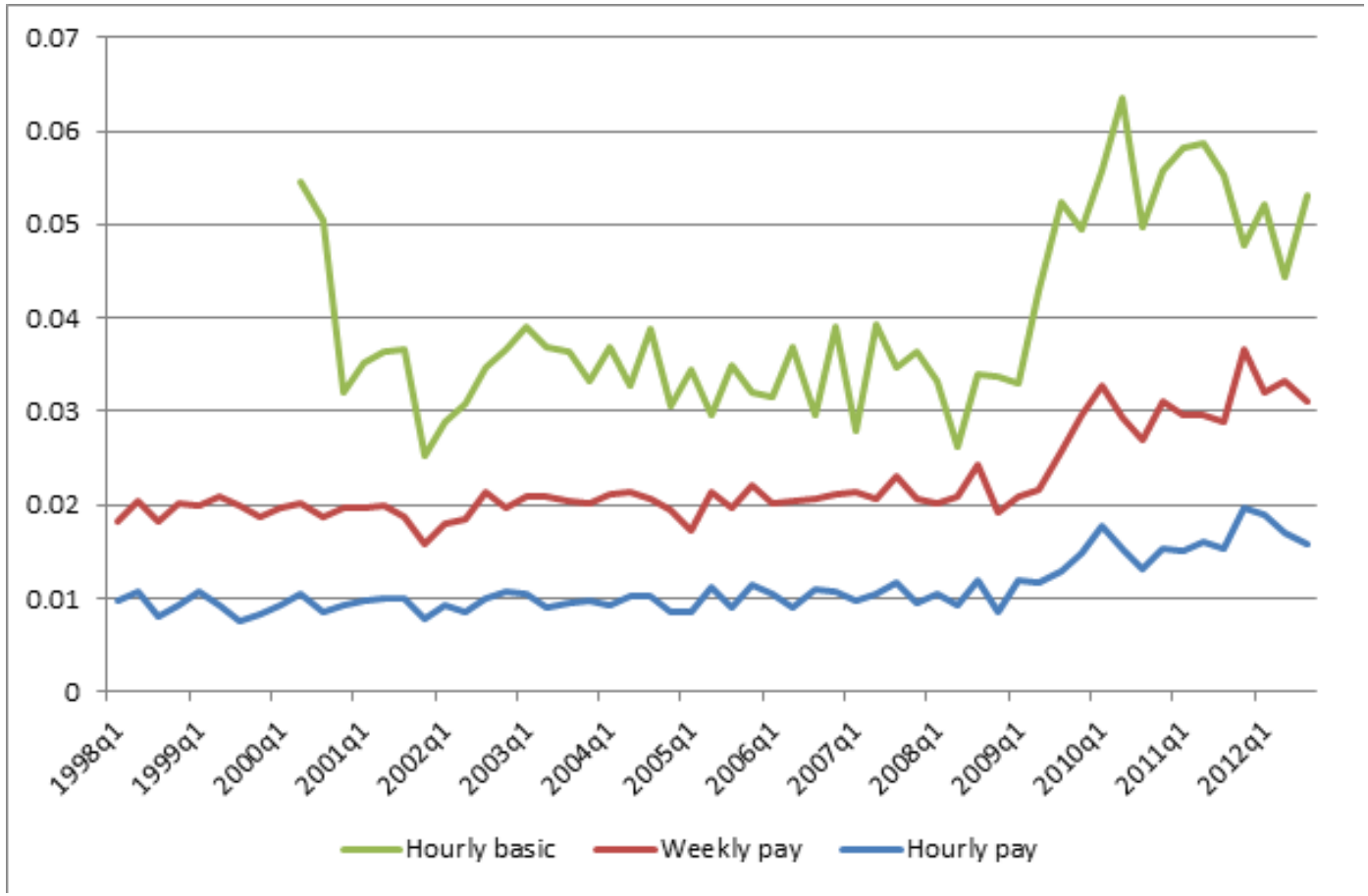


Source: LFS, Whole economy.

Measuring nominal rigidity for modern macro models

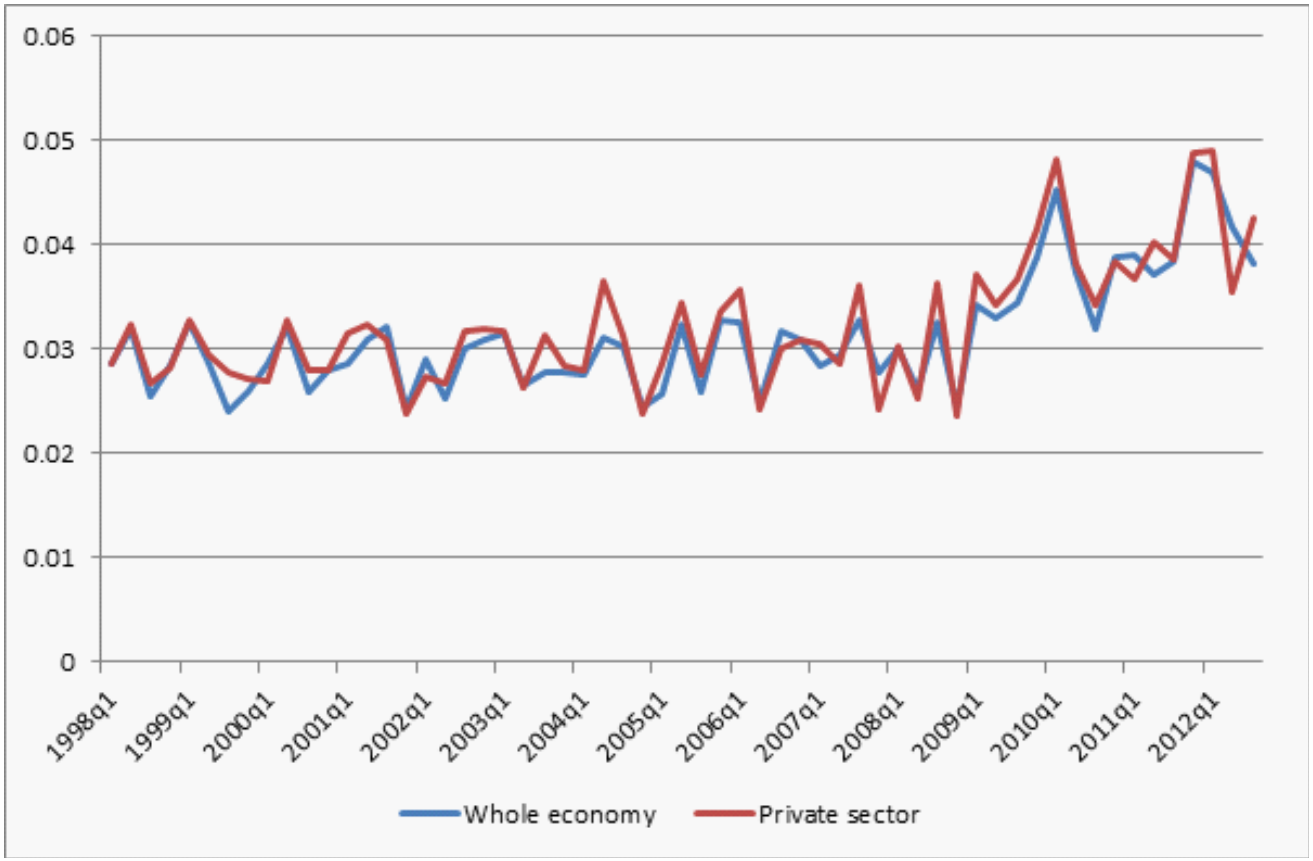
- If we assume heterogeneity – namely that freezes can affect only workers whose notional nominal wage falls – then we have a two-part distribution.
- The probability of a nominal wage change for those whose notional nominal wage rises is 1.
- The probability of a nominal wage change for others is

$$1 - n_{1t} = \frac{P\left(\Delta W_{it} < 0\right)}{P\left(\Delta W_{it} = 0\right) + P\left(\Delta W_{it} < 0\right)} = 1 - e^{-\lambda_{1t}}$$

- where the quarterly hazard is $\lambda_{1t} = -\ln\left(n_{1t}\right)/4$.

Measuring nominal rigidity for modern macro models

Quarterly nominal rigidity hazard rate for those whose notional nominal wage fell, as implied by the extent of nominal freezes vs cuts



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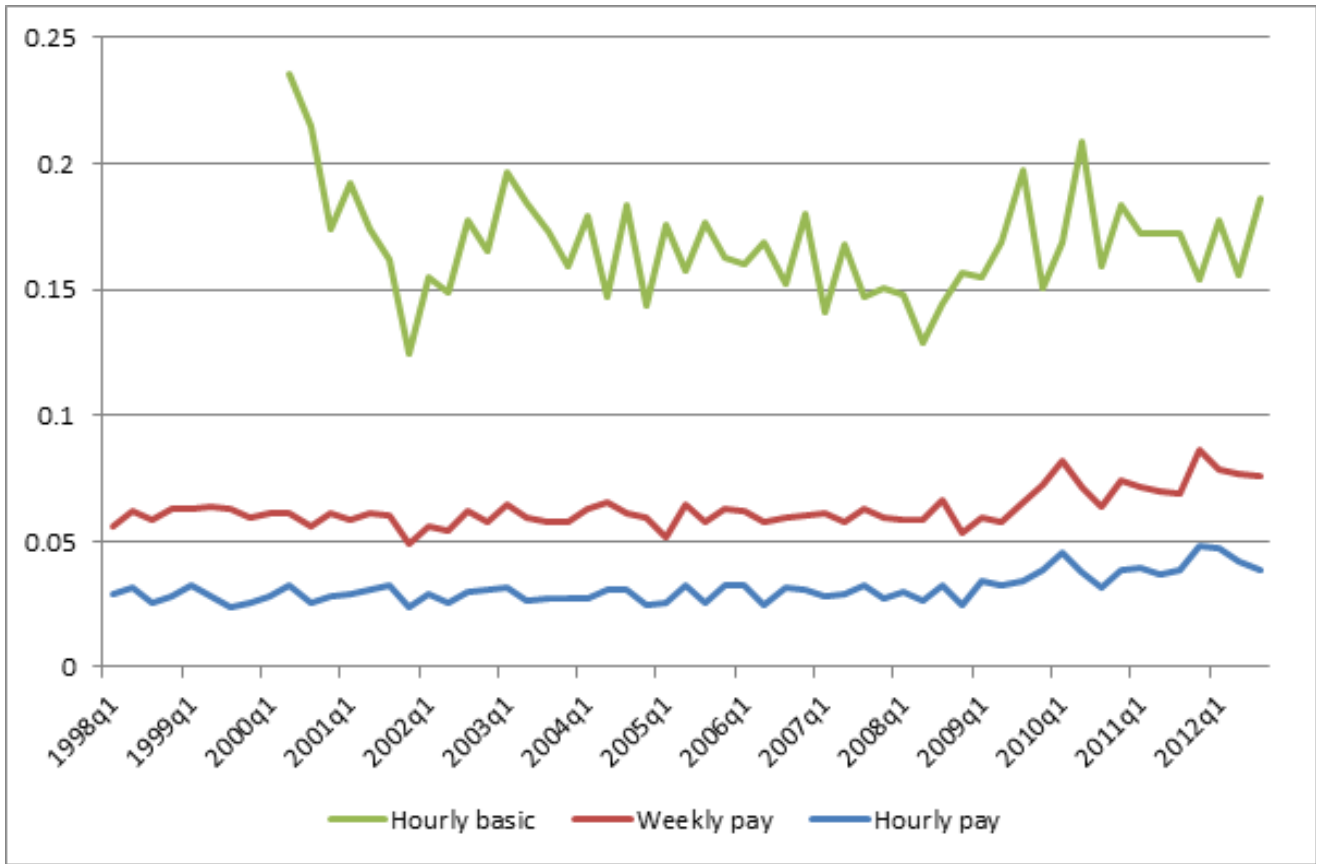


Source: LFS, Whole economy.

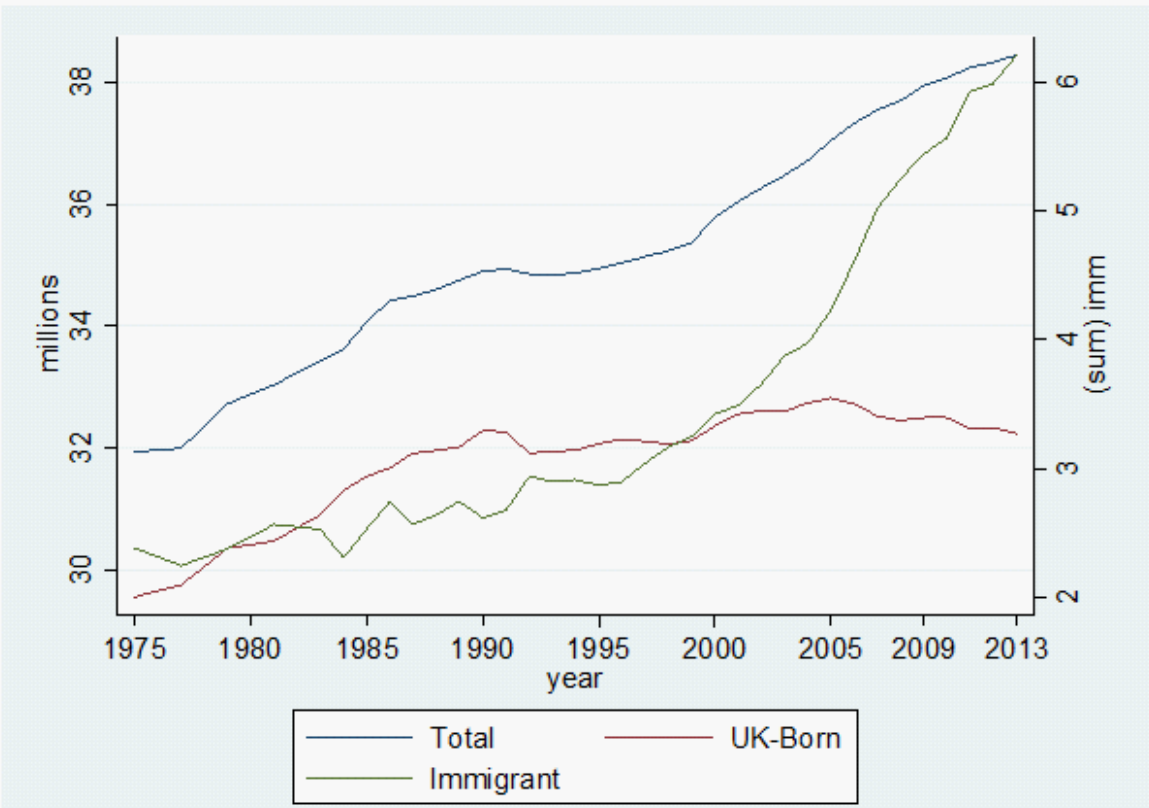
The influence of composition changes

The influence of composition changes

The UK economy has seen notable labour supply developments during, and before, the financial crisis.
A recurring question is the extent to which these have influenced UK labour market outcomes.

Immigration

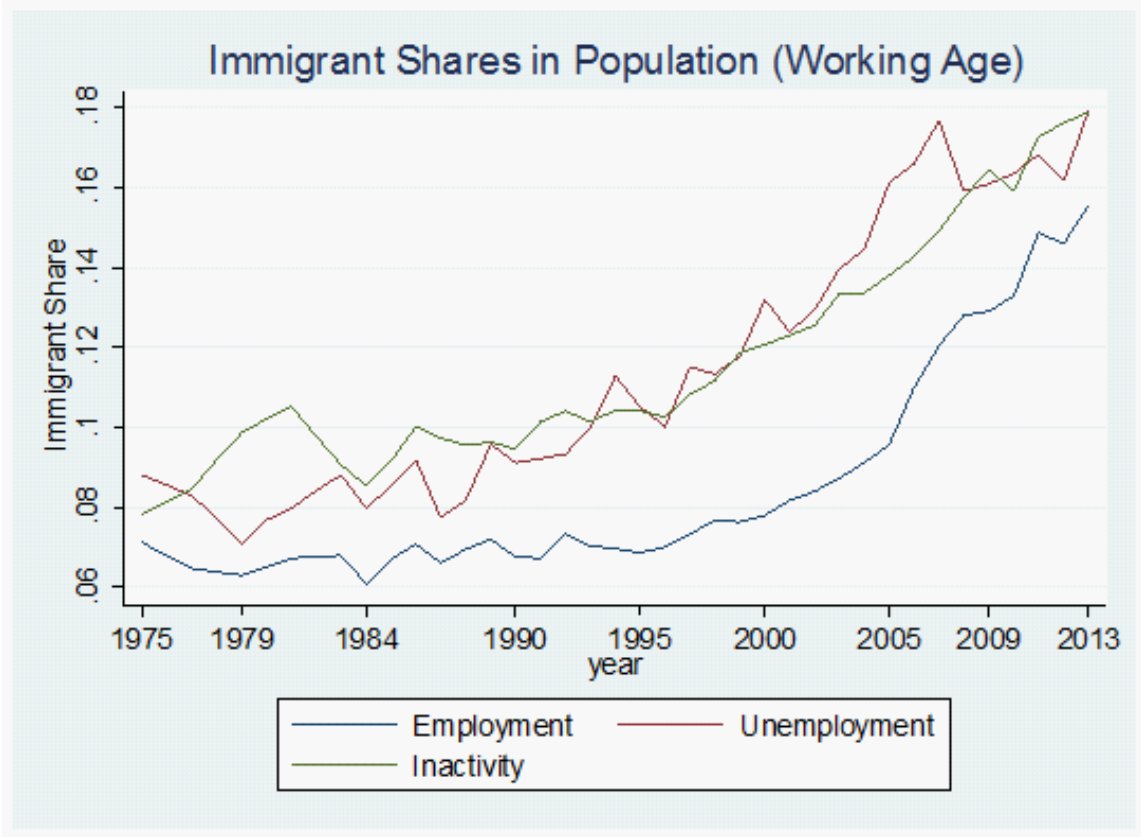
has been the main driver of the UK population increases since the mid-1990s. Current rate of increase about 0.5% (150,000) per year. Immigrant share of the working age population has risen from 8% to 15% over the last 15 years.



Source: LFS. Immigrant population: right hand scale. UK and Total populations: left hand scale.

Immigrants

have contributed more-than-proportionately to employment growth.



Source: LFS.

Participation

Since 2007, UK labour force participation rates have risen for all age groups apart from youth. Contrast to US (3pp fall) and Ireland (4pp fall). The rise is large for the super-prime age groups (50-75).

	Participation Rate in 1994	*Participation Rate in 2007*	*Latest Participation Rate (2014Q1)*	*Annual average increase (1994-2007)*	*Annual average increase since 2007*
16-24 yrs	72.30	66.77	65.75	-0.10	-0.14
25-29 yrs	83.45	84.41	93.05	0.02	0.03
30-34 yrs	82.58	84.37	93.64	0.04	0.06
35-39 yrs	84.08	84.38	93.60	0.01	0.06
40-44 yrs	86.02	86.15	92.80	-0.01	0.04
45-49 yrs	85.43	85.56	91.60	0.01	0.05
50-54 yrs	79.07	82.47	88.75	0.07	0.10
55-59 yrs	65.99	71.78	81.82	0.12	0.15
60-64 yrs	37.93	46.25	59.95	0.15	0.15
65-69yrs	10.87	16.23	25.76	0.11	0.17
70-74 yrs	4.49	6.79	12.43	0.05	0.11
75+ yrs	1.85	1.80	4.90	0.00	0.05

Source: LFS (Bank of England calculations)

Analysing the influence of composition changes

1. Non-parametrically adjust for observed changes in sample composition.
2. Compare two measures of the average wage change.

Use 1. to look at effect on rigidity, and 2. to look at the impact on wage growth.

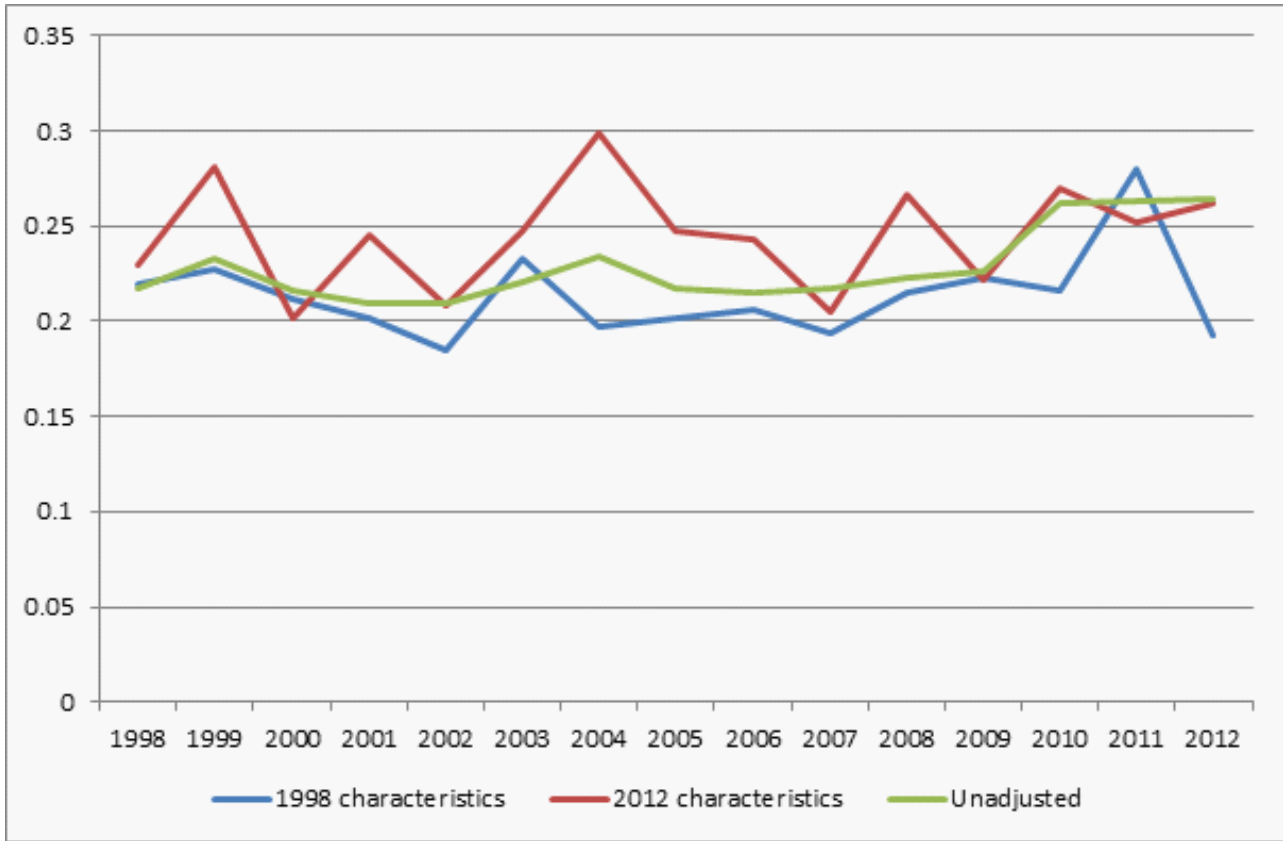
The influence of composition changes 1

DFL composition adjustment

- DiNardo, Fortin and Lemieux (1996) developed a reweighting method of adjusting for composition change.
- Reweight observed ΔW_{it} to match the counterfactual that would prevail if the distribution of worker characteristics did not change.
  - Does not impose parametric assumptions.
  - Allows nonlinear interactions between characteristics.
- We control for changes in composition by gender, unionisation, full-time versus part-time working, age (potential experience), job tenure, region, occupation and industry; migrant status, education (LFS only).
- Robustness check: investigate composition-adjusted wage growth using different 'base years' at the beginning and end of the sample.

The influence of composition changes 1

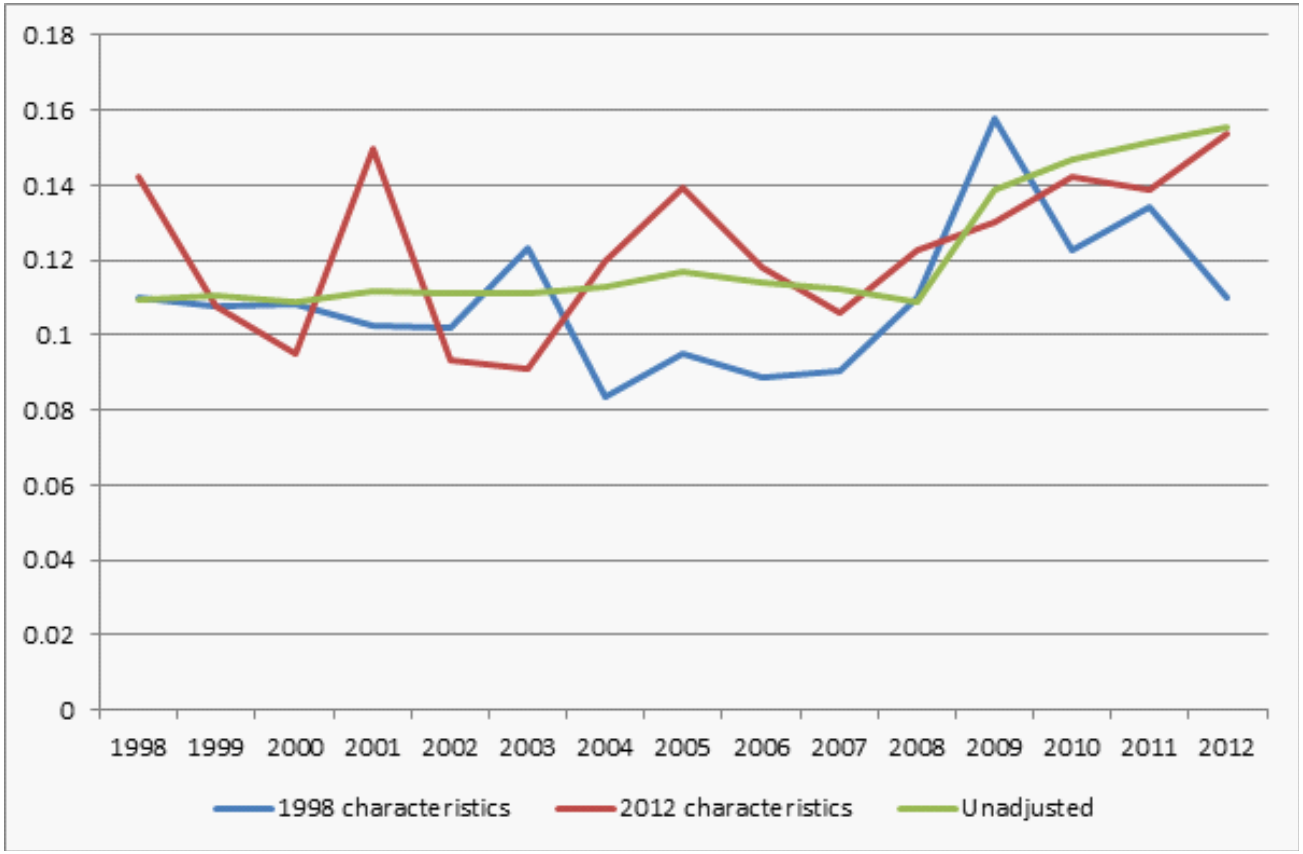
Effect of DFL composition adjustment on nominal rigidity in weekly pay



Weekly pay, private sector. Source: LFS.

The influence of composition changes 1

Effect of DFL composition adjustment on nominal rigidity in hourly pay



Hourly pay, private sector. Source: LFS.

The influence of composition changes 2

Change in means vs mean of changes

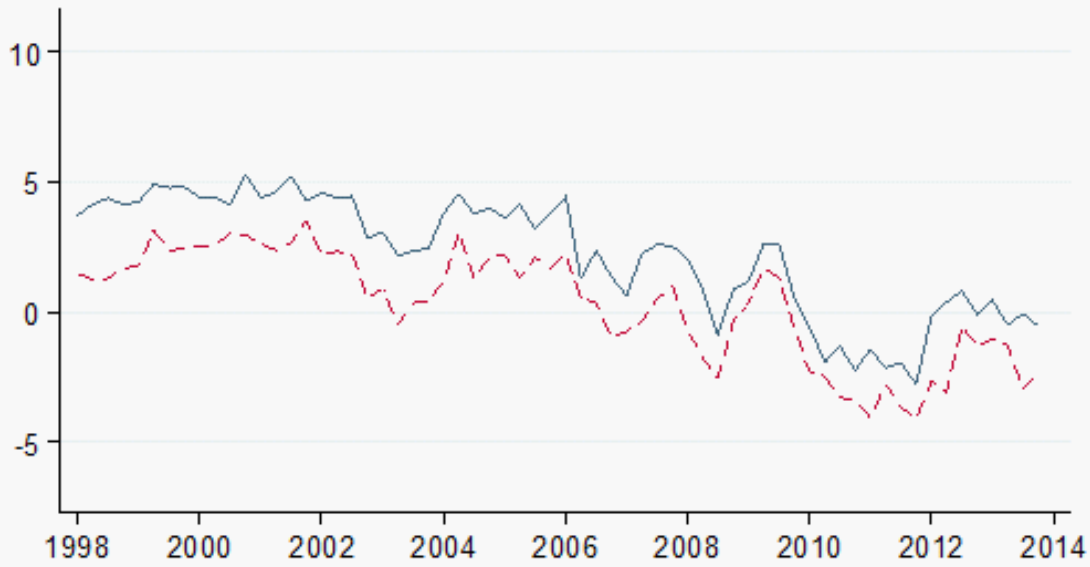
- Composition effects on annual wage growth will affect the change in cross-section mean wages ("change in mean wages") ...
- ... but are absent from the mean wage growth for a matched sample who are observed in two consecutive waves ("mean of wage changes").

- Note that we expect the mean of wage changes will lie above the change in mean wages
  - because the longitudinally-matched sample will experience life-cycle wage growth
  - whereas inflows of young and outflows of old workers refresh the age composition of the cross-sectional means, mitigating life-cycle impacts.

The influence of composition changes 2

Change in means vs mean of changes

- Some indication of cyclical composition effects can be seen in the UK: the recession seems to have raised the quality of successive cross-section samples, bringing the change in means closer to the mean of changes (Solon, Barsky and Parker, 1994).



Conclusions

- The fall in real wages in the UK has occurred despite increased nominal rigidity.
- By comparing nominal wage and inflation expectation distributions, we confirm a decline in real wage rigidity.
  - Some evidence that the decline in real rigidity started before the financial crisis.
- In proximate terms, real wages have fallen because an unusually large fraction of nominal wages have been set in the small interval below the inflation rate and above nominal zero.
- During, and to some extent after, the recession, aggregate wage growth would have been even lower, and nominal rigidity possibly higher, without the composition changes that have affected the UK labour force. However, over the longer run, composition changes have had a fairly limited impact.