

The Economic Impact of Brexit



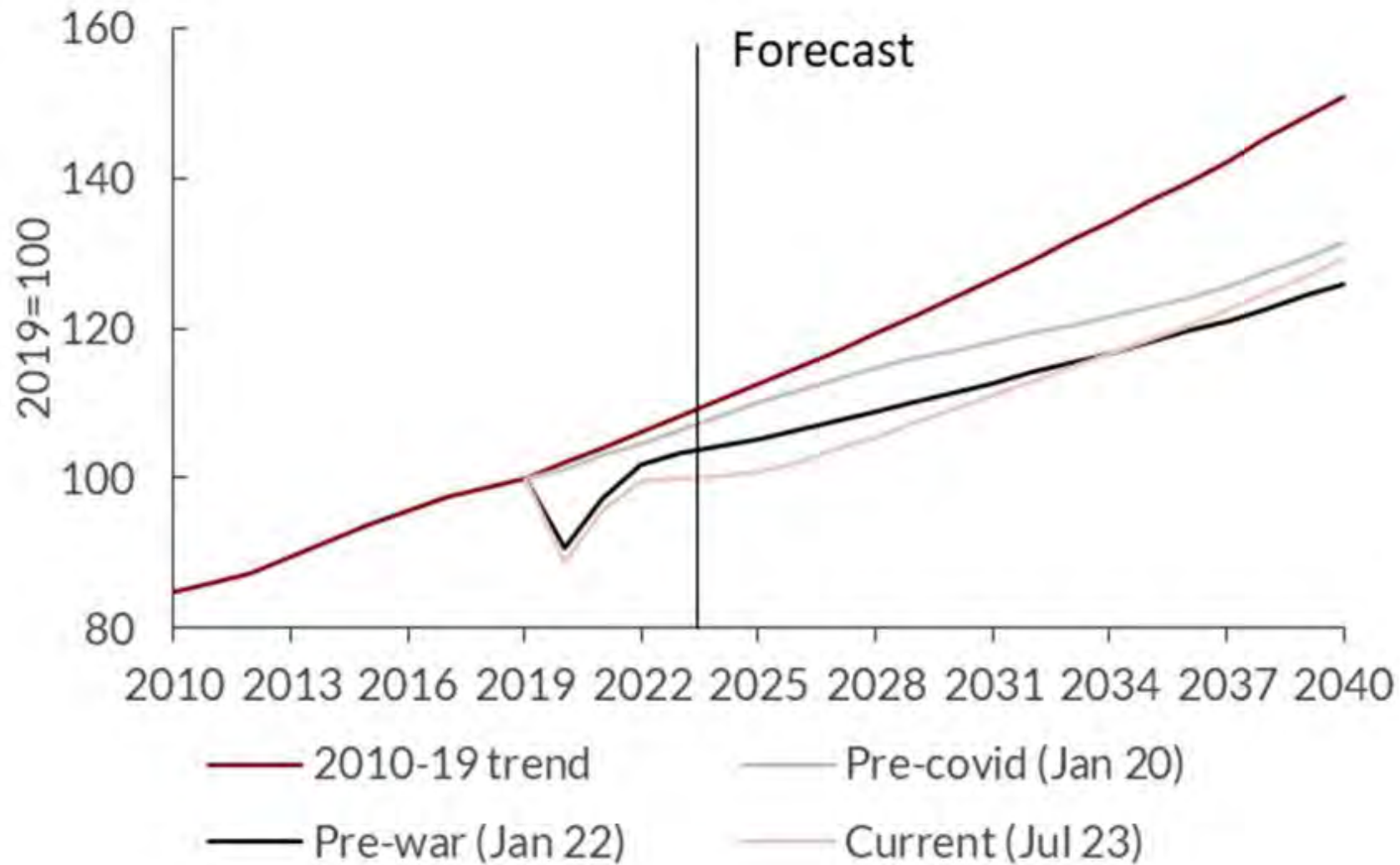
Morning Programme

- 09:30 Welcome and Introductions
- 09:45 Keynote: The Brexit vote, productivity, growth and macroeconomic adjustments in the UK
- 10:30 Immigration and the UK economy after Brexit
- 11:30 Break
- 11:45 Not to belittle NTBs: non-tariff barriers and trade during Brexit
- 12:30 Measuring the regional economic costs of Brexit
- 13:15 Lunch

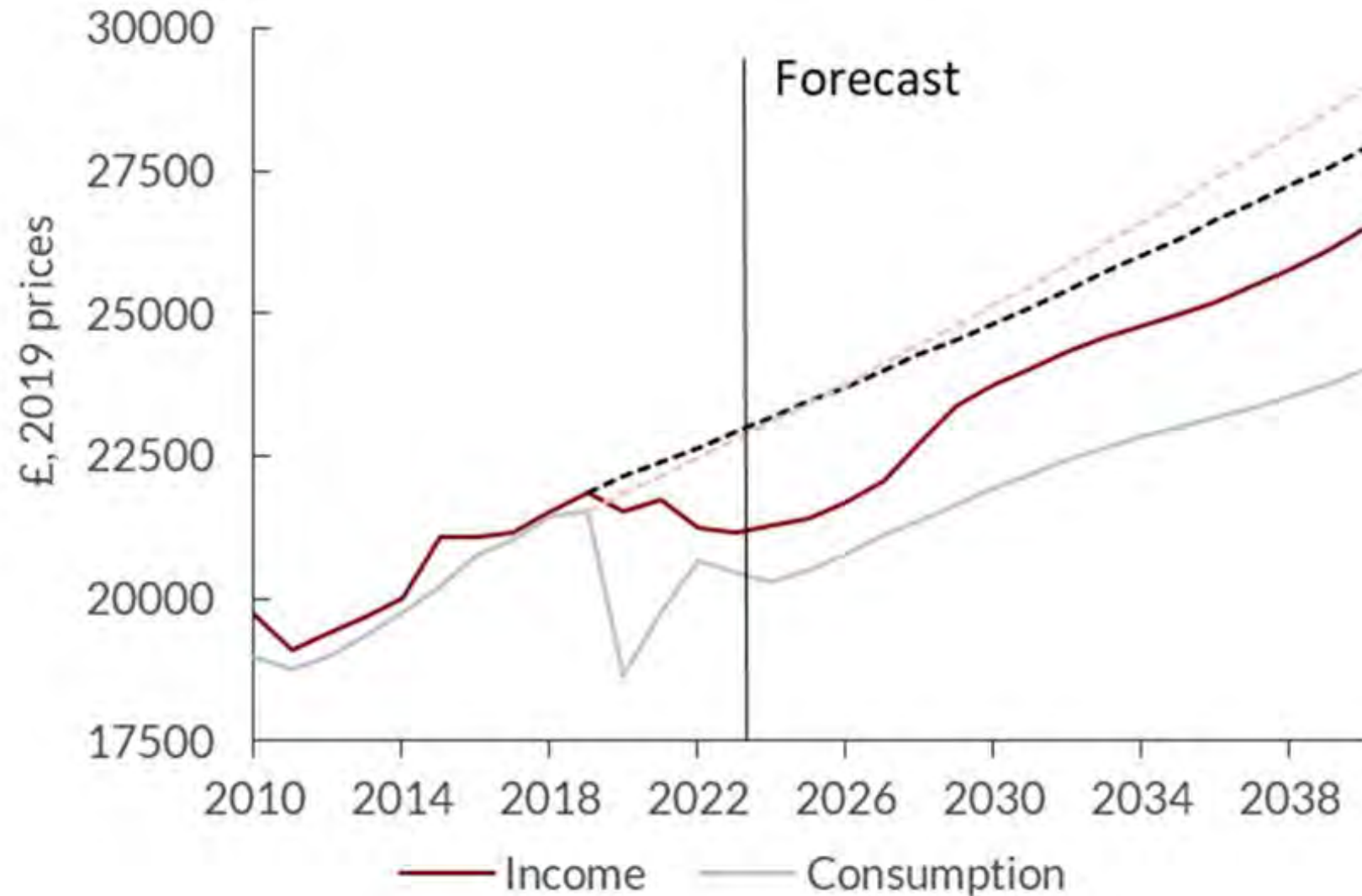
Welcome and Introductions

Stephen Millard (NIESR)

GDP Projections



Income and Consumption

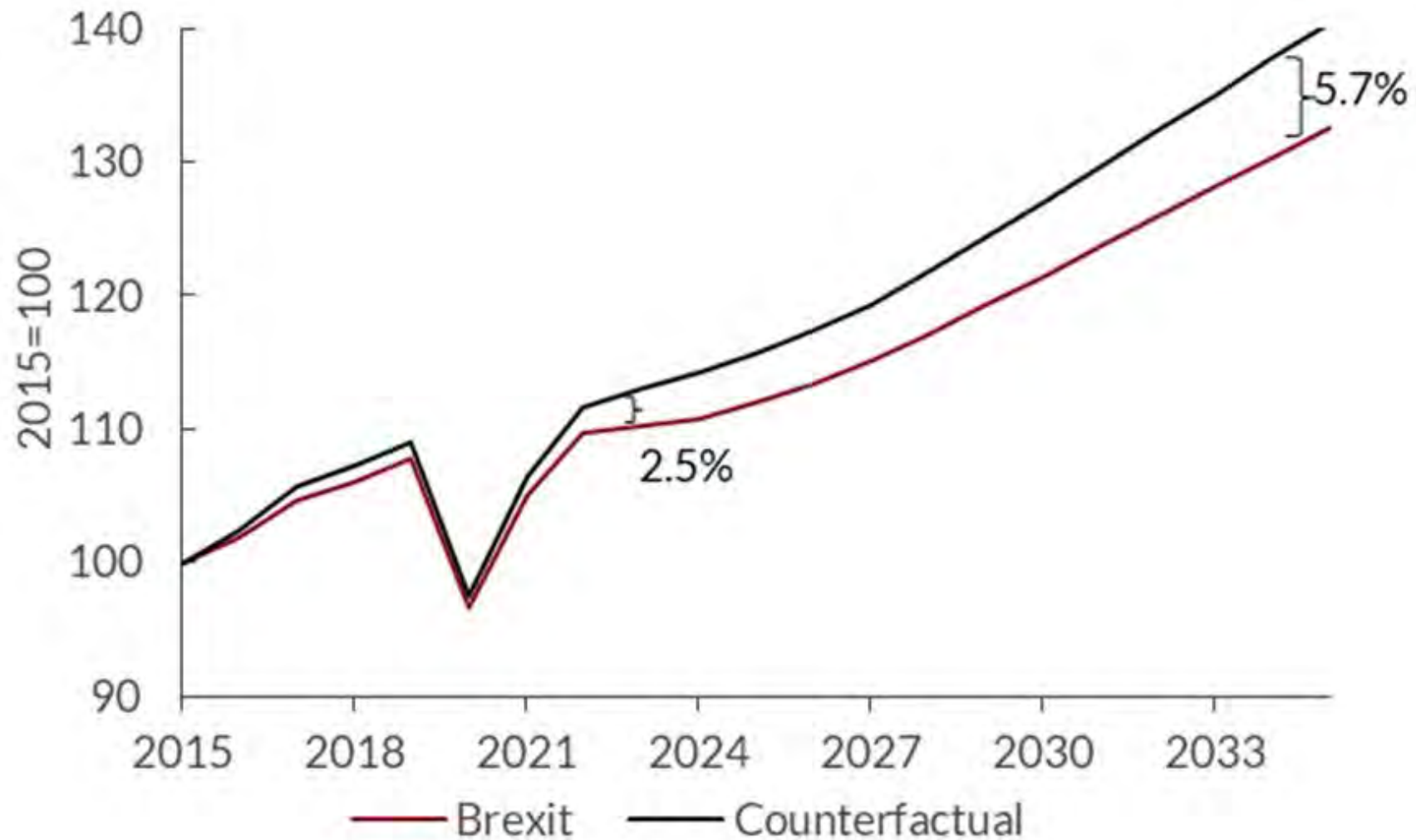


Channels

Table TF3 Brexit macroeconomics channels

Channel	Assumption	Rationale
Reduction in trade	25 per cent reduction in trade with EU over 15 years	Bilateral trade data with the EU
Decline in productivity	Technical progress shock of around -1.4 per cent in the first two years falling to around -4 per cent after 15 years.	OBR (2020)
Reduction in the willingness to invest	110 basis points permanent increase in the investment risk premium	Hantzsche (2019)
EU budget contributions	Not modelled due to small impact	Hantzsche (2019)
Migration	Not modelled due to no significant change	Migration data

Real GDP impact of Brexit



Impact of Brexit

Table TF4 Brexit impact on macroeconomic variables (per cent difference from base)

	2016	2020	2021	2022	2023	2024	2025	2030	2035
GDP	-0.4	-0.9	-1.2	-1.8	-2.5	-3.0	-3.2	-4.4	-5.7
Labour productivity	0.0	-0.7	-1.3	-1.9	-2.4	-2.7	-2.9	-4.2	-5.5
Business investments	-2.4	-2.8	-4.9	-9.3	-12.4	-12.5	-10.3	-7.5	-7.6
Income	-1.4	-2.4	-2.1	-2.7	-3.5	-3.8	-3.8	-4.4	-5.2
Consumption	-1.6	-4.8	-4.9	-5.3	-5.8	-6.2	-6.4	-7.3	-8.2

The Brexit vote, productivity growth and macroeconomic adjustments in the UK

Presenter: Silvana Tenreyro (LSE)

Discussant: Rob Elliot (University of Birmingham)

THE BREXIT VOTE, PRODUCTIVITY GROWTH AND MACROECONOMIC ADJUSTMENTS IN THE UNITED KINGDOM

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Richard Harrison¹ Silvana Tenreyro^{3,4}

¹Bank of England ²University of Maryland ³LSE ⁴CEPR

NIESR
November 2023

The views expressed here are those of the authors, and not necessarily those of the Bank of England

MAIN IDEA OF THIS PAPER

- ▶ Examine the macroeconomic adjustments of the UK to the referendum outcome
- ▶ Provide an economic interpretation of these adjustments:

News about decline in future productivity growth in the tradable sector

CONTRIBUTION OF THIS PAPER

1. Stylized facts about UK macroeconomic adjustments to 2016 Brexit vote

- ▶ Using newly constructed data set, document that $y_T \uparrow$ $y_N \downarrow$ $p_N \downarrow$ $Y \searrow$

CONTRIBUTION OF THIS PAPER

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2. Posit that patterns are consistent with changed expectations about g_T vs. g_N
 - ▶ Provide supporting cross-country evidence: EU membership \leftrightarrow sectoral productivity

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 - ▶ Estimate the model using the newly constructed data

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 - ▶ Provide supporting cross-country evidence: EU membership \leftrightarrow sectoral productivity
3. Introduce small open economy model with tradable and non-tradable sectors
 - ▶ Estimate the model using the newly constructed data
4. Conduct Brexit news simulation in estimated model
 - ▶ Generates empirical patterns & additional facts: $c_T \downarrow$ $c_N \downarrow$ $n_T \uparrow$ $n_N \downarrow$ $I \downarrow$

RELATED LITERATURE

▶ **Effects of Brexit:**

- ▶ *Synthetic control approach.* Born et al. (2018)
- ▶ *Long-run trade.* Dhingra et al. (2017), Sampson (2017), McGrattan Waddle (2017)
- ▶ *Uncertainty.* Steinberg (2017), Bloom et al. (2018), Faccini and Palombo (2019)
- ▶ *News and asset prices.* Broadbent (2017a, 2017b) and Davis and Studnicka (2018)

▶ **Calibration of models with T&N sectors:**

- ▶ De Gregorio et al. (1994), Betts and Kehoe (2006), Lombardo and Ravenna (2012)

▶ **Small open economy models with shocks to growth rate:**

- ▶ Aguiar and Gopinath (2017), Drechsel and Tenreyro (2018)

▶ **News shocks:**

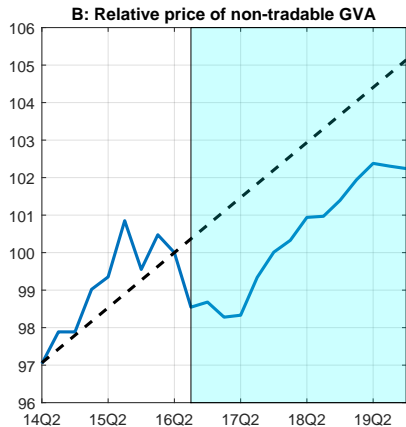
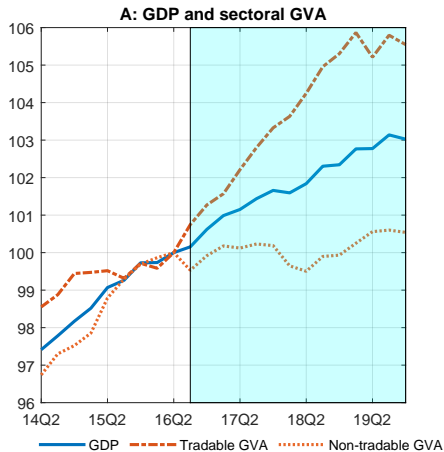
- ▶ Beaudry and Portier (2006), Jaimovich and Rebelo (2009), several others

STYLIZED FACTS: THE UK ECONOMY AFTER 2016

NEW UK MACRO DATA SET

- ▶ Construct time-series data for T and N Gross Value Added and labor productivity
 - ▶ Classify 2-digit SIC sectors into T and N using supply and use tables for 1997-2016
 - ▶ Use 10% cutoff for final demand (Lombardo and Ravenna, 2012) ▶ sut2016
 - ▶ Aggregate (chain-link) industry data to macro level using the ONS methodology
- ▶ This is a novel data set for the UK → [available online for other researchers!](#)
 - ▶ First paper to estimate macro model with T and N time series data

THE UK'S ECONOMIC ADJUSTMENT TO THE BREXIT VOTE



INTERPRETING THE EMPIRICAL FACTS

- ▶ Upon revelation of Brexit news, $y_T \uparrow$ $y_N \downarrow$ $p_N \downarrow$ $Y \searrow$
- ▶ How to interpret these patterns?
 - ▶ Brexit vote is revelation of future slowdown in tradable sector productivity growth Broadbent (2017)
 - ▶ Relative prices inversely related to relative productivity across sectors
 - ▶ With forward-looking agents, today's prices reflect future path of relative productivity
 - ▶ Change in relative price provides temporary "sweet spot" for tradable sector today
- ▶ Next steps:
 - ▶ Provide supporting cross-country evidence
 - ▶ Formalize and assess this idea in macroeconomic model

CROSS-COUNTRY EVIDENCE: EU MEMBERSHIP AND SECTORAL
PRODUCTIVITY GROWTH

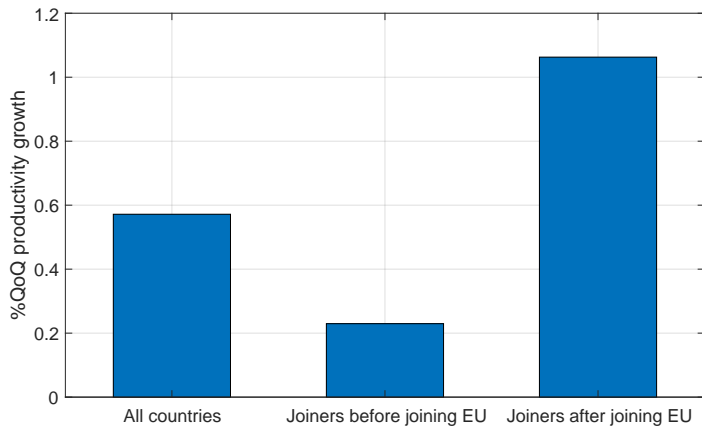
EU MEMBERSHIP AND SECTORAL PRODUCTIVITY GROWTH

- ▶ Panel dataset combining OECD and Eurostat data for sectoral GVA and hours
- ▶ Data spans across 31 countries, 10 sectors, 1995:Q1-2016:Q2
- ▶ Existing EU members, accession countries and other OECD countries
- ▶ Estimate the following regression across countries (c), sectors (s) and quarters (t):

$$\Delta z_{c,s,t} = \alpha \mathbb{1}_s^{TRD} \times \mathbb{1}_{c,[t,t+h]}^{EU} + \beta \mathbb{1}_s^{TRD} + \gamma \mathbb{1}_{c,[t,t+h]}^{EU} + \delta_{c,s} + \delta_{c,t} + \varepsilon_{c,s,t},$$

where α is the coefficient of interest

A LOOK AT THE RAW DATA: T vs. N PRODUCTIVITY GROWTH



FORMAL ANALYSIS

LHS variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	growth in real output per hour ($\Delta z_{c,s,t}$)						
tradable x joined EU	0.443*** [0.117]	0.442*** [0.117]	0.444*** [0.117]	0.441*** [0.118]	0.484*** [0.134]	0.438*** [0.117]	0.482*** [0.134]
tradable	0.184*** [0.034]	0.184*** [0.034]		0.185*** [0.034]			
joined EU	0.396** [0.168]	0.137 [0.118]	0.395** [0.168]	0.453** [0.194]	0.139 [0.126]		
Observations	25,006	25,006	25,006	25,006	25,006	25,006	25,006
Country FE	-	✓	-	-	-	-	-
Sector FE	-	-	✓	-	-	✓	-
Time FE	-	-	-	✓	✓	-	-
Country*sector FE	-	-	-	-	✓	-	✓
Country*time FE	-	-	-	-	-	✓	✓
R-squared	0.002	0.010	0.005	0.044	0.060	0.238	0.242

- ▶ EU membership is associated with higher productivity growth in T vs. N
- ▶ We posit that leaving the EU should reverse the productivity effects of entering it

THE MODEL

MAIN FEATURES

- ▶ Small Open Economy RBC model with two sectors: T and N
- ▶ Each sector $M = \{T, N\}$ grows at its own rate g_M
- ▶ Labour is sector-specific, capital is composite of T and N
- ▶ Treat tradable price as numeraire $\Rightarrow P_{N,t} = P_t \approx$ 'internal' real exchange rate
- ▶ Assets: bond denominated in T units, bond denominated in N units
 - ▶ Return on T bond exogenously given
- ▶ Representative household who consumes both goods according to CES, supplies labor to both sectors, invests

KEY EQUATIONS

- ▶ The detrended bond Euler equations

$$\lambda_t = \beta (1 + r_t^*) g_{Tt}^{-\gamma} \mathbb{E}_t \lambda_{t+1}$$

$$\lambda_t p_t = \beta (1 + r_t) \frac{g_{Tt}^{1-\gamma}}{g_{Nt}} \mathbb{E}_t p_{t+1} \lambda_{t+1}.$$

- ▶ The relative price can be written as

$$p_t = \frac{c_{T,t}}{c_{N,t}} \frac{1 - \frac{c_{T,t}}{C_t}}{\frac{c_{T,t}}{C_t}}$$

- ▶ p_t is related to MRS between sectors and forward-looking Euler equations
- ▶ Shocks to $g_{T,t+j}$ will affect p_t today

MAIN ECONOMIC FORCES

- ▶ Suppose agents learn that *productivity growth in T sector weaker in the future*
- ▶ Relative prices inversely related to relative productivities + forward-looking agents
 - ▶ Relative price of N ↓ *upon announcement*
 - ▶ Immediate real exchange devaluation
- ▶ But productivities today are unchanged
 - ▶ T sector experiences a temporary activity increase (“sweet spot”)
 - ▶ Resources move to T sector, N sector contracts
- ▶ Patterns reverse *after realization* of the news

DATA AND ESTIMATION

DATA AND ESTIMATION

TABLE: Industries shares in non-tradable and tradable sector (%)

	Non-tradable	Tradable
Agriculture	0.05	1.41
Mining and Quarrying	0.00	2.60
Manufacturing	1.31	21.56
Electricity, Gas, Steam Air Conditioning	2.49	0.00
Water Supply, Sewage, Waste Mgmt	1.53	0.93
Construction	11.34	0.00
Services	83.26	73.50

DATA AND ESTIMATION

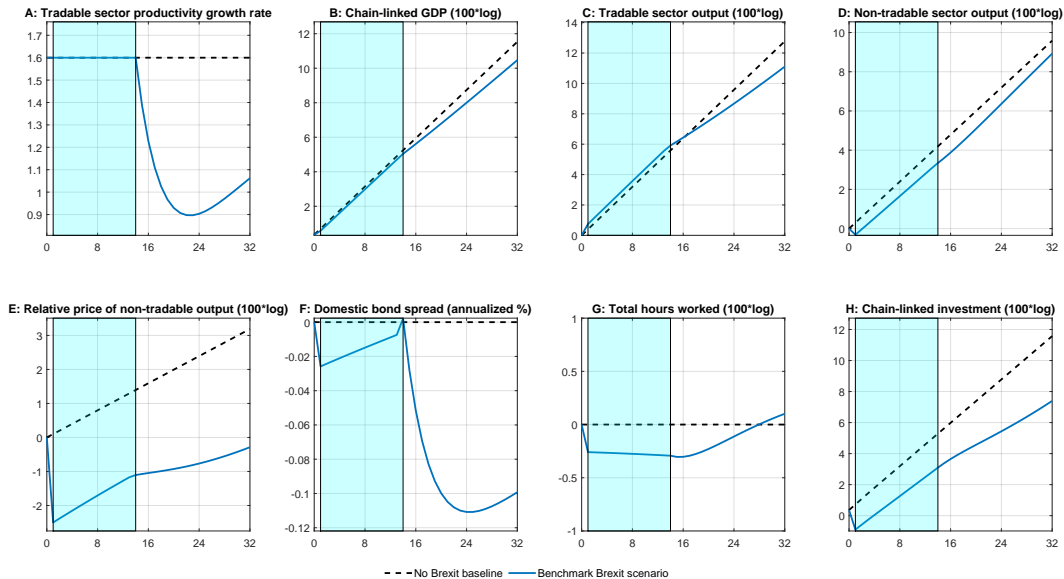
- ▶ The model is estimated with Bayesian techniques
- ▶ Use aggregate UK time-series data from 1987Q3 - 2016Q2 (period during which the UK was an active member of the EU)
- ▶ This estimation procedure gives us:
 - ▶ Values for the structural parameters
 - ▶ A balanced growth path from which we can start simulations

BREXIT SIMULATIONS

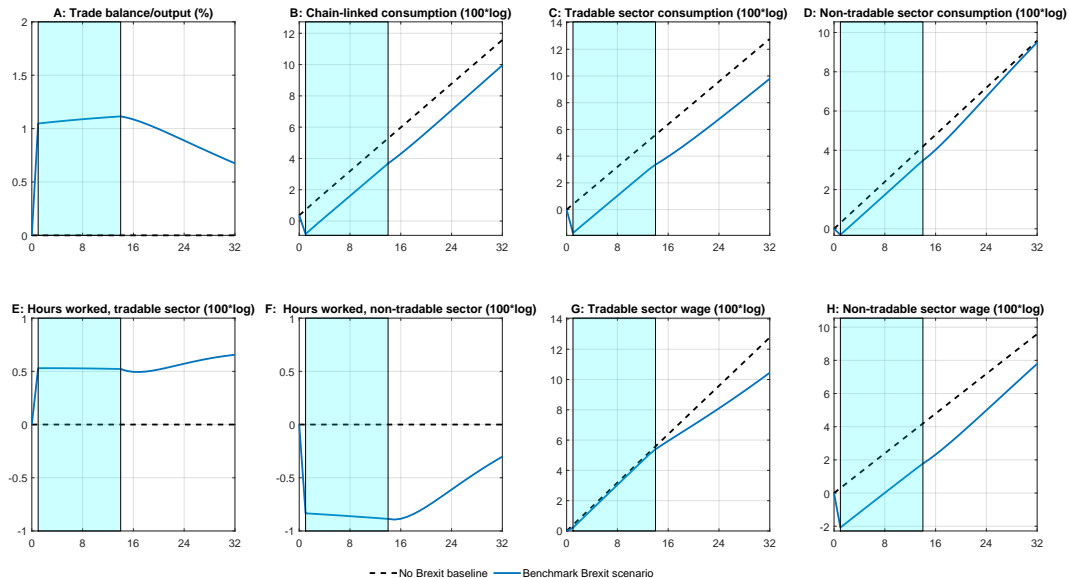
THE BREXIT EXPERIMENT

- ▶ Economy starts on balanced growth path in period 0
- ▶ In period 1, news of persistent reduction in T sector TFP growth from period 14
 - ▶ Mimics period between EU referendum and (unmet) Brexit deadline of March 2019
- ▶ No uncertainty over future path of productivity growth
- ▶ We calibrate our experiment to match exactly the fall in P_t
- ▶ Economy converges in the long-run to the same balanced growth path

MAIN MODEL RESPONSES



ADDITIONAL RESPONSES



EMPIRICAL VALIDATION WITH FURTHER VARIABLES

Sectoral variables	6 quarter horizon			12 quarter horizon		
	Simulation	Data	Ratio	Simulation	Data	Ratio
Tradable output	0.4	1.0	0.4	0.4	0.5	0.7
Non-tradable output	-0.7	-1.3	0.6	-0.8	-2.3	0.3
Tradable sector hours	0.5	1.1	0.5	0.5	5.4	0.1
Non-tradable sector hours	-0.9	-0.4	2.0	-0.9	-0.6	1.6
Tradable consumption	-2.2	-0.5	4.1	-2.2	-2.2	1.0
Non-tradable consumption	-0.6	-1.8	0.4	-0.7	-1.1	0.6

Aggregate variables	6 quarter horizon			12 quarter horizon		
	Simulation	Data	Ratio	Simulation	Data	Ratio
GDP	-0.2	-0.1	1.9	-0.2	-0.7	0.3
Total consumption	-1.4	-1.2	1.2	-1.4	-1.7	0.8
Total investment	-1.7	-0.5	3.1	-1.9	-4.2	0.5
Tradable net export ratio	1.1	0.5	2.2	1.1	-0.1	-18.1
Average real wage	-1.2	-2.5	0.5	-1.2	-2.8	0.4

- ▶ Model matches various outcomes, including hours, consumption, investment, ...
- ▶ Despite the simplicity of the model, even magnitudes are in reasonable range

CONCLUSION

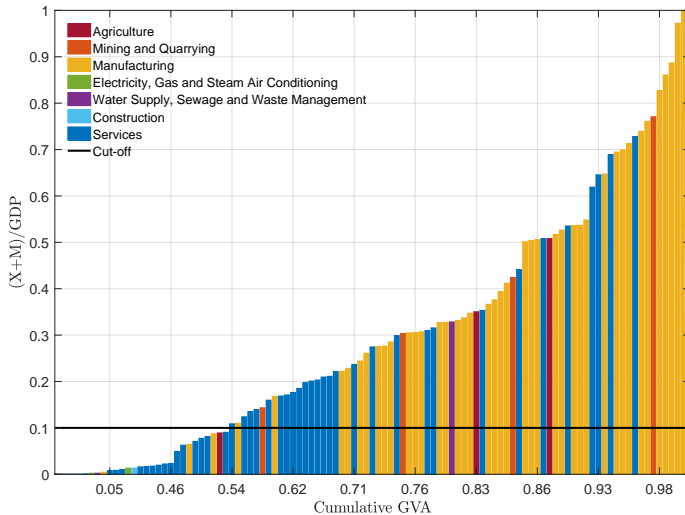
CONCLUSION

- ▶ Document the UK's macroeconomic adjustments to the 2016 referendum
- ▶ Interpret referendum as negative news about the tradable sector
- ▶ Observed responses are consistent with this theoretical rationalization
- ▶ Central to the mechanism:
 - ▶ Immediate permanent drop in relative price of nontradables
 - ▶ “Sweet spot” for tradable producers
 - ▶ Expansion in activity in the tradable sector
 - ▶ Reversal upon the realisation of the shock

APPENDIX SLIDES

INDUSTRY CLASSIFICATION (SUT 2016)

▶ GOBACK



The Brexit vote, productivity growth and macroeconomic adjustments in the United Kingdom: Discussion

Robert J R Elliott¹

¹University of Birmingham

17th November
NIESR Brexit workshop, Birkbeck University

Key results

- Brexit can be considered to be a single news shock (unexpected)
- Brexit impacted the tradable and non-tradable sectors differently
- The paradox of a short term “sweet spot” for exporters (as there is a downward adjustment in the relative price of non-tradable exports)
- The authors predict this will be temporary and eventually reverse

Key results

- Aston University has shown that UK exports to the EU fell by an average of 22.9% in the first 15 months after the introduction of the EU-UK Trade and Cooperation Agreement
- The variety of UK products exported to EU down by 42%
- Unlike exports, an initially significant drop on EU imports to Britain has recovered during the same period, suggesting that UK businesses and consumers have quickly adjusted to new rules - stands in contrast to the persistent decline in UK exports
- Perhaps Brexit can be considered to be a series of news shocks or similar to a period of higher uncertainty across a range of different dimensions?

Measuring Brexit Uncertainty: A Machine Learning and Textual Analysis Approach

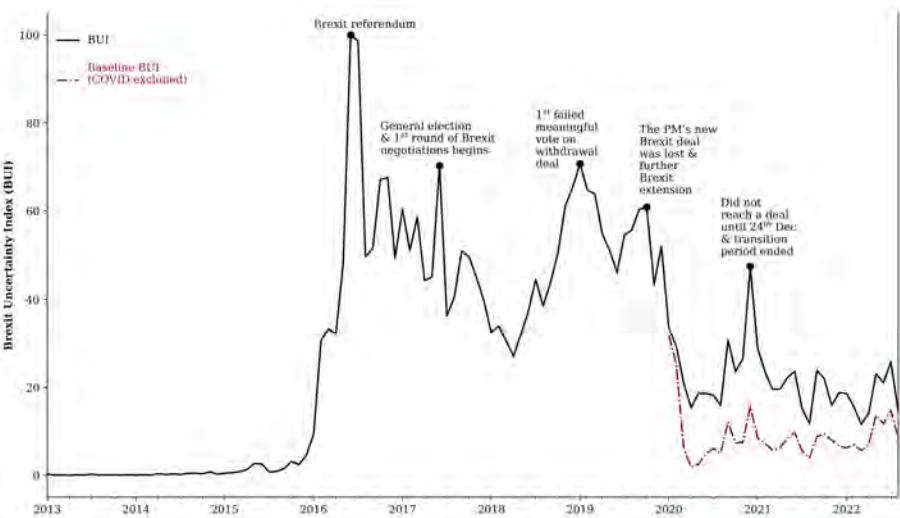
Wanyu Chung¹ Duiyi Dai² Robert J R Elliott² Christoph Görtz²

¹University of Birmingham; CEPR

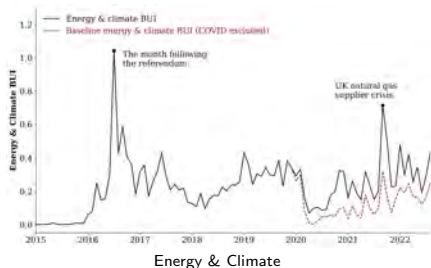
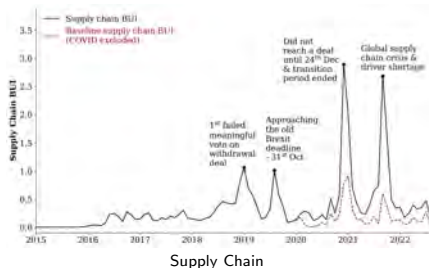
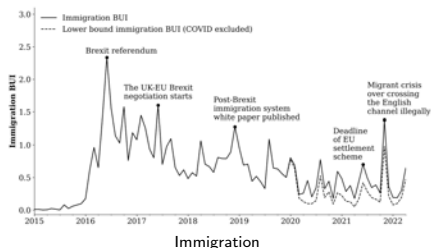
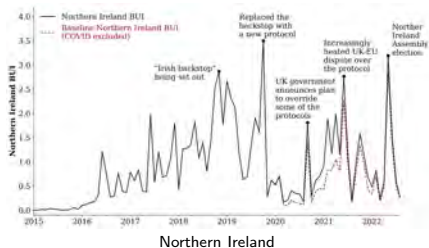
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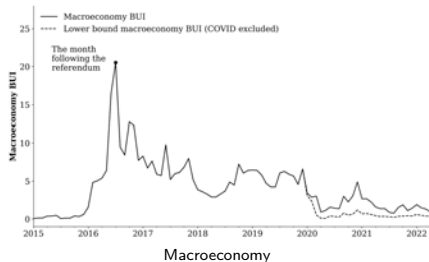
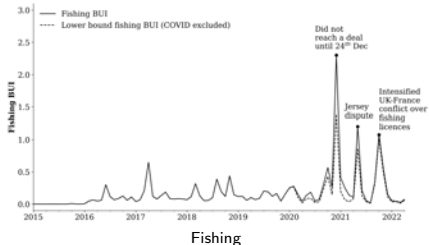
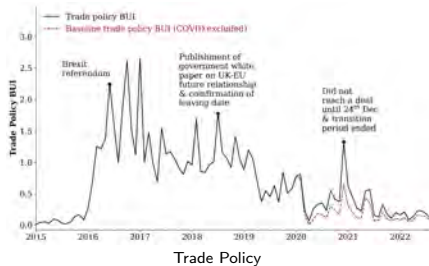
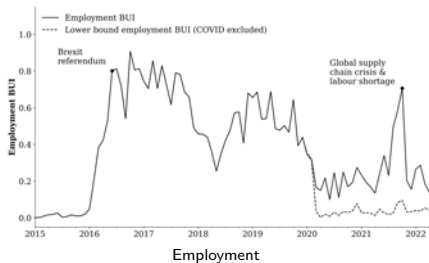
Aggregate Brexit Uncertainty Index



Topic Specific BUIs



Topic Specific BUIs



- We estimate a proxy SVAR model which identifies Brexit uncertainty shocks using an external instrument based on our baseline BUI
- Figures shows the impulse response functions (IRF) to a Brexit uncertainty shock that increases different macro variables by one standard deviation

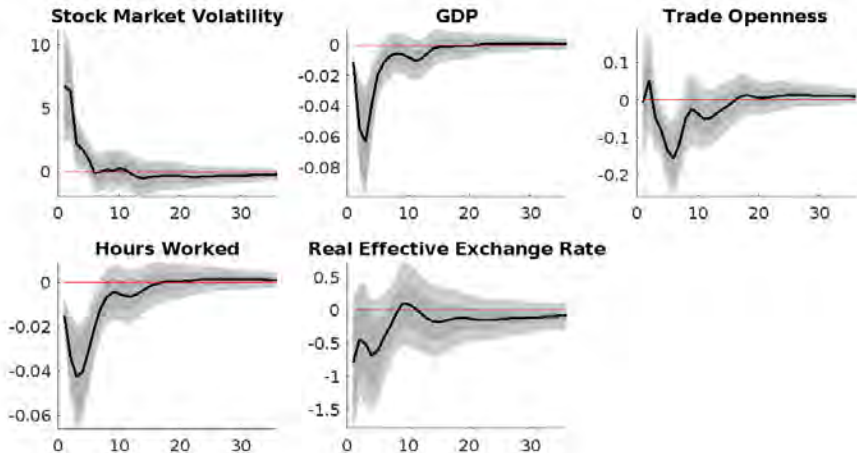
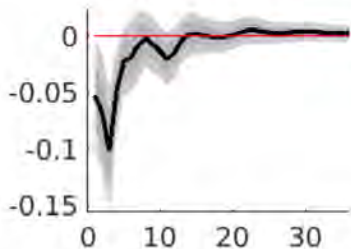
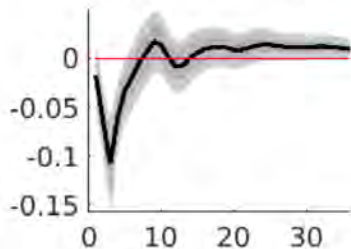


Figure: Impulse response to a Brexit uncertainty shock that increases stock market volatility by one standard deviation over a period of 36 months. Shaded areas exhibit 68% (dark) and 90% (light) confidence intervals. For GDP and hours worked the y-axis units are percentage changes, for all other variables they correspond to the respective units.

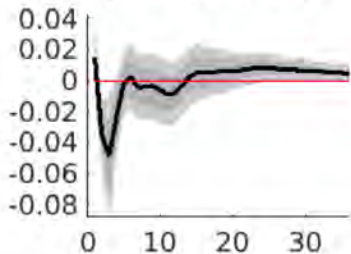
Exports to EU



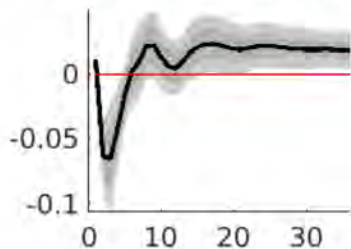
Imports from EU



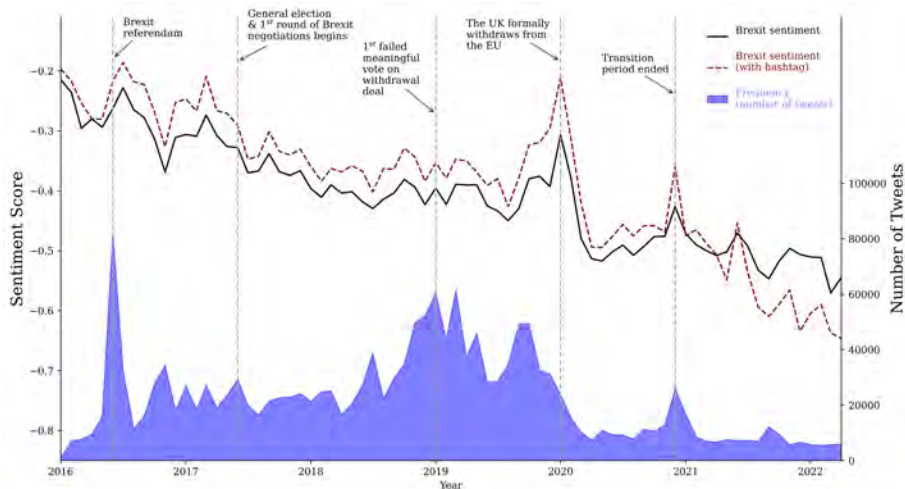
Exports to Non-EU



Imports from Non-EU



Application of BUIs: Sentiment Score



Immigration and the UK economy after Brexit

Presenter: Jonathan Portes (King's College, London)

Discussant: Ines Homburg (University of Antwerp)



The **UK** in a **Changing Europe**

**Immigration and the UK economy after Brexit
November 2023**

**Jonathan Portes
King's College London & UKandEU**

@jdportes

UKandEU.ac.uk



Developments since 2016...

EU migration has fallen sharply beginning in 2016 and accelerating during the pandemic

- Non-EU migration for work and study has increased, particularly since the pandemic and the introduction of the post-Brexit migration system

- Increase in refugee/asylum flows since the pandemic: Hong Kong, Ukraine, and irregular arrivals on small boats

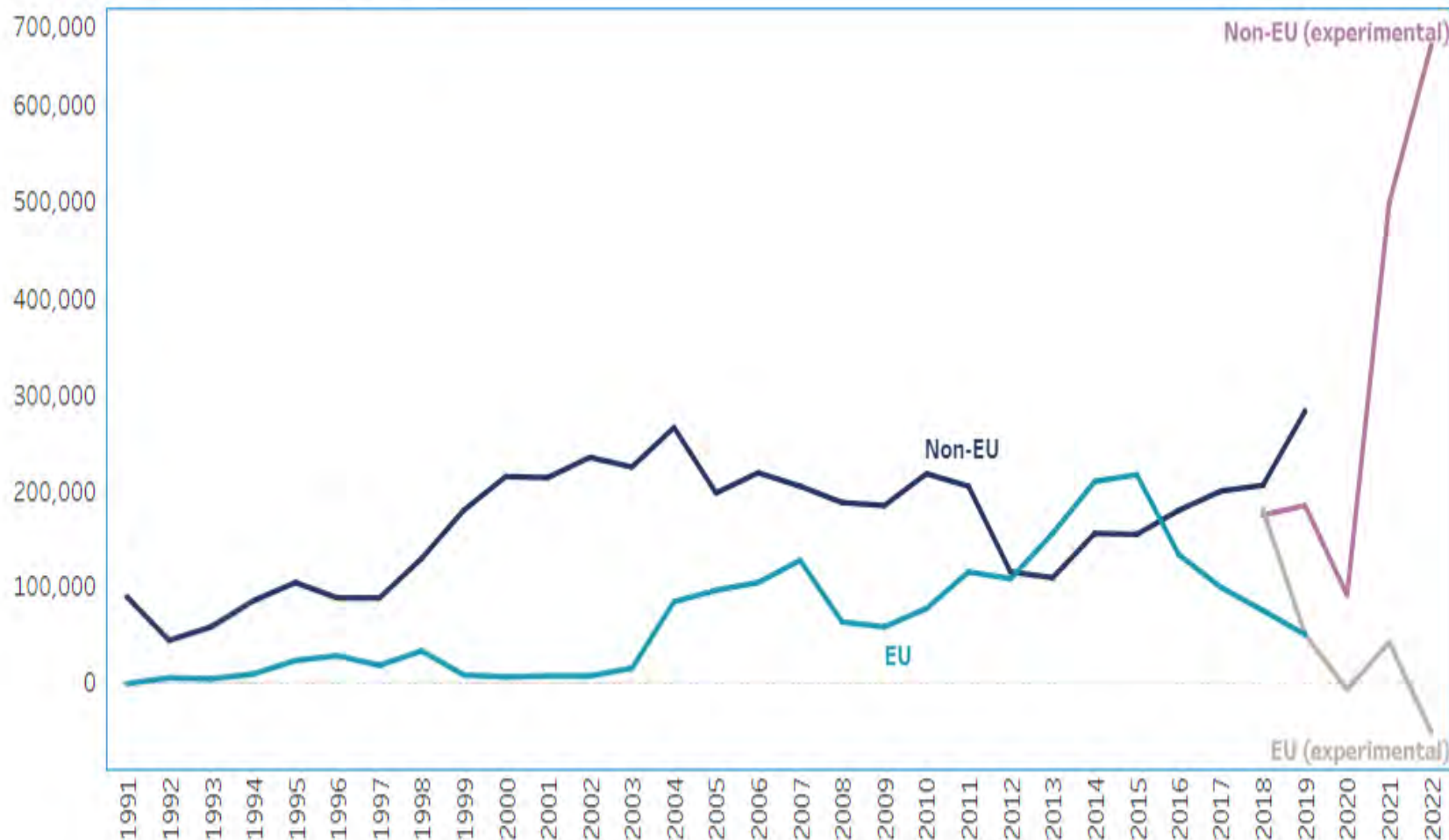
- [Background [Portes \(2022\)](#), [Portes & Springford \(2023\)](#)]

- Current estimate of “equilibrium” levels of 250-350K (Manning and Sumption)

Estimates of the net migration and immigration of EU and non-EU citizens in the UK, per year, 1991 to 2022

LTIM estimates are for 1991 to 2019

Measure
 ● Net migration
 □ Immigration



Source: LTIM: for 1991 to 2010: ONS, Table 2.00: Long-term international migration time series; and for 2011 to 2020: ONS, provisional estimates of long-term international migration, year ending March 2020, Table 1. Modelled estimates: ONS Long-term international migration, provisional: 2018 to 2022, Table 1.

Note: Figures are for calendar years. All estimates come with substantial uncertainty.



The post-Brexit migration system

- End free movement
- New “skilled work visa” for all nationalities (except Irish)
- Salary threshold: £25,600 but lower for Phds, new entrants, NHS and social care, higher for others
- Remove cap, lower skill requirements and no RLMT
- New Graduate visa

Impact: more than 50% of all jobs in principle open to migrants. Most “liberal” system of any advanced economy?

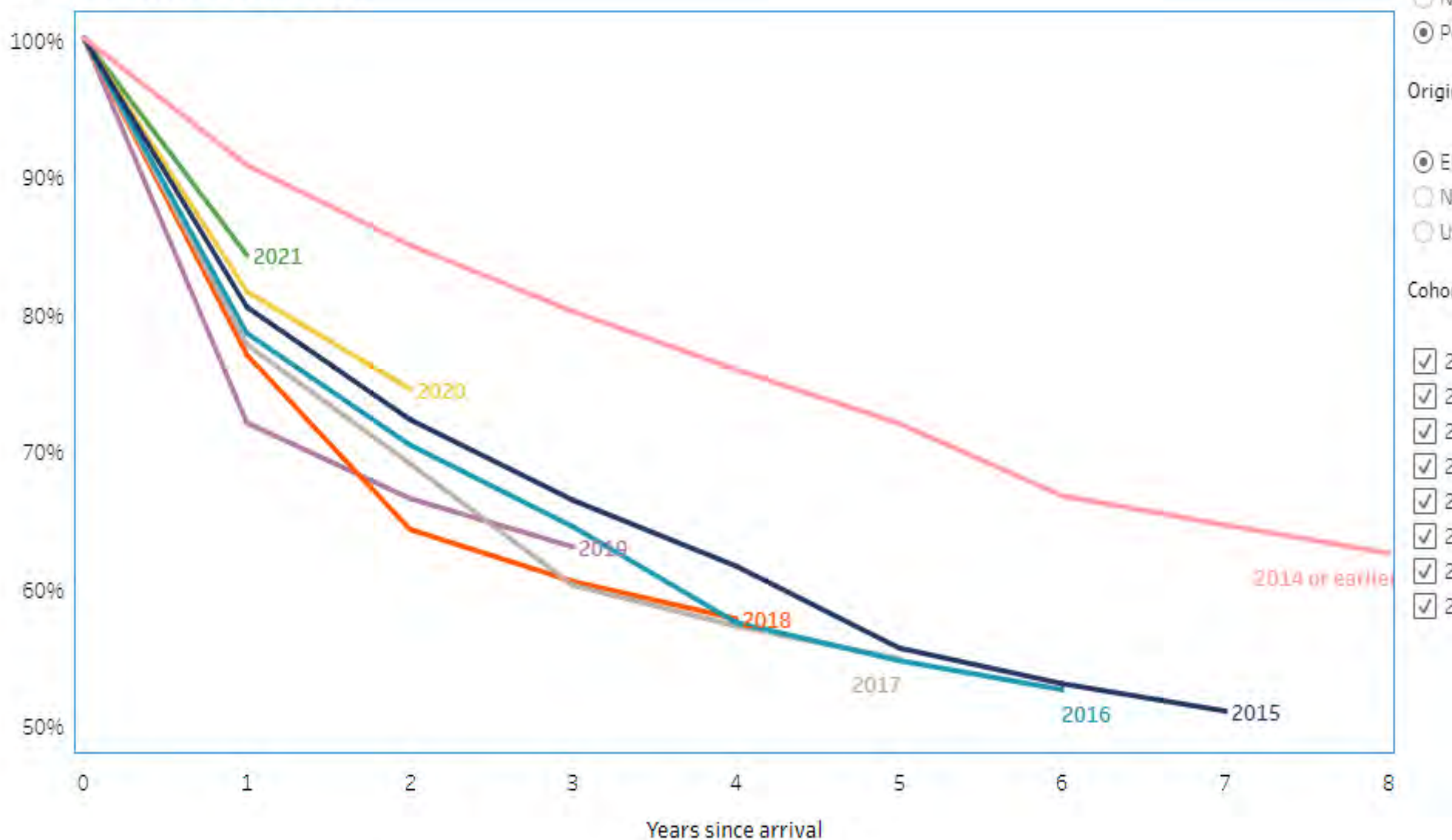
New research in 2023

- [Migrants' earnings progression](#) (with Madeleine Sumption and Ben Brindle, Migration Observatory, University of Oxford)

- [Migration and productivity](#) (with Hoseong Nam, KCL)

- Migration and wages (with Stephen Hunsaker, KCL), forthcoming

Cohort attrition by origin



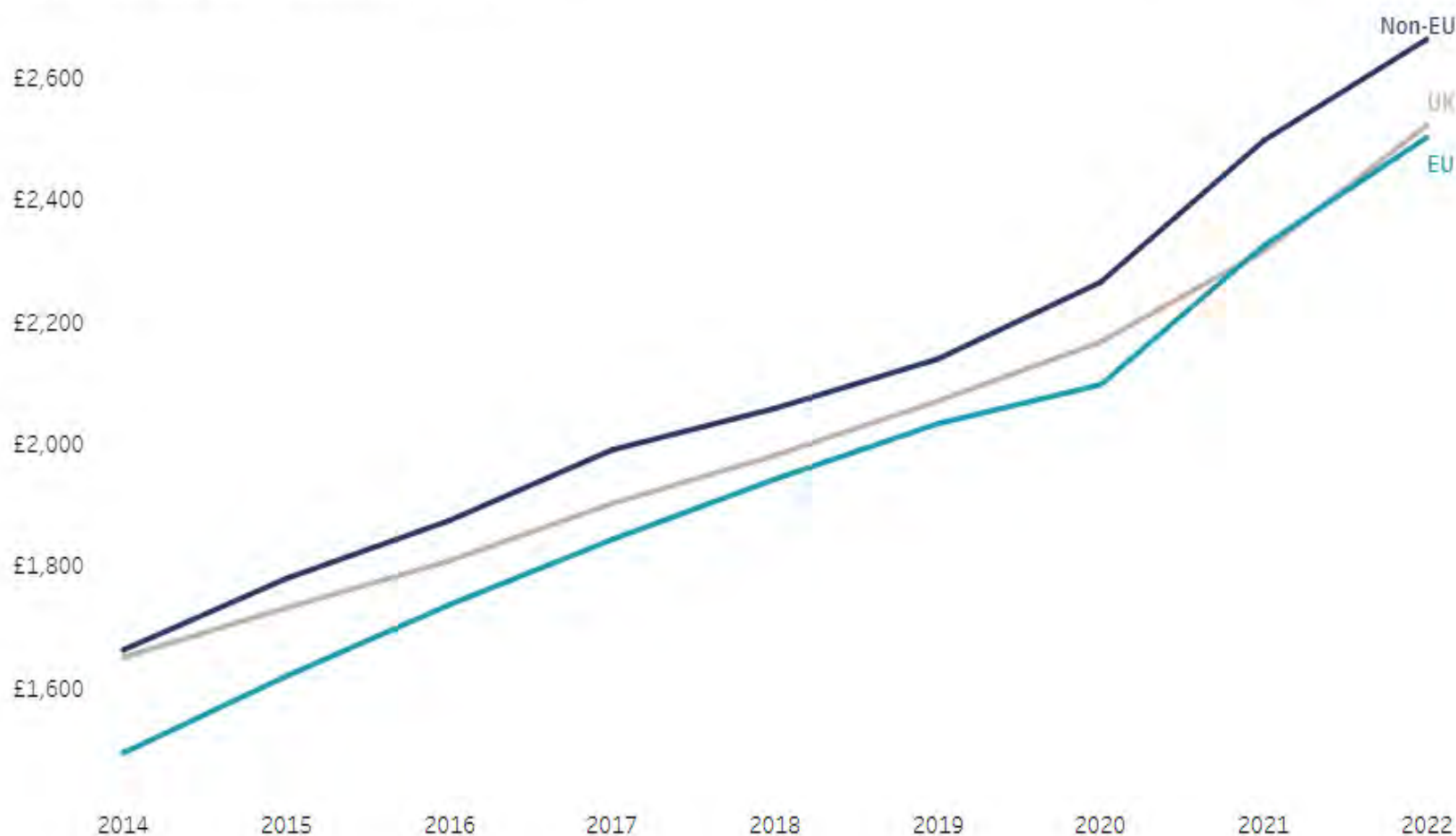
Source: Migration Observatory analysis of HMRC, Pay As You Earn Real Time Information.

Note: "Attrition" refers to exits from the employee workforce (including movement into self-employment). UK-origin includes people that were born overseas but moved to the UK before the age of 16.

Distribution of monthly earnings for established employees, 2014 to 2022

25th, 50th and 75th percentiles, by origin

Percentile
○ 25th percentile
● 50th percentile
○ 75th percentile



Source: Migration Observatory analysis of HMRC, Pay As You Earn Real Time Information.

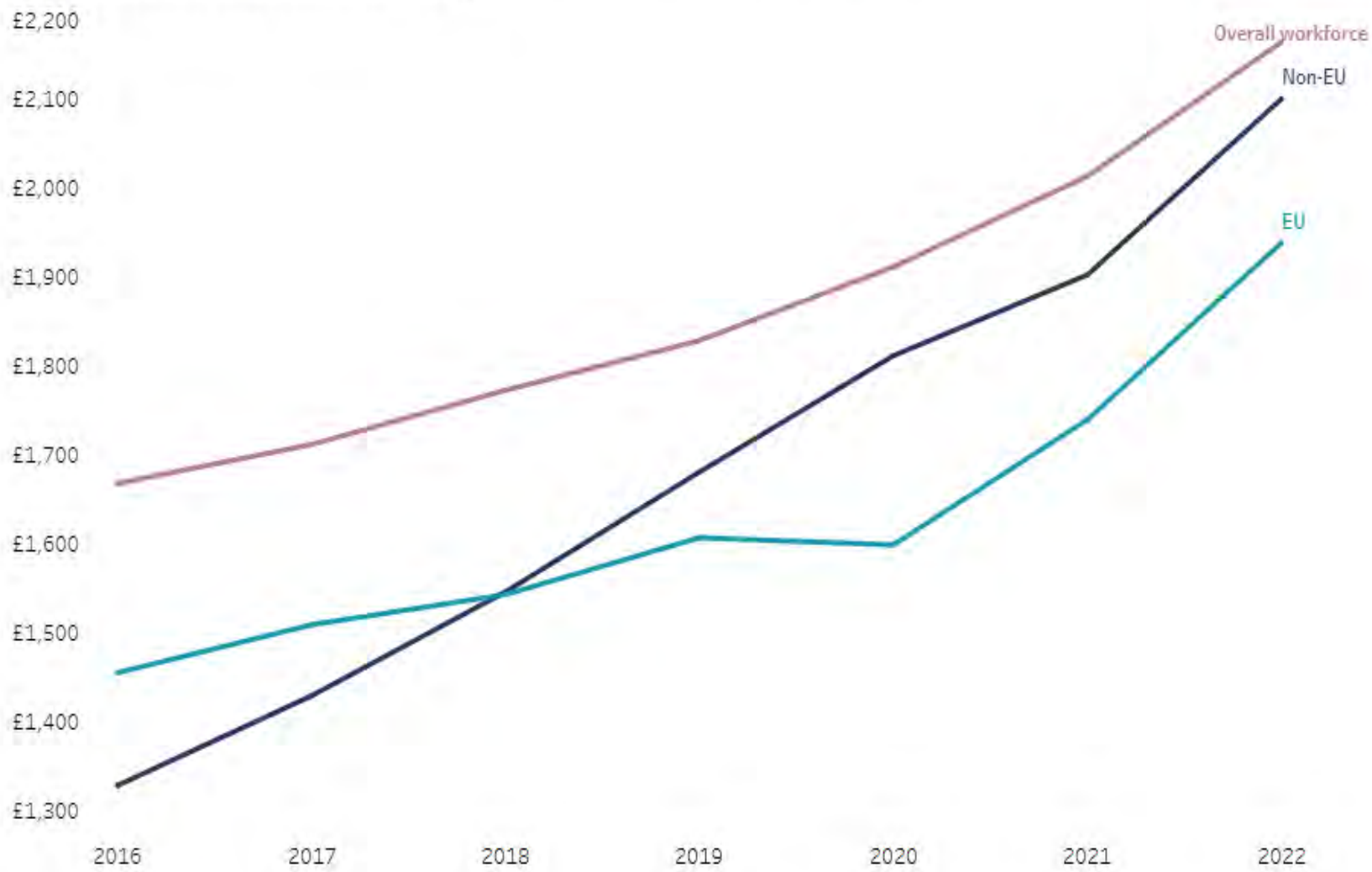
Note: Figures refer to monthly earnings for employees whose first appearance in HMRC data was 2014 or earlier. UK-origin includes people that were born overseas but moved to the UK before the age of 16.



Distribution of employee monthly earnings in the first full year of employment, 2016 to 2022

25th, 50th and 75th percentiles, by origin

Percentile
○ 25th percentile
● 50th percentile
▽ 75th percentile



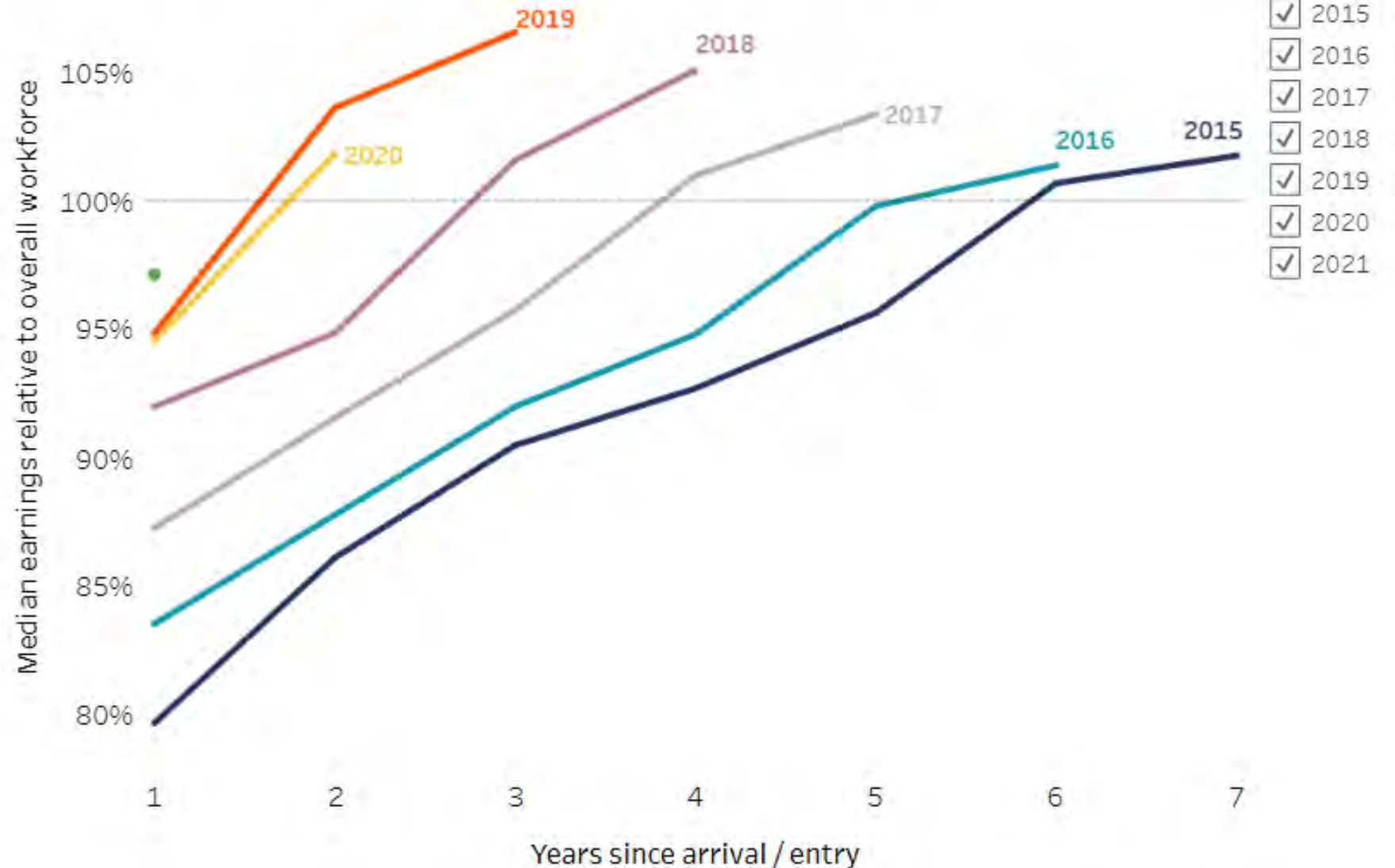
Source: Migration Observatory analysis of HMRC, Pay As You Earn Real Time Information.

Note: Figures refer to monthly earnings in the first full year for employees who first appeared in HMRC data the previous year (e.g. 2016 for employees who first appeared in 2015). Earnings are not adjusted for inflation. UK-origin includes people that were born overseas but moved to the UK before the age of 16.

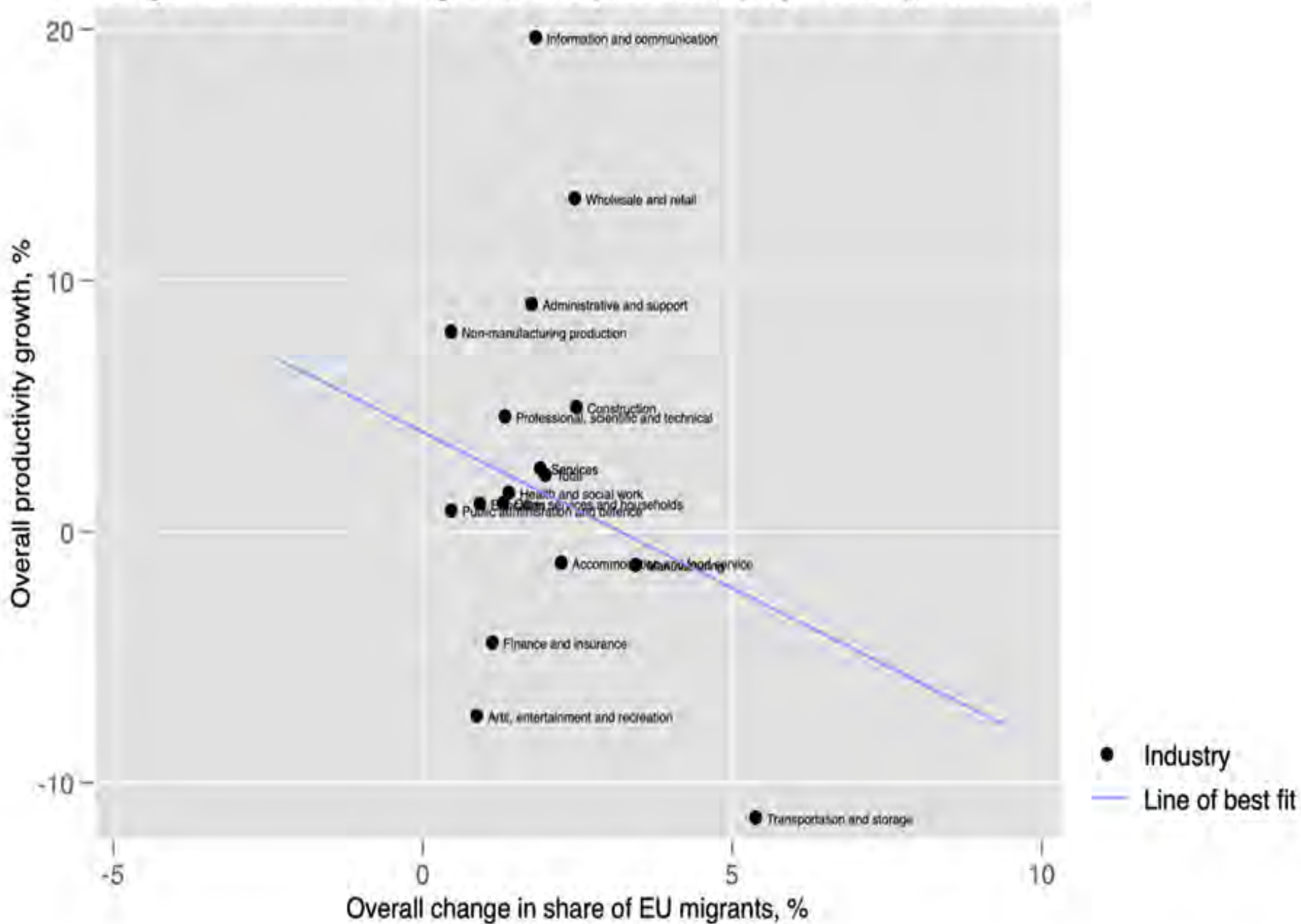


Progression of monthly median earnings, by origin and arrival cohort

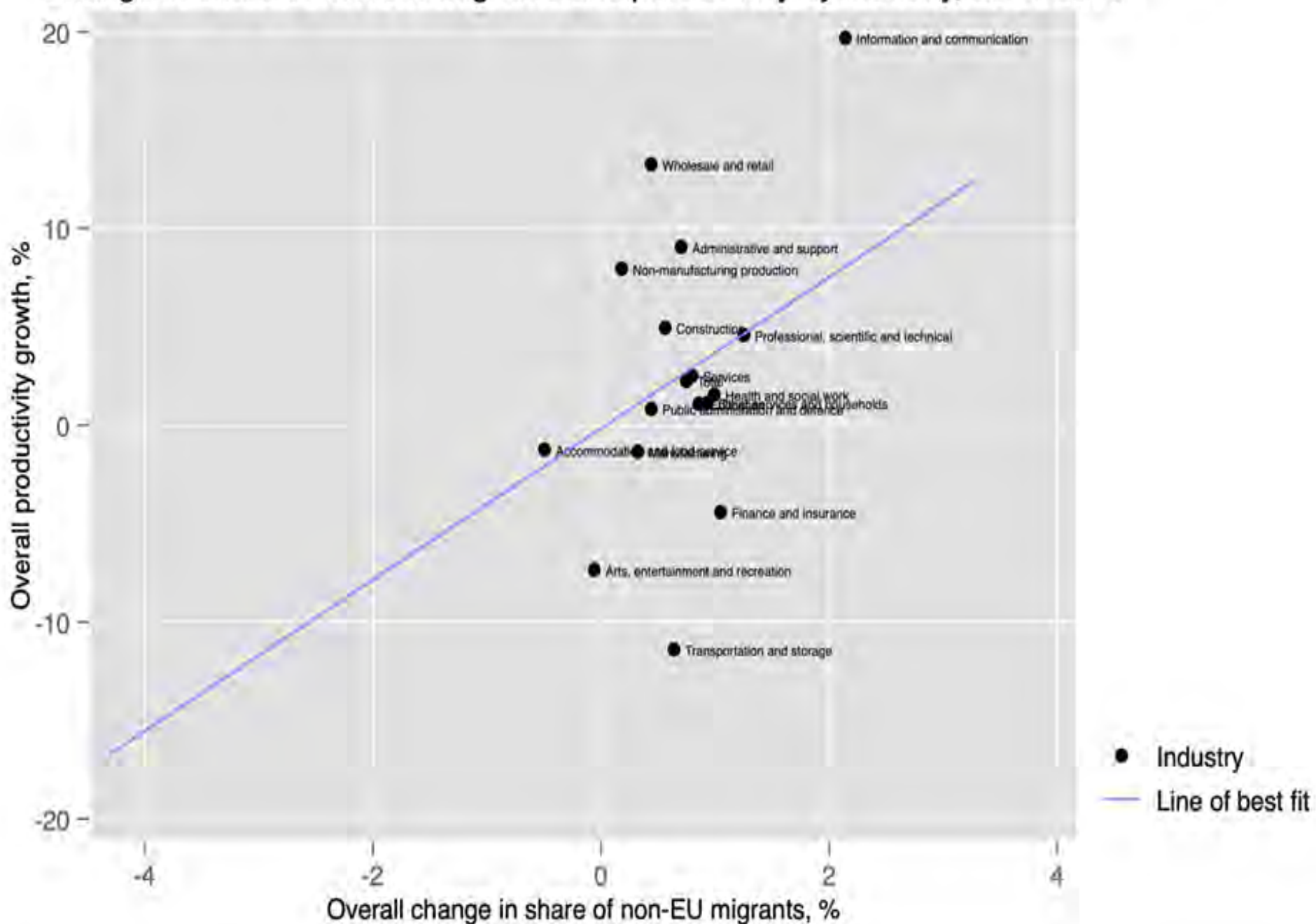
Relative to the median earnings of the overall workforce



Change in share of EU migrants and productivity by industry, 2014-2019



Change in share of non-EU migrants and productivity by industry, 2014-2019



Column	(1)	(2)	(3)	(4)	(5)
Dependent Variable	logProductivityperjob			ΔProductivityperjob	
Fixed effects	No	Yes	Yes	Yes	Yes
Weighted	No	No	Yes	No	Yes
Explanatory Variable					
EUEmployment%	-.03339 .0446	-.37139 .36146	-.04018 .27762		
nonEUEmployment %	.07858 .05762	2.96091** *	1.47134** *		
ΔEUEmployment%		.88079	.52783		
ΔnonEUEmployment%				-.7041707 .5888755 3.092276* *	-.0175677 .4453118 1.369535* .8201292
L1.Productivityperjob	.9927001* **	.3187454* **	.3700014* **		
L1.ΔProductivityperjob	.0047749	.033791	.033495		
ΔTotalemployment%				-.121919* **	-.1340132* **
Cons	.0800037 .0513989	7.222974* **	6.691561* **	.3428495 .5783661	.3668363 .4115159
R-squared	0.9785	0.5584	0.8377	0.0287	0.0346
Adjusted R-squared	0.9784			0.0197	0.0257

(Early and tentative) conclusions

- Radical shift in size and composition of immigration flows to UK
- Some evidence of improved earnings (entry and progression) among non-EU migrants
- Positive association between non-EU migration and productivity and (perhaps) wages
- Negative association between EU migration and (perhaps) productivity

Overall impact of recent changes appears to have be positive (so far)

Total fertility rate in the United Kingdom from 1961 to 2021

Zoomable Statistic: Select the range in the chart you want to zoom in on. ✕

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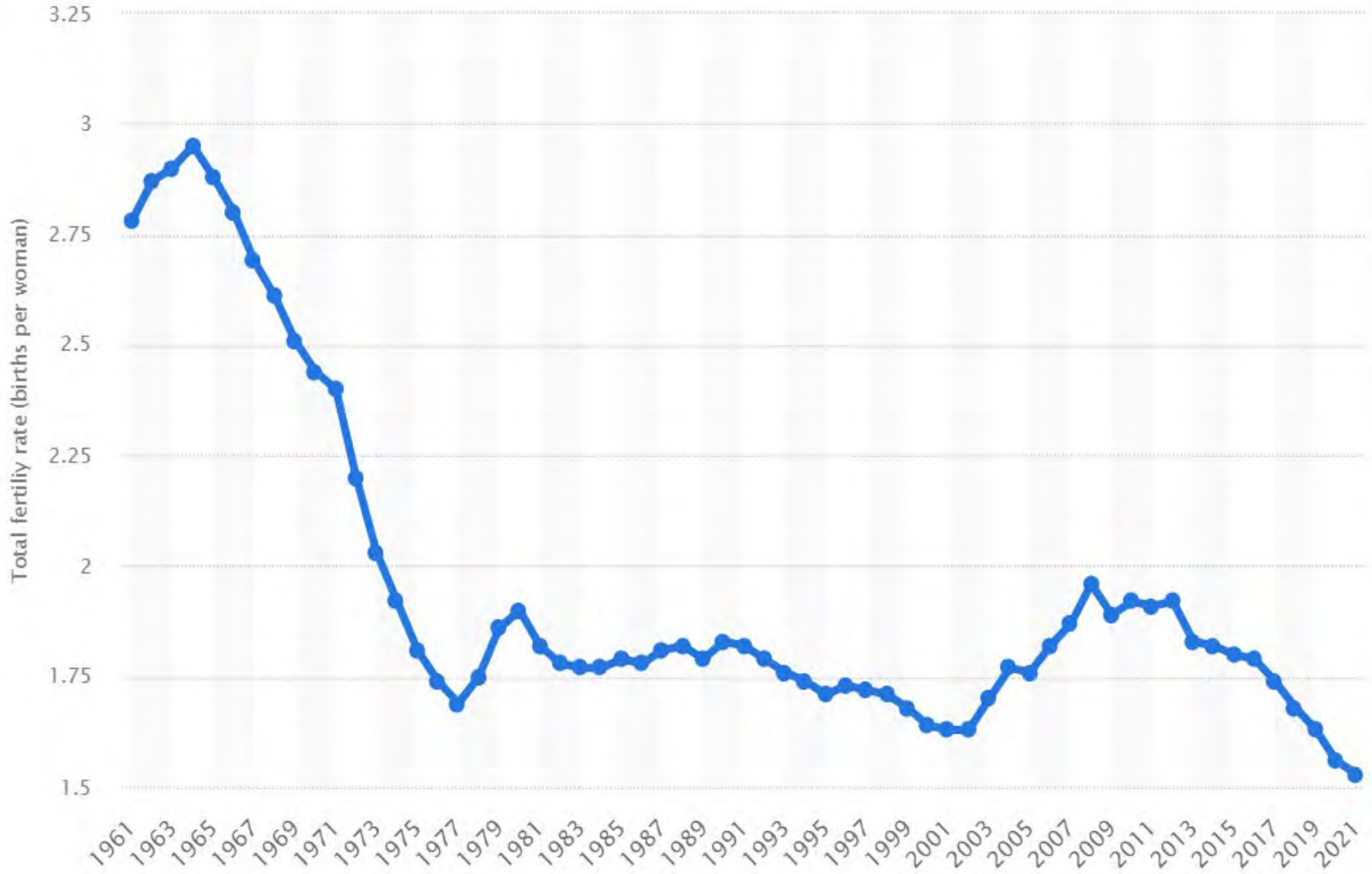


Table 2

Global total fertility rates, by region, 2010 to latest available

Region/country		2010	2015	2019	2020	Latest available data for 2021Q1	Long-term change, 2010-20	"Pandemic change," 2019-latest available
Northern Europe	France	2.03	1.96	1.86	1.82	1.7	-10%	-9%
	Denmark	1.87	1.71	1.7	1.67	1.72	-11%	1%
	Sweden	1.98	1.85	1.7	1.66	1.64	-16%	-4%
	Belgium	1.84	1.69	1.57	1.56	—	-15%	-1%
	Netherlands	1.79	1.66	1.57	1.55	1.6	-13%	2%
	Germany	1.42	1.5	1.54	1.52	—	7%	-1%
Southern Europe	Portugal	1.39	1.31	1.43	1.41	—	1%	-1%
	Greece	1.48	1.33	1.34	1.37	1.41	-7%	5%
	Italy	1.41	1.35	1.27	1.24	—	-12%	-2%
	Spain	1.37	1.33	1.24	1.2	1.13	-12%	-9%
Eastern Europe	Romania	1.59	1.62	1.65	1.71	—	8%	4%
	Hungary	1.26	1.44	1.53	1.6	1.62	27%	6%
	Serbia	1.64	1.61	1.62	1.59	1.59	-3%	-2%
	Slovenia	1.57	1.57	1.62	1.56	1.58	-1%	-2%
	Croatia	1.55	1.4	1.47	1.49	1.56	-4%	6%
	Bulgaria	1.57	1.53	1.59	1.56	—	-1%	-2%
	Russia	1.57	1.78	1.5	1.5	1.53	-4%	2%
Anglo-Saxon Five Eyes	United States	1.93	1.84	1.7	1.64	—	-15%	-4%
	New Zealand	2.17	2	1.72	1.61	—	-26%	-6%
	Australia	1.95	1.8	1.66	1.6	—	-18%	-4%
	England/Wales	1.93	1.82	1.65	1.6	—	-17%	-3%
	Canada	1.63	1.56	1.47	—	—	-10%	0%

Table 1.1. **Permanent-type migration to selected OECD countries, 2014-22**

	2014	2015	2016	2017	2018	2019	2020	2021	2022 (estimates)	2022/21 change	2022/19 change
	Thousands									%	
Standardised statistics											
United States	1 017.2	1 051.0	1 186.9	1 103.7	1 089.6	1 031.0	581.5	835.4	1 048.0	+25.5	+1.7
Germany	572.5	684.4	1 051.9	861.0	633.5	620.4	499.5	531.5	641.1	+20.6	+3.3
United Kingdom	357.7	390.2	374.9	353.5	357.2	377.9	233.7	385.8	521.2	+35.1	+37.9
Spain	268.1	269.6	292.1	321.8	339.6	397.8	324.2	370.4	471.8	+27.4	+18.6
Canada	261.5	275.8	296.7	286.5	321.0	341.2	184.5	406.0	437.5	+7.8	+28.2
France	257.9	262.3	259.9	260.8	282.5	292.0	232.0	278.1	301.1	+8.3	+3.1
Italy	244.6	223.1	214.0	220.1	206.6	194.0	126.5	241.2	271.6	+12.6	+40.0
Netherlands	111.8	126.8	138.5	148.0	147.7	163.1	132.8	170.8	207.5	+21.4	+27.2

Conclusions

- Radical shift in nature and composition of immigration flows to UK
- Not just Brexit – driven by broader economic, social and political trends. Considerable uncertainty
- BUT
- Any realistic economic strategy (particularly one focused on “Global Britain”) likely to mean continued historically high immigration rates
- Other European countries face similar challenges
- ..



The **UK** in a **Changing Europe**

Immigration and the UK economy after Brexit
November 2023

Jonathan Portes
King's College London & UKandEU

@jdportes

UKandEU.ac.uk





Immigration and the UK economy after Brexit

Discussion

Ines Homburg

17/11/2023

Summary of the presentation

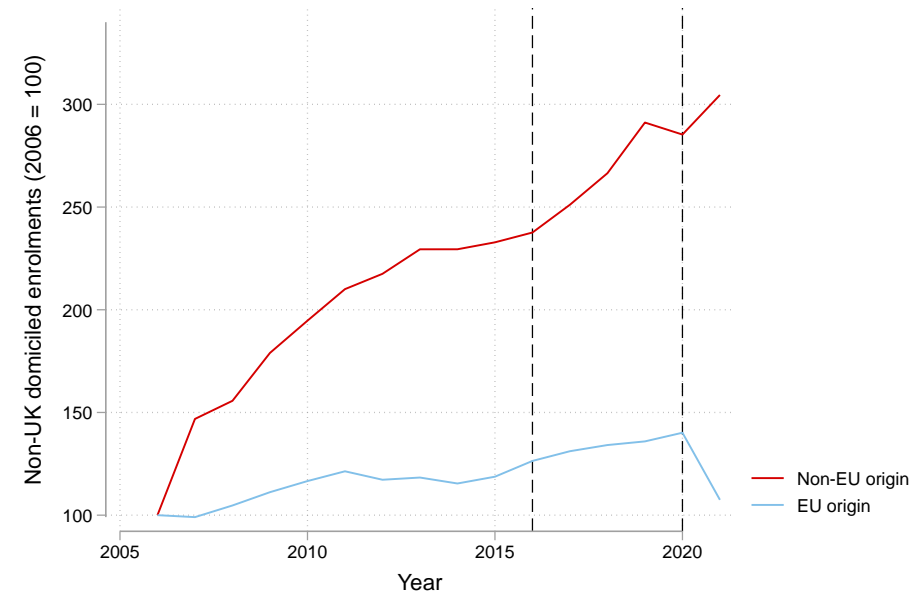
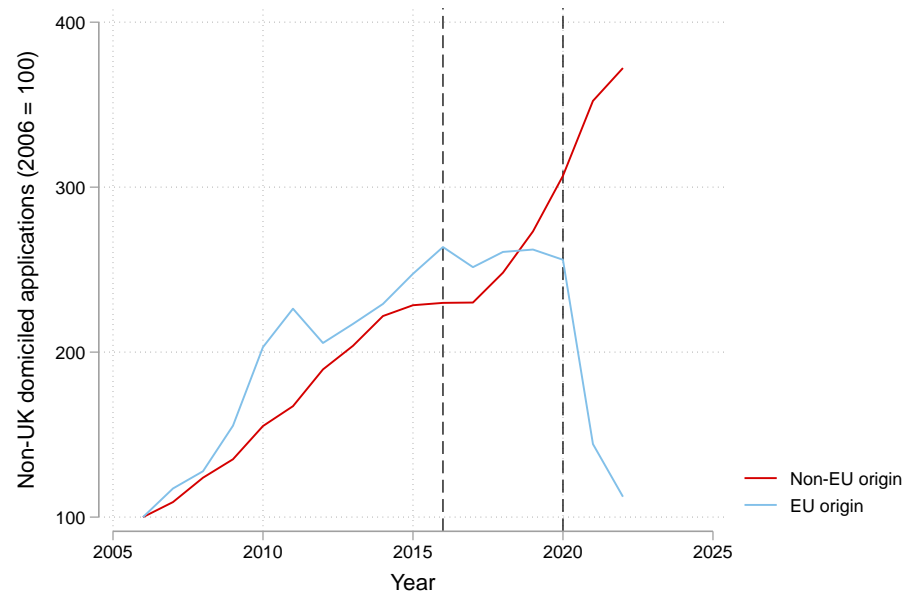
- **Trends in migration**
 - After the referendum: EU inflow ↓
 - After Brexit: EU inflow ↓ and non-EU inflow ↑
- **Impact of Brexit**
 - Changing number of migrants
 - Changing skill composition of migrants
 - New immigrants' earnings at entry and progression over time: improved for non-EU migrants
- **Impact of immigration on the UK labour market**
 - Among others, impact on labour productivity
 - Positive correlation between change in migrant share and productivity growth for non-EU workers
- **Impact on other types of migrants...**

Discussion

- **Student migration in the UK**
- **Large impact on regulations for EU students wishing to study in the UK**
 - Pre-Brexit: freedom of movement, lower tuition fees as “home” students, ...
 - Post-Brexit: visa and other requirements, higher tuition fees as “overseas” students, ...
- **Working paper (Clifton-Sprigg, Homburg, Huyghe, & Vujic, 2023)**
 - How did Brexit affect the attractiveness of the UK as a study destination
 - Outcome variables: international student applications and enrolments to UK universities and colleges
 - Methodology: difference-in-differences strategy comparing EU students (treated) with non-EU students (control)
 - Results
 - 2016: referendum → no impact
 - 2020/21: visa and other requirements → no impact
 - 2021/22: tuition fees increased → - 45% student applications and - 20% student enrolments from EU students
 - Back-of-the-envelope calculation to estimate potential monetary losses
 - Lost tuition fees are compensated by increased tuition fees for remaining students
 - Large monetary losses due to lost students’ day-to-day spending

Discussion

- **Student migration in the UK**
- **Large impact on regulations for EU students wishing to study in the UK**
 - Pre-Brexit: freedom of movement, lower tuition fees as “home” students, ...
 - Post-Brexit: visa and other requirements, higher tuition fees as “overseas” students, ...
- **Working paper (Clifton-Sprigg, Homburg, Huyghe, & Vujic, 2023)**



Discussion

- **Self-employed migrants in the UK**
- **Working paper (Acosta and Marinoni, 2023)**
 - How did the Brexit referendum affect the self-employment of immigrants
 - Outcome variable: number of newly established firms that are officially registered in the UK, of which the founder or the majority of founders is an immigrant
 - Methodology: difference-in-differences strategy comparing the growth rate of new firms created by EU immigrants with those by non-EU immigrants
 - Results
 - Persistent decrease of 3.2% in the growth rate of new EU-immigrant-based businesses
 - High-quality firms establish their business elsewhere
 - Low-quality firms better off taking up paid employment
- **Brexit likely has a similar impact as referendum: negative trend in EU migrant entrepreneurship will continue**

Discussion

- **Multidimensional impact of Brexit on migration and the UK economy**
- **Further questions**
 - Return migration of EU migrants
 - Emigration of British citizens
 - Impact on the integration of migrants
 - Switch to irregular migration
 - ...

Break

11:45 | Not to belittle NTBs: non-tariff barriers and trade during Brexit

12:30 | Measuring the regional economic costs of Brexit

13:15 | Lunch

Not to belittle NTBs: non-tariff barriers and trade during Brexit

Presenter: Thomas Sampson (LSE)

Discussant: Katrin Forster van Aerssen (ECB)



EUROPEAN CENTRAL BANK

EUROSYSTEM

Brexit-impacts on trade

Some comments

NIER Brexit workshop



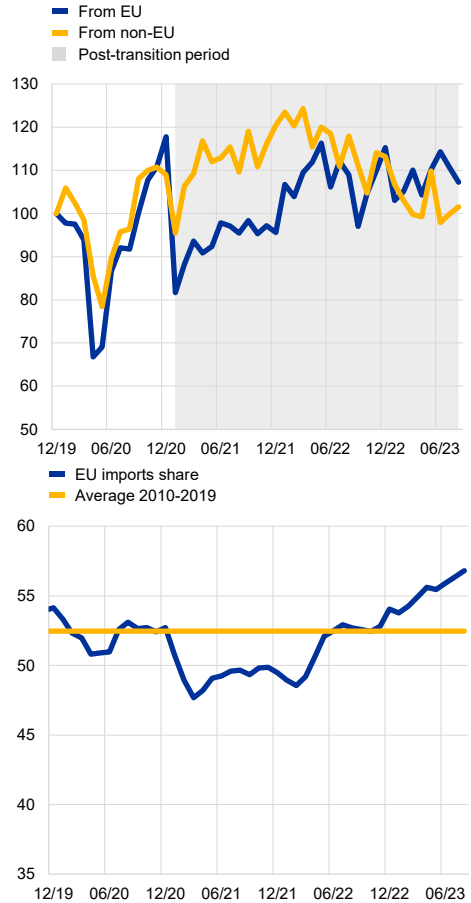
17 November 2023

Katrin Forster (DG-I, ECB)

Disclaimer: Any views expressed are solely mine and the presentation should not be reported as representing the views of the ECB.

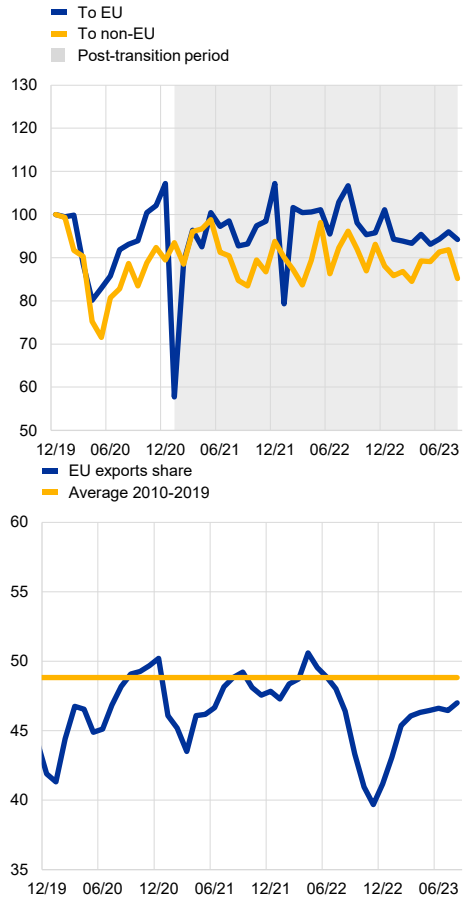
- Analysis using very disaggregated data highly appreciated
- Sheds more light on how firms adjusted during Brexit in various dimensions
 - Within firms
 - Across firms, also compared with other relevant time periods, with particular focus on firm size
- Difficulty to disentangle Brexit- vs Covid-related effects
- Limitations due to the length of the data set ending Dec 2021

Import volumes (index: 2019=100)



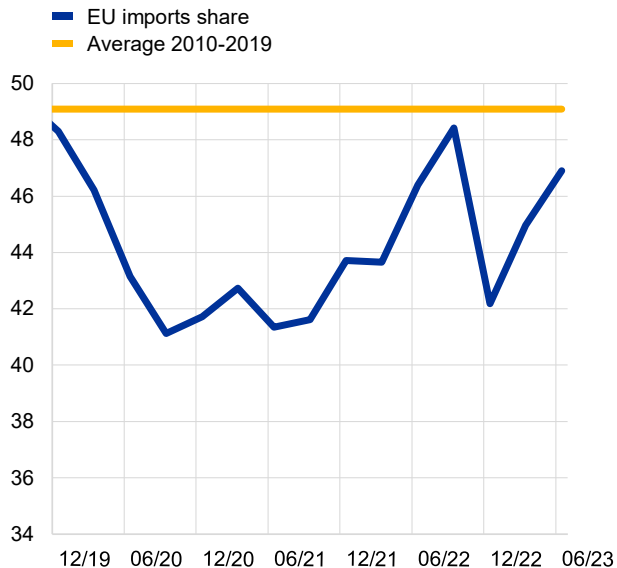
Sources: ONS and Haver.
Latest observation: June 2023.

Export volumes (index: 2019=100)



Share of UK services imports from the EU in total UK services imports

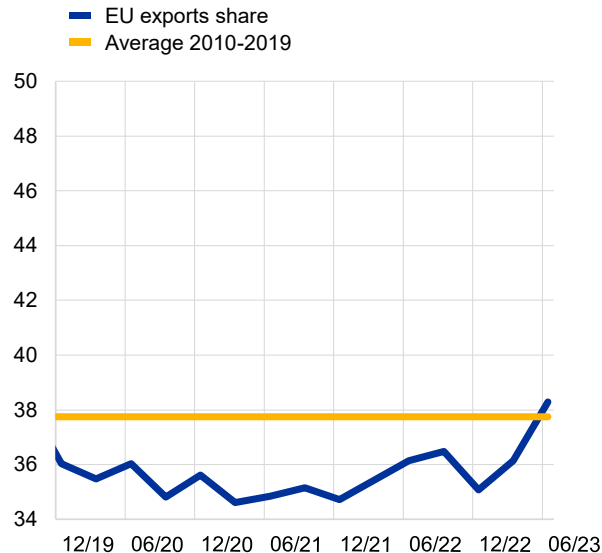
(percentages, three-month moving averages)



Sources: ONS and own calculations.
Last observation: 2023Q2.

Share of UK services exports to the EU in total UK services exports

(percentages, three-month moving averages)



Sources: ONS and own calculations.
Last observation: 2023Q2.

Thank you

Measuring the regional economic costs of Brexit

Presenter: Thiemo Fetzer University of Warwick, University of Bonn,
NIESR)

Discussant: Leaza McSorley (NIESR)

Measuring the Regional Cost of Brexit

Eleonora Alabrese, Thiemo Fetzer and Shizhuo Wang

Long Arc of Protest

15/11/2023



The correlates of Brexit

Service & manufacturing sector cleavage

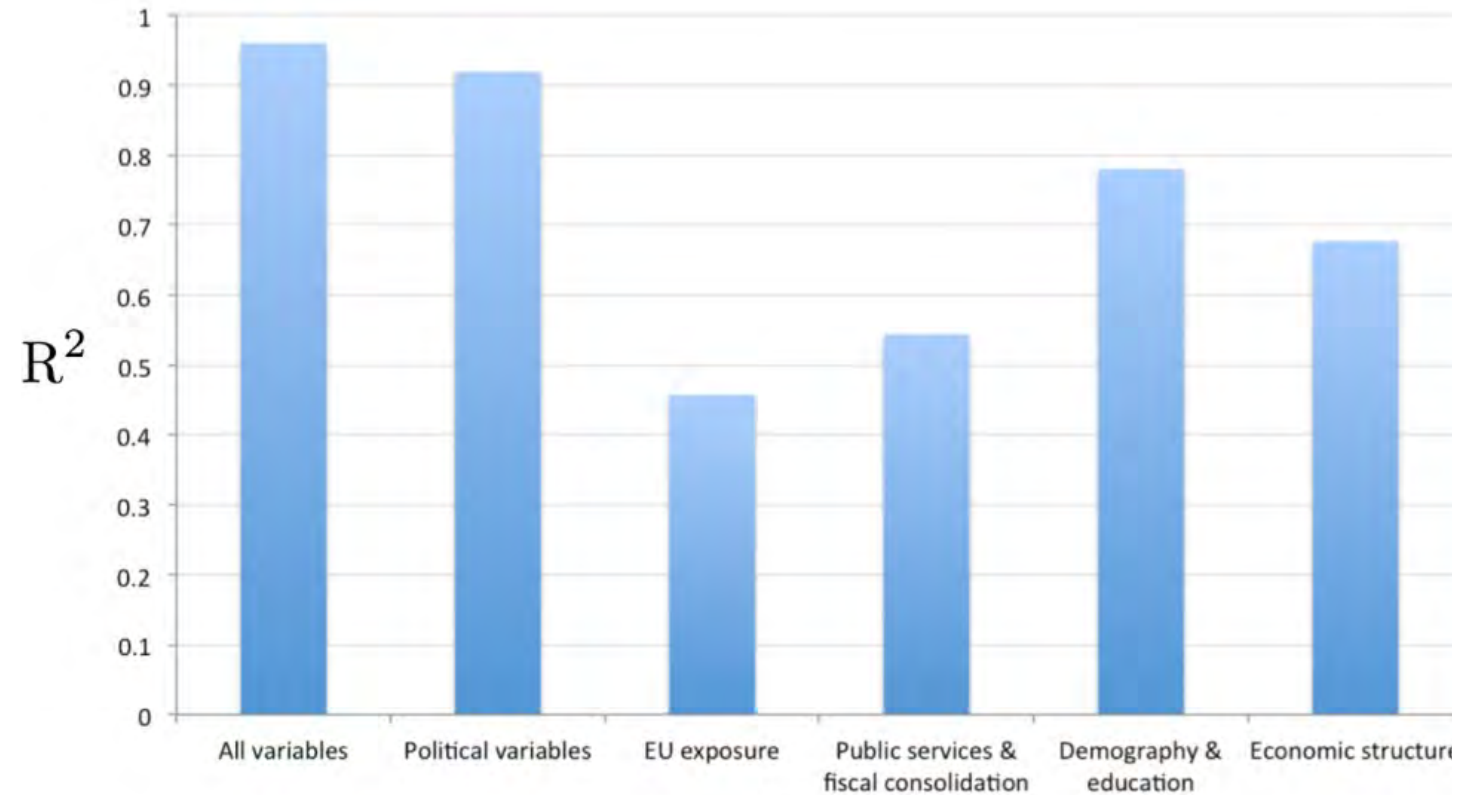
Economic structure

Demographic cleavage

Age and educational attainment

Poverty and deprivation

Welfare state as band-aid



Becker, Fetzer, Novy (2017) Who voted for Brexit.

Thiemo Fetzer

Brexit is leveling up, by pushing down

- Almost across the board it is hard to argue that the UK is "doing well" with Brexit
 - Massive and widening output gap with exacerbating regional differences
 - West Midlands and industrial heartlands see biggest adjustment (car industry...)
 - Adjustments may not be inconsistent with reallocation needed for climate action
 - But UK car industry could just disappear
 - Northern Ireland is getting "the best deal"
- Best Brexit is **no Brexit**

Table 1: Region Level Brexit-vote Cost Estimates derived from quarterly data

ITL1	Region	Ensemble		"Best synthetic control"		
		\hat{y}^{ENS}	\hat{y}_d^{ENSsim}	AAPE _s	RMSPE _s	MAPE _s
Panel A: Average post 2016						
TLC	North East	-5.93	-5.46	-6.41	-5.09	-5.13
TLD	North West	-7.00	-5.86	-7.00	-4.74	-4.65
TLE	Yorkshire and The Humber	-5.08	-5.08	-5.08	-3.33	-3.42
TLF	East Midlands	-6.97	-6.97	-6.97	-4.50	-4.46
TLG	West Midlands	-7.64	-8.03	-8.03	-7.67	-7.61
TLH	East	-4.13	-4.63	-4.52	-4.10	-4.11
TLI	London	-7.45	-5.93	-6.57	-6.43	-6.40
TLJ	South East	-4.62	-4.18	-4.62	-3.88	-3.88
TLK	South West	-5.44	-5.66	-5.44	-4.57	-4.54
TLL	Wales	-6.03	-6.12	-6.12	-5.06	-5.05
TLM	Scotland	-6.52	-6.66	-6.52	-5.91	-5.88
TLN	Northern Ireland	-1.72	-1.72	-1.72	-1.35	-1.43
Panel B: Average in 2022						
TLC	North East	-8.52	-7.46	-9.77	-7.48	-7.52
TLD	North West	-9.58	-7.98	-9.58	-6.07	-5.94
TLE	Yorkshire and The Humber	-7.28	-7.28	-7.28	-4.53	-4.70
TLF	East Midlands	-11.80	-11.80	-11.80	-7.30	-7.21
TLG	West Midlands	-14.27	-15.14	-15.14	-14.17	-14.08
TLH	East	-7.11	-8.32	-8.15	-7.53	-7.58
TLI	London	-10.39	-7.93	-9.20	-8.58	-8.52
TLJ	South East	-6.46	-5.28	-6.46	-5.50	-5.50
TLK	South West	-9.17	-9.61	-9.17	-7.51	-7.50
TLL	Wales	-10.68	-10.64	-10.64	-8.28	-8.26
TLM	Scotland	-9.74	-10.03	-9.74	-8.74	-8.71
TLN	Northern Ireland	-0.53	-0.53	-0.53	0.37	0.23

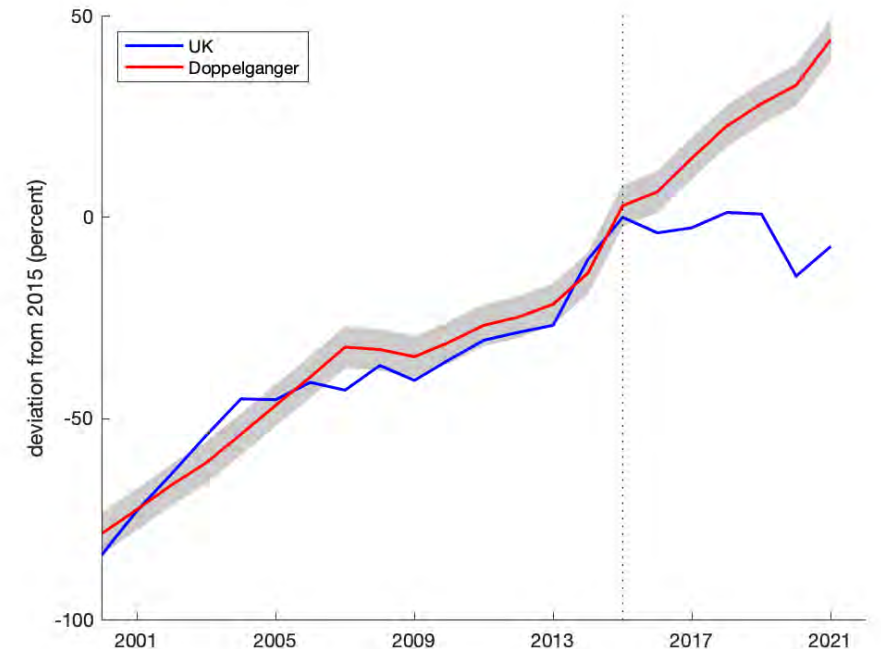
Very few “winners” across UK local authorities

- Across local authorities many more losers than winners
- Identify winners/losers based on trend changes and/or absolute average negative gap in the post 2016 years

Loser	Unclear	Winner
199	109	66

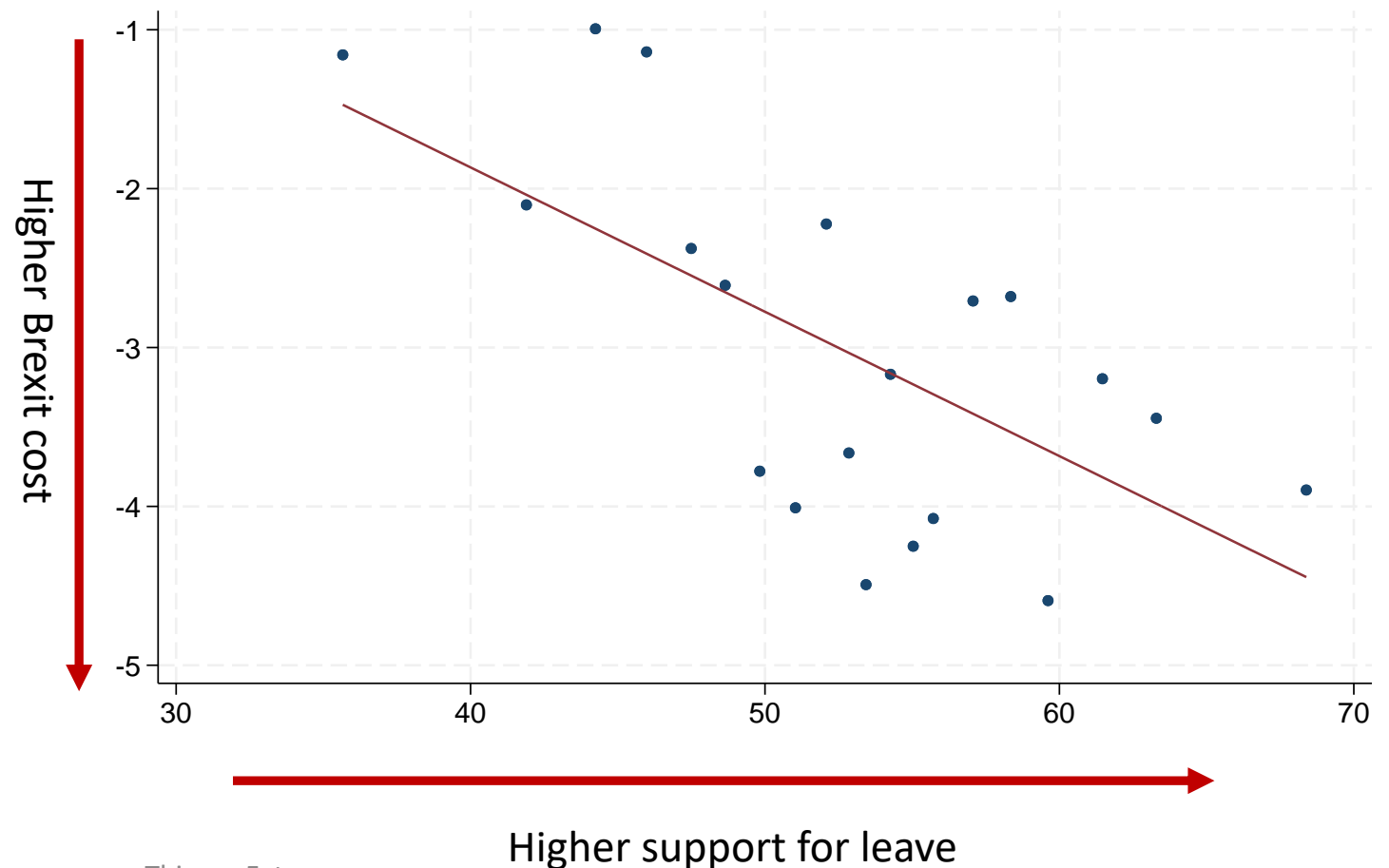
- can not identify differential effects on the trends yet

Across local authority estimations of 100+ estimates



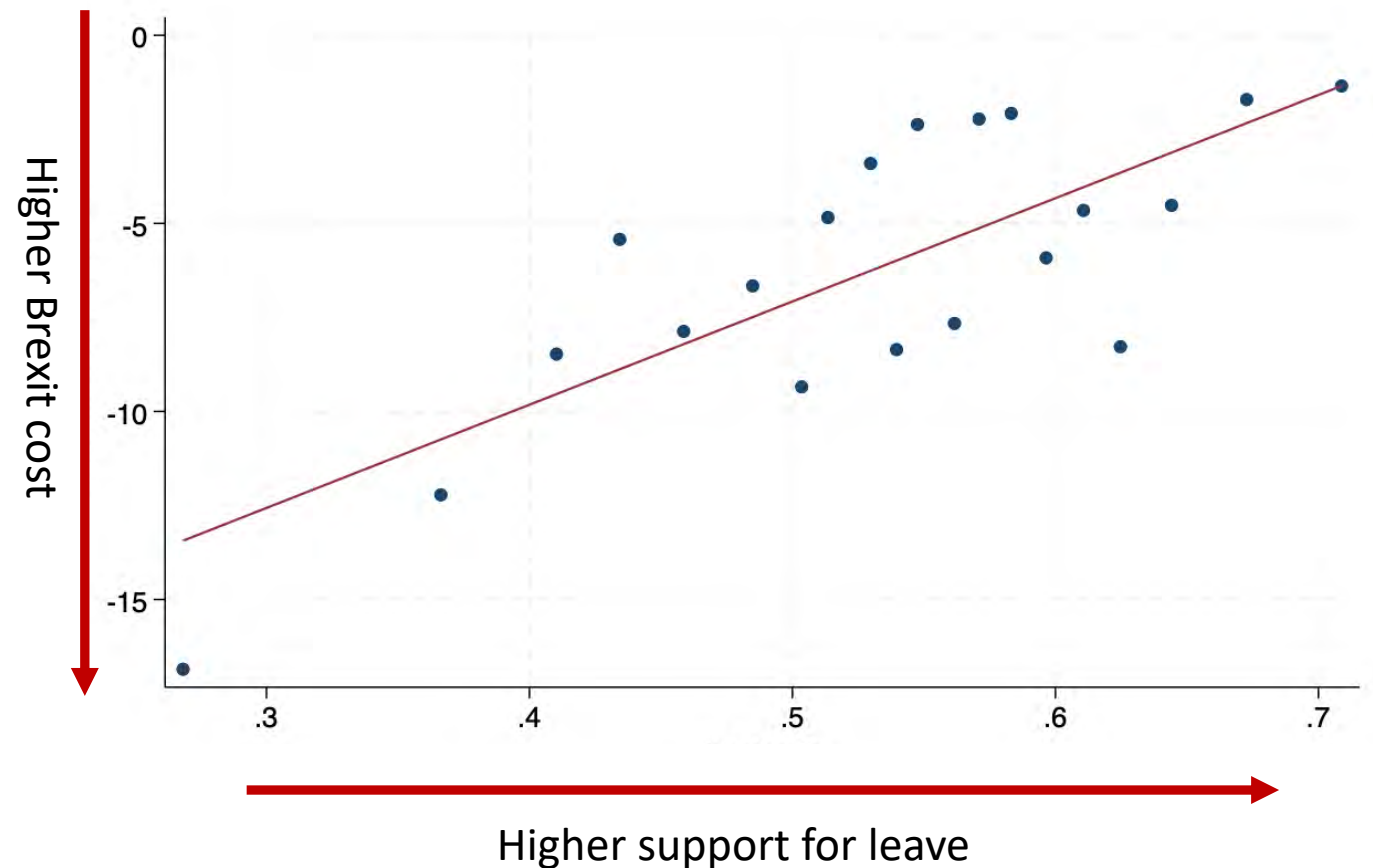
Brexit, its roots and a reversal? A look at 2018 data from 2020

- In 2018 with gross value added data we saw a negative association between an areas' support for Leave and the estimated output gap
- Leave voting areas were being "hit the hardest" economically



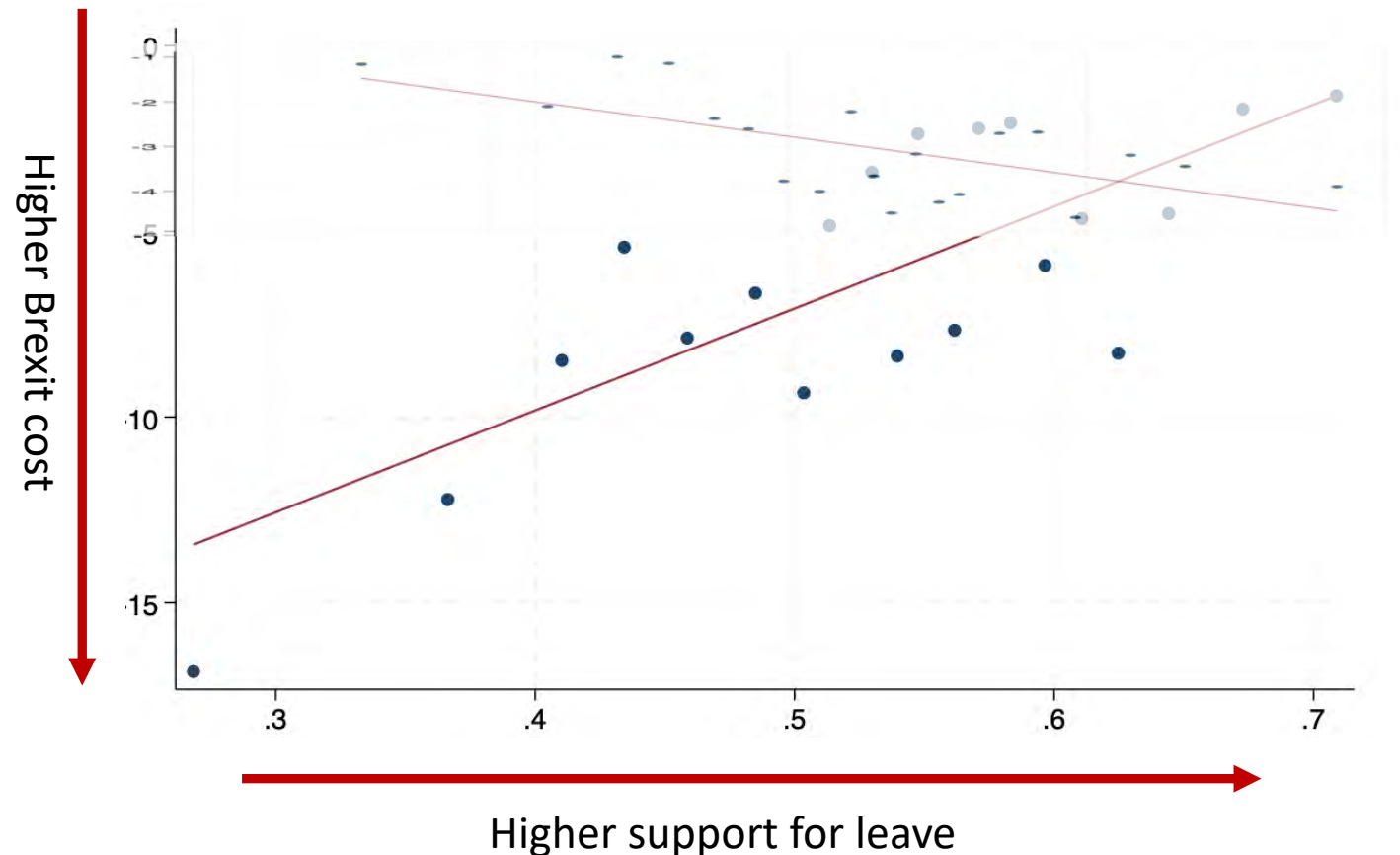
Brexit, its roots and a reversal? A look at 2018 data published in 2023

- Relationship has reversed
- Likely due to changes in economic statistics (attribution of service sector activity)
- Brexit is a costly way of reducing regional economic inequality
- **Zero sum politics at work**
- **“unholy coalition”**



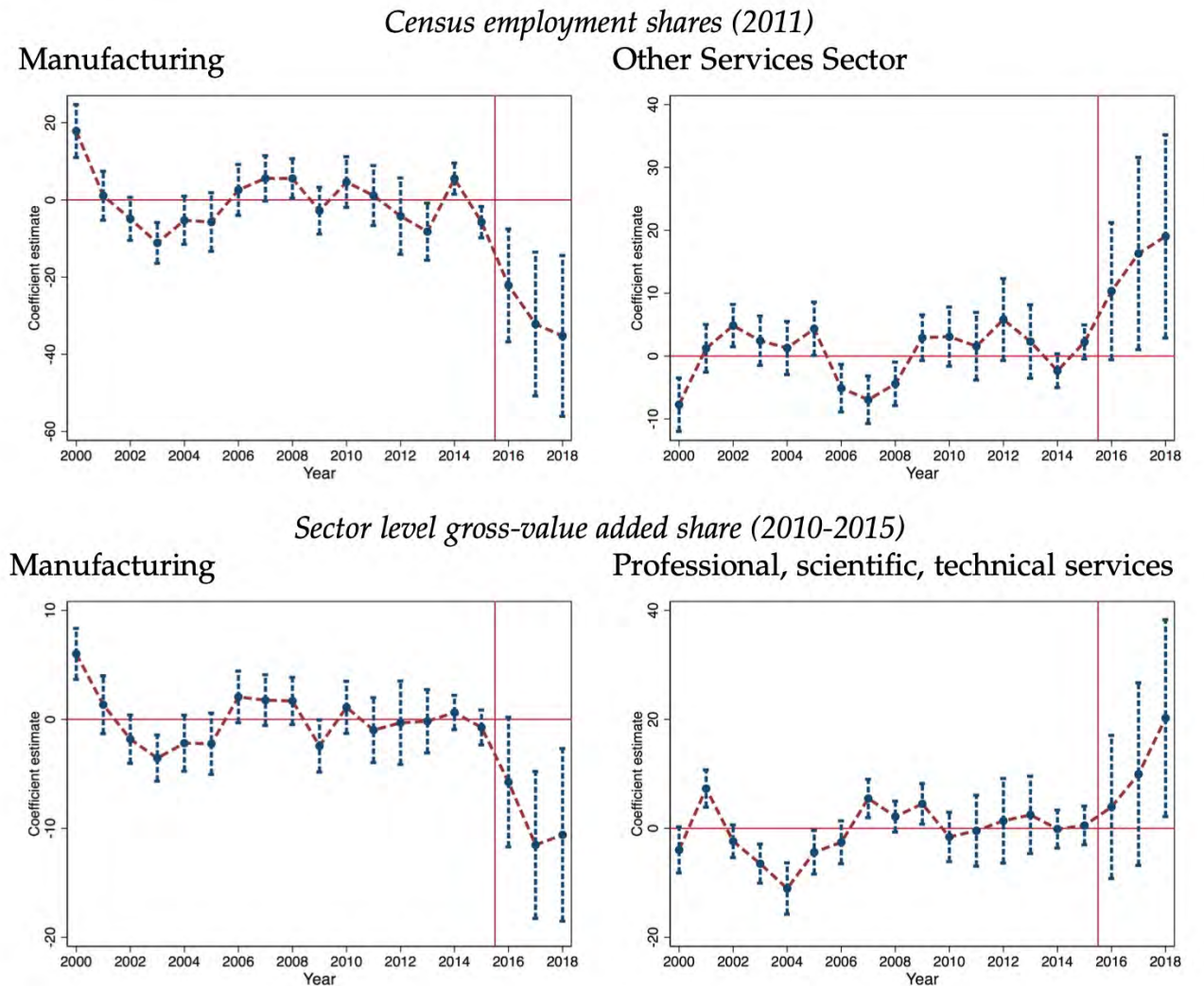
Brexit, its roots and a reversal?

- In 2021 data and patterns seems to be very different
- Why?
- In UK data the spatial attribution of some service sector activity has changed (planets)
- Data revisions elsewhere?
- But: level effect is just massive and variance has increased a lot
- A lot has happened



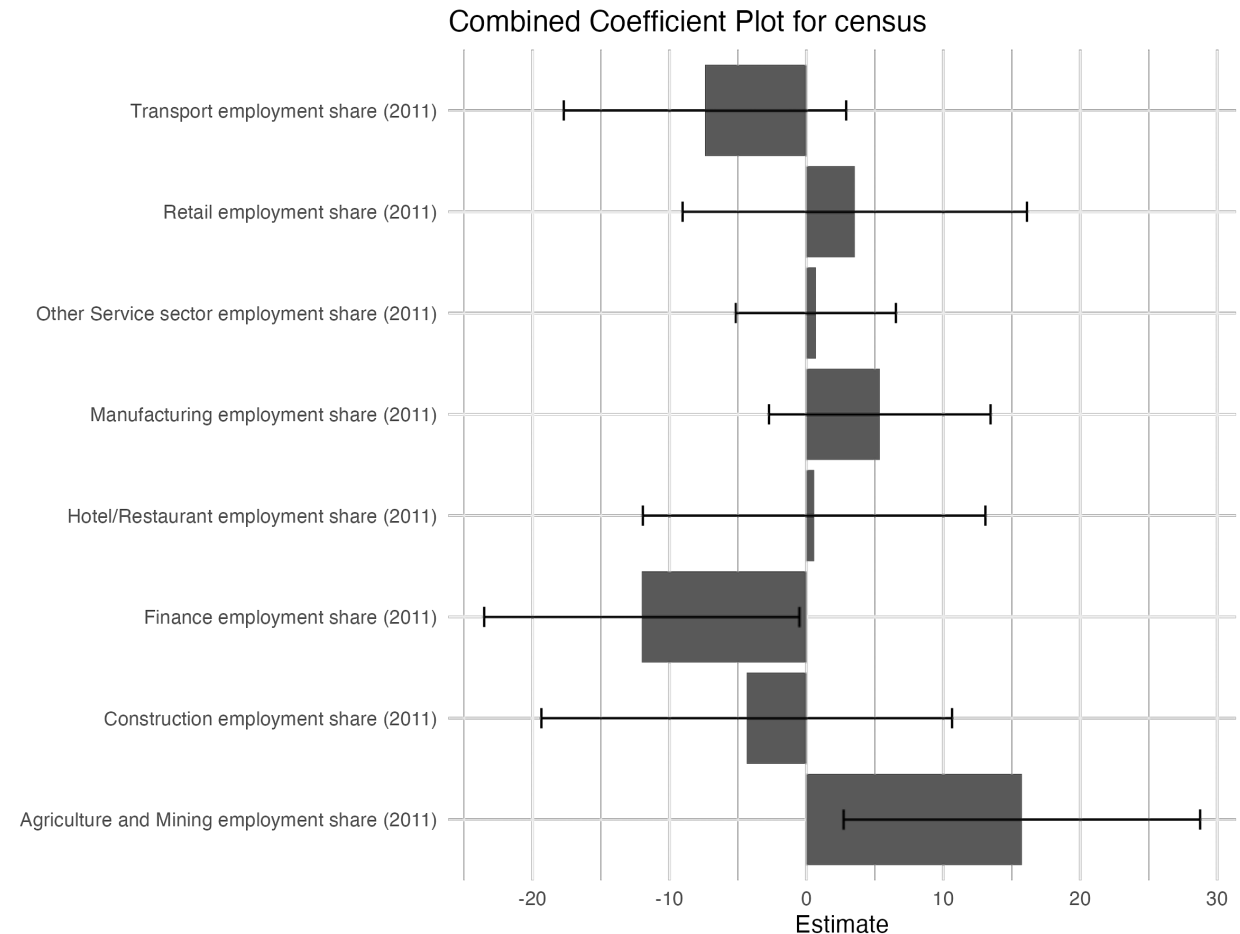
Brexit was a bet on service sector trade – the 2018 data

- Northern Ireland is indeed getting “the best deal”
- Large degree of heterogeneity in Brexit cost estimates across regions
- Structural issue of geographic attribution of service sector trade requires fiscalisation of service sector economy
- SaaS will likely lead to localization demands
- Tension between privacy and data transparency



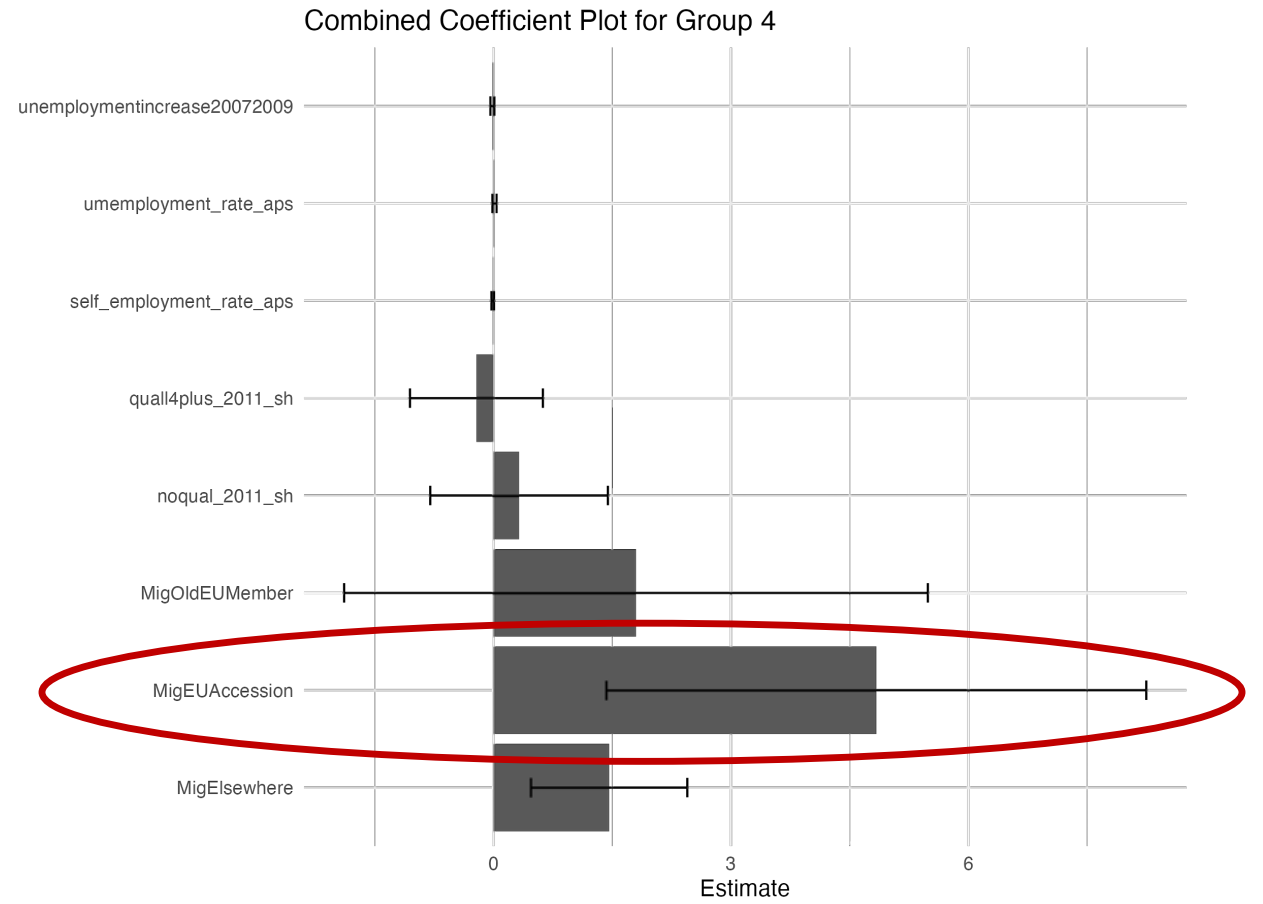
Comparing the correlates of Brexit to the correlates of being a Brexit loser

- By 2021, things are more “messy”
- But seems to still hold true with finance employment share heavy areas seemingly benefiting (less likely to be a loser) vis-à-vis areas with agricultural sector...
- Pandemic “cull” helped, post pandemic adjustments such as WFH are changing spatial economy
- Service sector trade bet “backfiring” due to AI shock
- Or inducing massive localization & reallocation



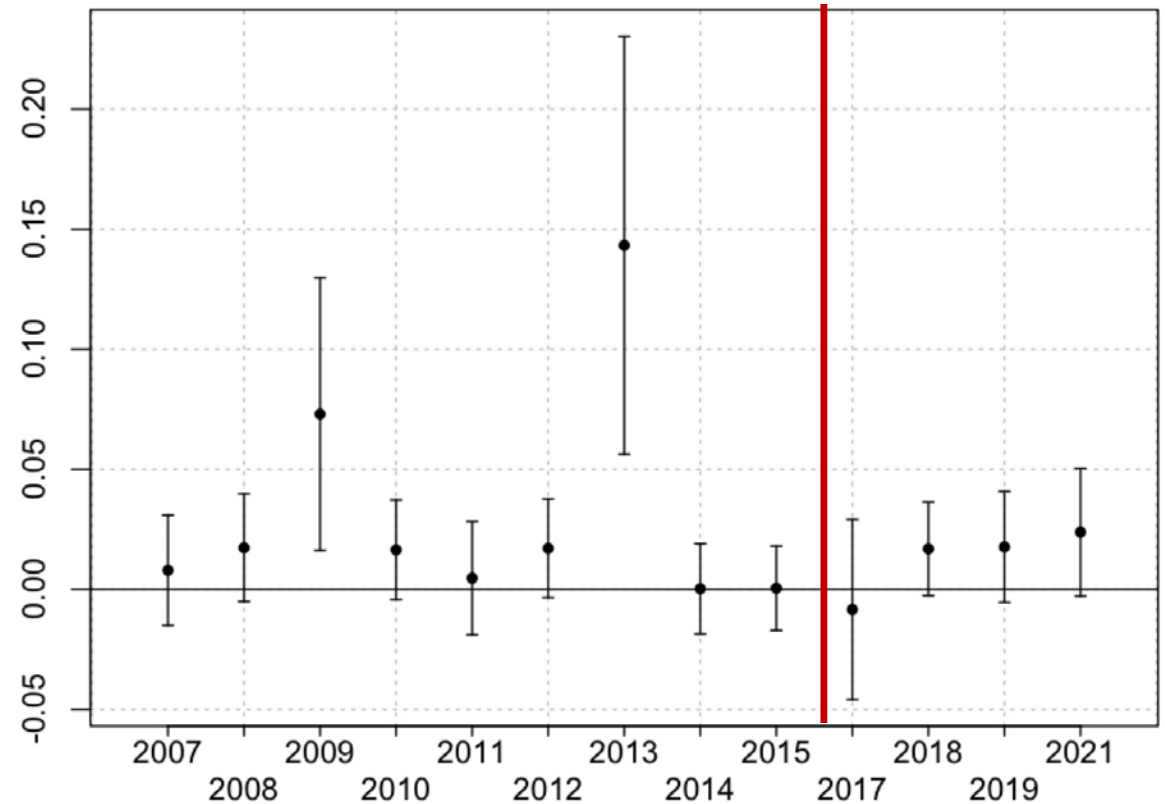
On the immigration narrative?

- Areas that received more immigrants during 2001-2011 are more likely to be economic Brexit vote Losers post 2016
- But: Brexit vote losers are those that, on average, are more Remain-y
- At least based on the regional economic data presented.



Long arc of protest

- Places that would become Brexit vote Losers saw sharp increase in non traditional party vote share (non Lab, LD, C) in local elections (conditional on turnout)
- Unmet demand for plurality may have been “culled” or diluted or it provides for ample mass to mess about in 2022ff
- Narrative channeling and engineering has facilitated sophisticated vote splitting strategies (UKIP, Brexit Party etc.)



Tragedy of a consequential protest vote

- In 2019, carried out an experiment to measure **uncertainty over democratic norms**
- Support for Brexit collapsed already by 2018. But, what has helped to uphold support for Brexit for so long since 2016?
- We document that **uncertainty over democratic norms** is likely an important mechanism.

“Having a second referendum on Brexit is appropriate?”

“How uncertain are you about whether having a second referendum on Brexit is appropriate?”

Table 1 Treatment Overview

	Leavers		Remainers	
	Agreement	Uncertainty	Agreement	Uncertainty
High Level	15%	41%	91%	25%

When Leave supporters **receive information that a large share of other Leavers are relatively uncertain** about whether a repeat referendum would be appropriate, they become ***more likely to donate to and tweet in support of the People’s Vote campaign.***

Way forward

- Logic of the UK's political system generates zero sum politics due to unholy coalition between the privileged preying on the vulnerable
- Brexit damage is not inconsistent with evening out regional imbalances but at huge expense its “leveling down, not leveling up”
- Pandemic fall out will help “fix” some of the structural challenges
- Working from home can undo some of the regional economic cleavages
- UK will soon realize that it struggles with internal immigration just as much as with external
- City of London dislikes WFH due to financial stability concerns
- Massive immigration wave since end of pandemic needed to stabilize
- Significant reallocation and reshaping of the spatial equilibrium in the works

Lunch

14:30 | Brexit and consumer food prices

15:30 | The kindness of strangers: Brexit and bilateral financial linkages

16:30 | Break

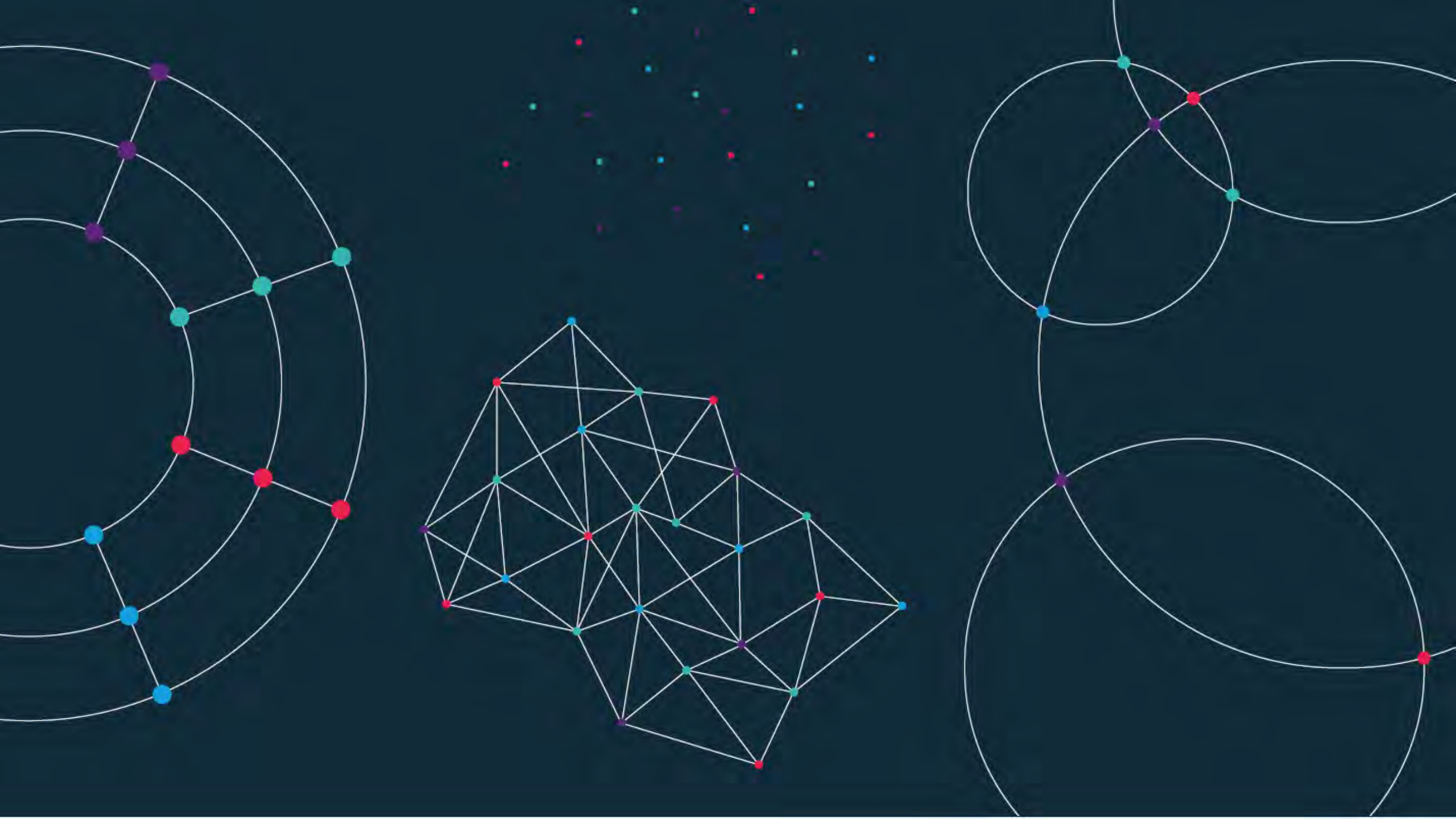
Afternoon Programme

- | | |
|-------|--|
| 14:30 | Brexit and consumer food prices |
| 15:30 | The kindness of strangers: Brexit and bilateral financial linkages |
| 16:30 | Break |
| 17:00 | Trade in services and the trade and co-operation agreement |
| 18:00 | Close |

Brexit and consumer food prices

Presenter: Richard Davies (LSE)

Discussant: Daniela Glocker (OECD)



Trade and inflation.

The Brexit impact, and towards automated price collection

Presenter: Richard Davies (LSE)

Joint with:

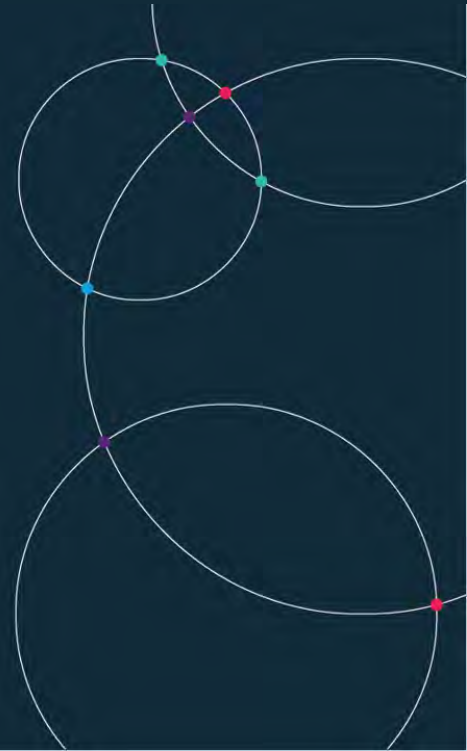
Paper 1: Jan David Bakker (Bocconi & CEP), Nikhil Datta (Warwick & CEP), Josh De Lyon (OECD & CEP)

Paper 2: Josh Hellings (LSE), Finn McEvoy (LSE)

NIESR. Friday 17th November 2023



Economic
and Social
Research Council



Summary.

Today's argument



Summary

Today's argument

Motivation:

- Historically significant rise in food prices.
- What are the implications (costs) of this?
- How much of it is due to import prices?
- Answer this with two micro-data approaches.
 - (1) Matching official (ONS) UK micro-data with UN trade data.
 - (2) Building new micro-data set of supermarket prices.

Summary

Today's argument

Paper 1: Non-tariff barriers and consumer prices: Evidence from Brexit ([CEP, 2022](#); [2023 update](#))

- Idea: Track item by item exposure to EU imports. Find that imports from EU have higher price growth
- Impact: Significant increases when TCA came into force. Brexit increased food prices by c3% per year in 2020 and 2021
- Mechanism: Price increases entirely driven by products with high non-tariff barriers (NTBs). Find high but imperfect pass-through of NTBs into prices (50% - 83%).
- Welfare: back-of-the envelope calculation on price and quantity changes equivalent to an income loss of £210 per household.

Summary

Today's argument

Paper 2: Towards an automated CPI. {Preliminary work}

- Technological leap:
 - (1) Automated Price Gathering;
 - (2) ML tools including LLMs (e.g. Chat-GPT).
- We employ automated techniques to gather 100,000 prices per day, then use LLMs to parse it.
- **Question:** can a real-time CPI that tracks sources of inflation be built?
- **Answer:** tentatively, yes...

Summary

Today's argument

Policy implications

- On EU trade:
 - Powerful evidence that weaker trade deals contribute to cost of living crisis.
 - More optimistically: improved trade deals can improve ToT, boosting real wages.
- On data:
 - Reminder that price changes are signals. Not all price changes are alike.
 - Modern price collection methods gather much more data than just prices. The result is far too much information. LLMs can help us sift it, disentangling the source of inflation.
 - Monetary Policy 101 tells us that inflation with different sources of inflation (Demand v Supply) should lead to different responses.

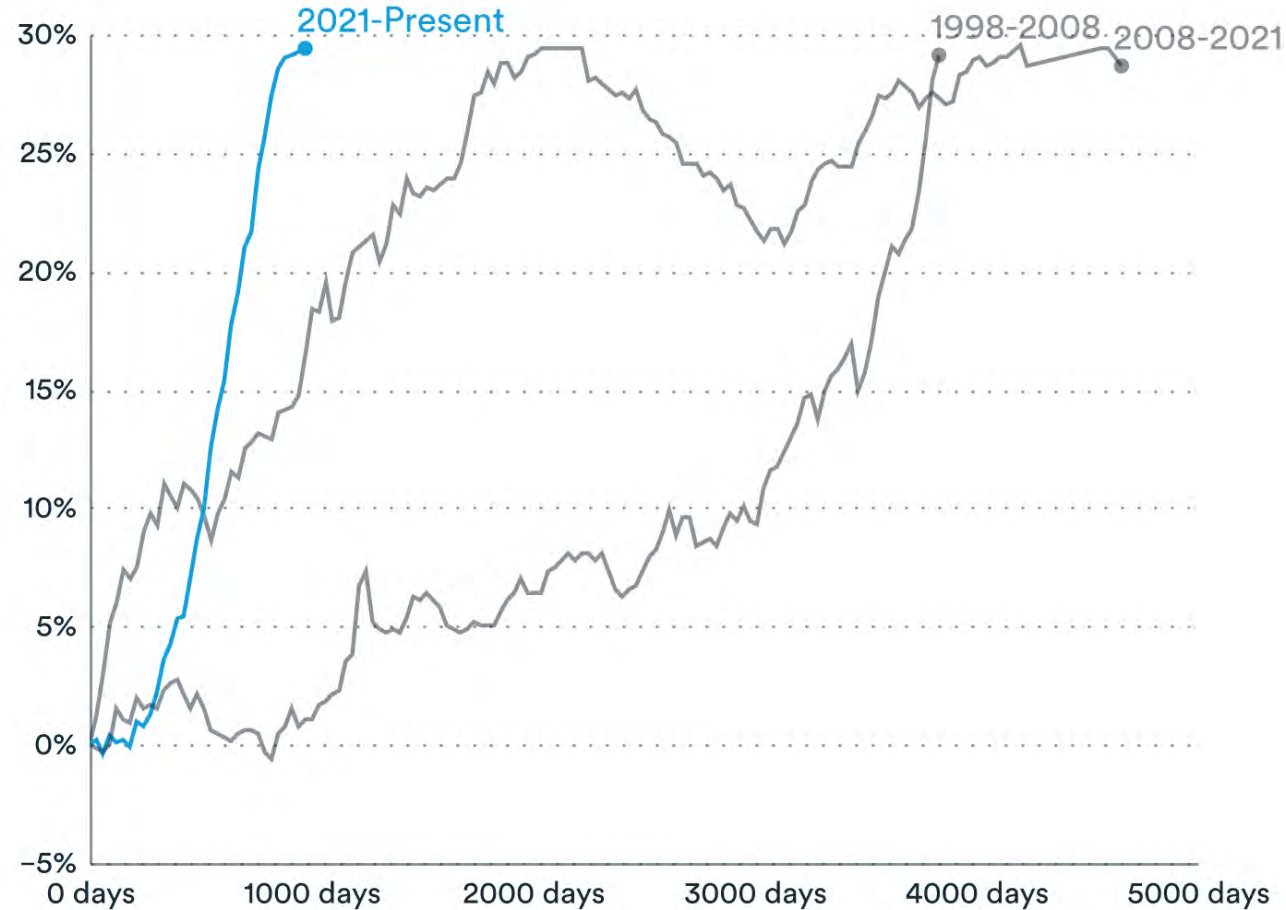
Some facts.

A historic rise in prices



Food CPI

A historic rise (CPI index 01 – food)



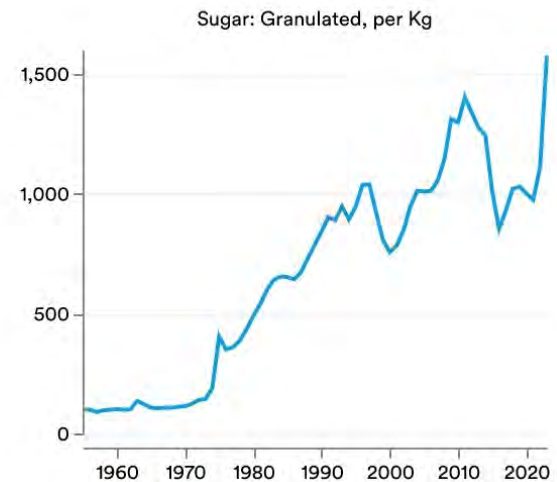
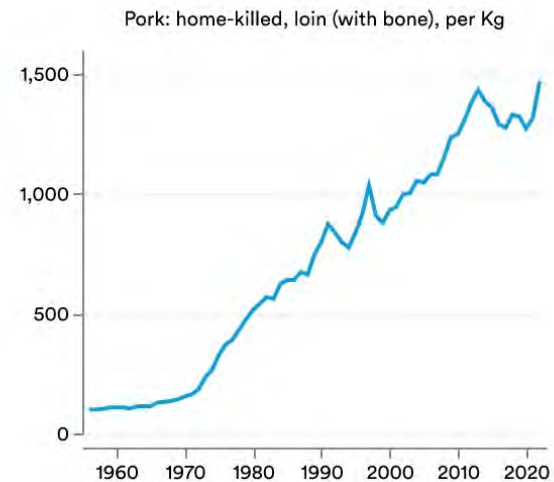
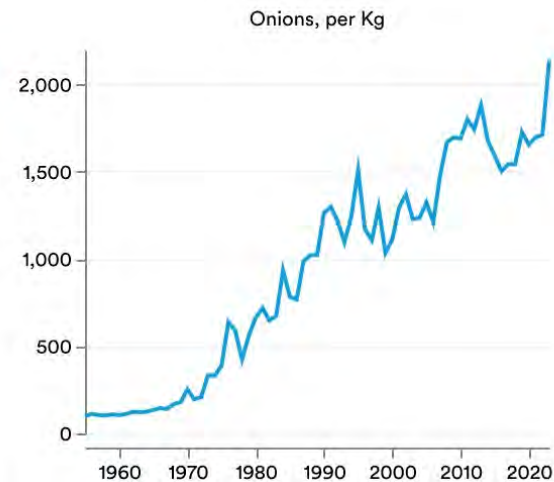
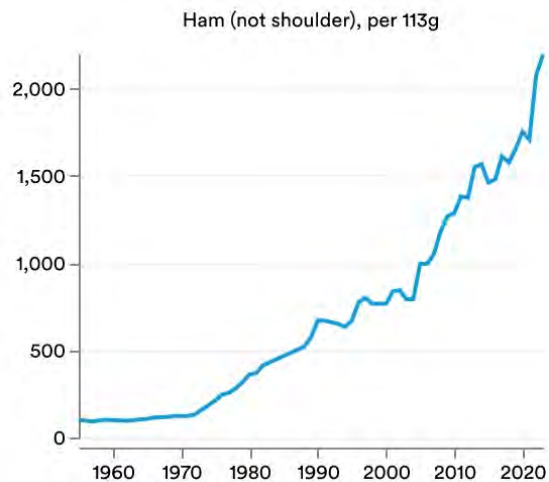
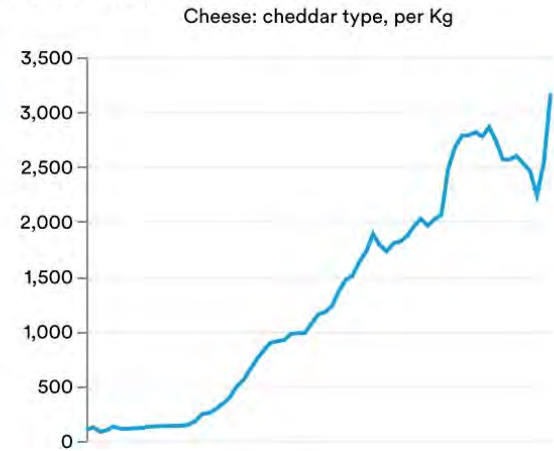
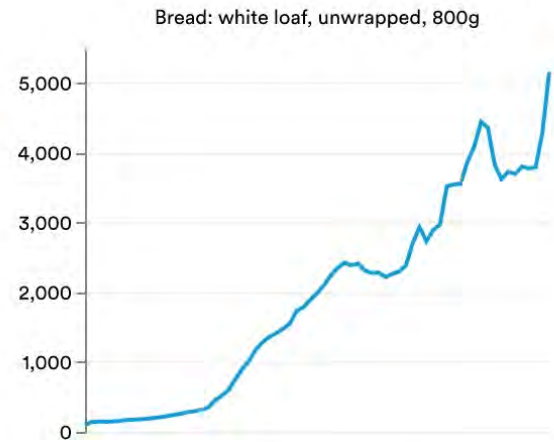
Between January 2021 and October 2023 (1003 days), the food index increased 30%.

It took 4658 days (March 2008 – Jan 2021) for prices to increase by 30% before that

Longer run data

Food items in the longer run RPI data

Retail Prices Index
1955 = 100, 1955 to Oct 2023



Very long run data

How bad has recent experience been?

2-year periods

2021 to 2023 -15th highest inflation

Higher up this league table are:

- Wars
- 1970s oil shocks

	t0	t2	p_change
0	1916	1918	53.1%
1	1915	1917	48.2%
2	1974	1976	44.8%
3	1973	1975	44.2%
4	1975	1977	35.0%
5	1917	1919	34.4%
6	1978	1980	33.8%
7	1914	1916	32.7%
8	1979	1981	32.0%
9	1939	1941	29.5%
10	1823	1825	27.4%
11	1918	1920	27.1%
12	1972	1974	26.6%
13	1852	1854	25.9%
14	1976	1978	25.5%
15	2021	2023	23.9%
16	1977	1979	22.8%
17	1980	1982	21.5%
18	1938	1940	20.2%
19	1803	1805	19.1%

Brexit impact.

Paper 1 – the role of NTBs



Non-tariff barriers and consumer prices: Evidence from Brexit

Jan David Bakker
Bocconi & CEP

Nikhil Datta
Warwick & CEP

Richard Davies
U Chicago & LSE

Josh De Lyon
Oxford & CEP

Motivation: the importance of NTBs

- **Global question.** Inflation at a 40-year high in many advanced economies
- Good understanding of pass-through for tariffs & exchange rates
- Tariffs (still) at all-time low.
- **Non-tariff barriers (NTB) key margin for trade policy**
- **This paper: use a historic shift in NTBs (Brexit) to quantify their effect on prices and welfare**

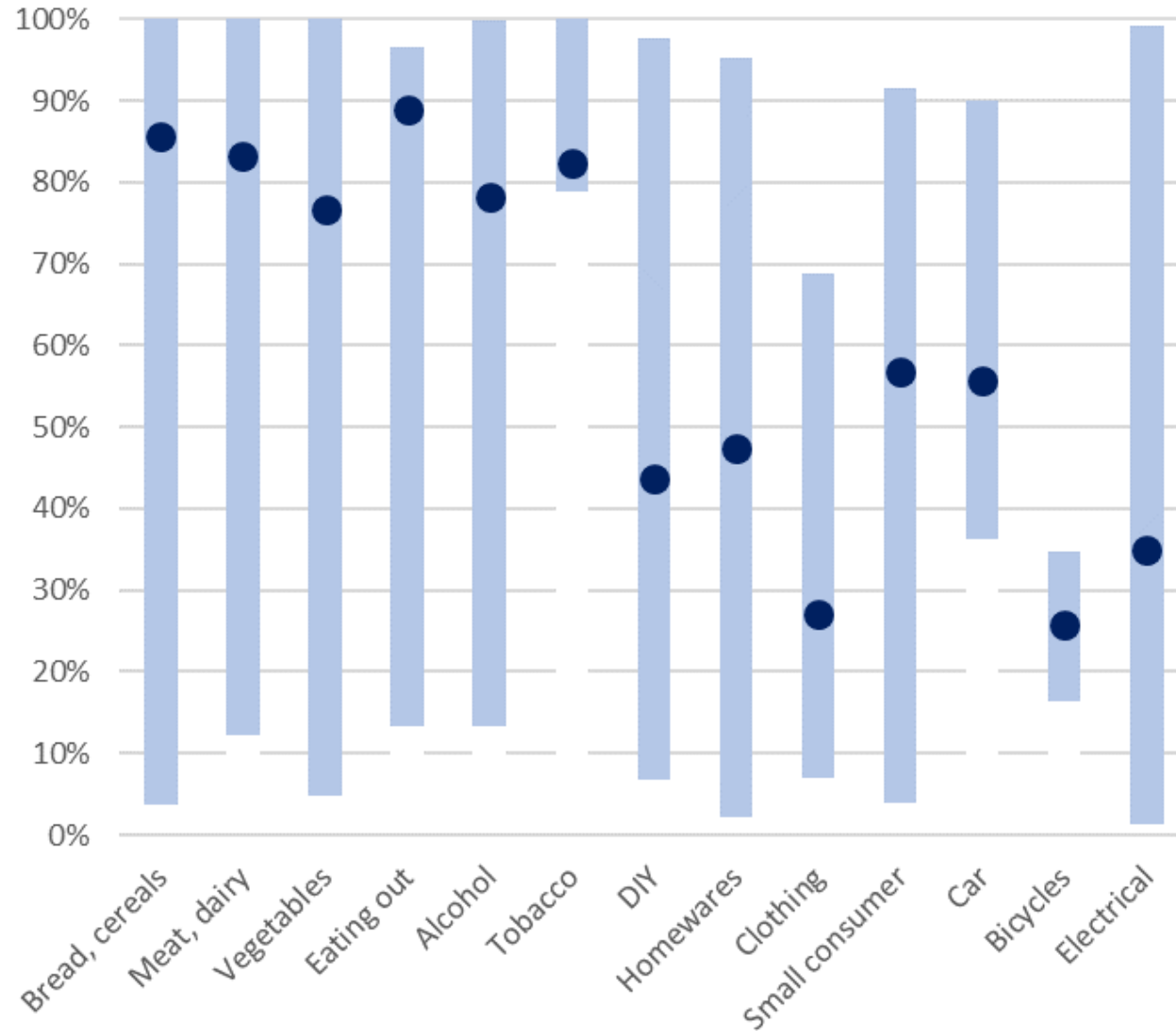
Data

- Micro-level CPI data set from ONS (Davies 2021)
- Bilateral trade flows from UN Comtrade
- Match between trade and price data:
 - Result: for each CPI food item we have a trade exposure measure.
- NTB data from World Bank and Global Trade Analysis Project
- Why focus on food products?

Practicalities – matching the data

- Constructing the match was tricky.
- The micro price data is consumer focused
 - “LADY’S UMBRELLA – FOLDING”
- The bilateral trade data is legalistic:
 - “Umbrellas, sun umbrellas, walking-sticks, seat sticks, whips, riding crops; and parts thereof”
- We conducted the match manually, then did a blind cross check.

EU exposure – by category



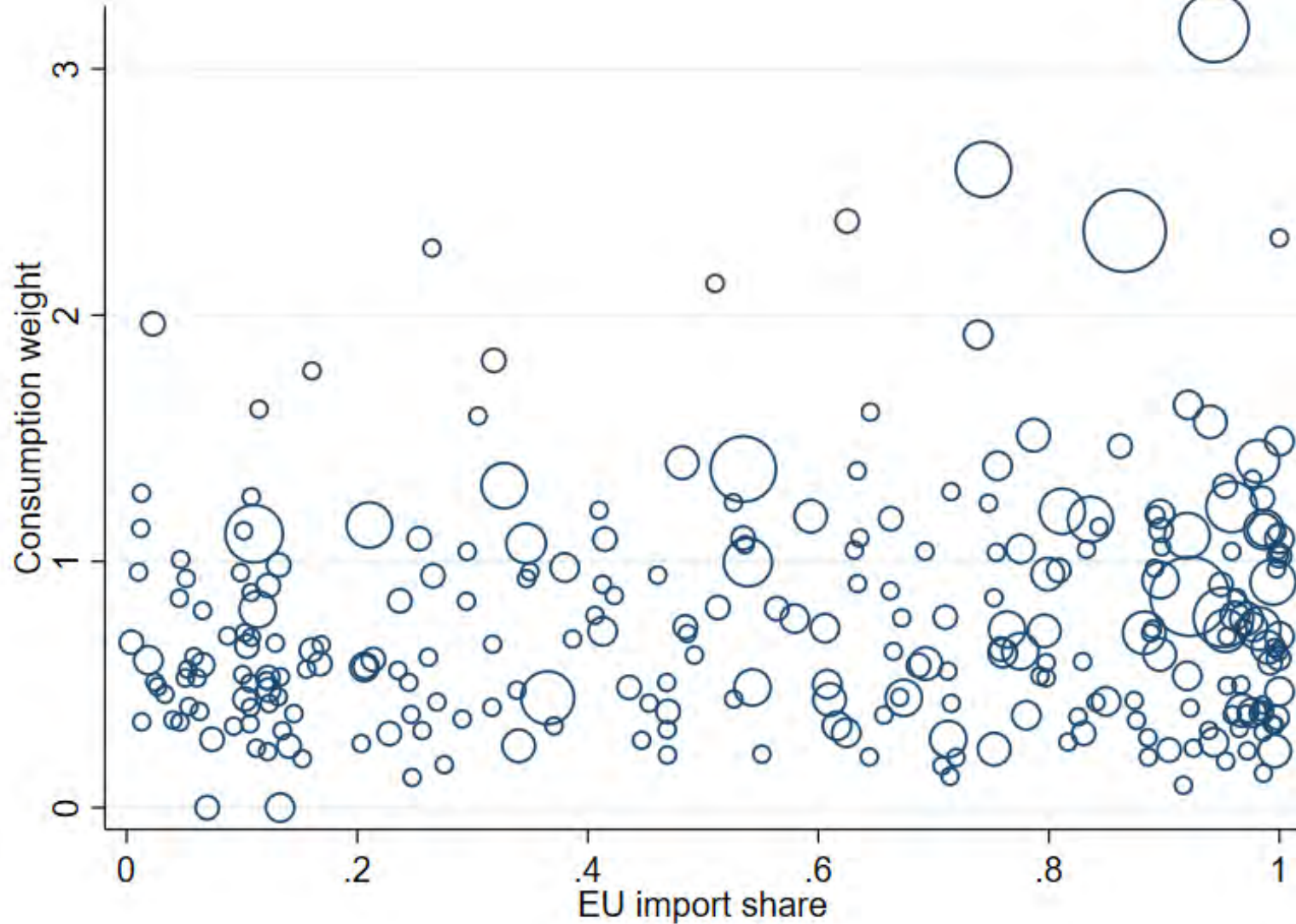
Lowest EU share is the Umbrella category above.

High shares in e.g. dairy produce.

We focus on food products:

- Biggest area of inflation, policy focus, and consumer cost.
- Precise, narrowly defined categories with high match share
- Tend to be imported as nearly-finished goods
- Significant variation in NTBs

EU exposure – and consumption weights



Post match analysis:

Import shares vs consumption weights.

{Size of bubbles = n products}

Trade data: CPI data

- Many matches (honey) are 1:1
- Some (e.g. bread) are 1:m

A pause: what drives inflation?

Post 1992 – the primary macro variable – in the UK and globally

Lots of things go into it:

- The flavour of index chosen:
- The weights – and how they change over time:
- ONS steps: sampling, validation etc.
- The way gaps are filled. Linking etc.
- The prices themselves.



Consumer Prices Indices Technical Manual, 2019

This technical manual is a reference tool for anyone wanting to understand how measures of consumer price inflation and associated indices are compiled.

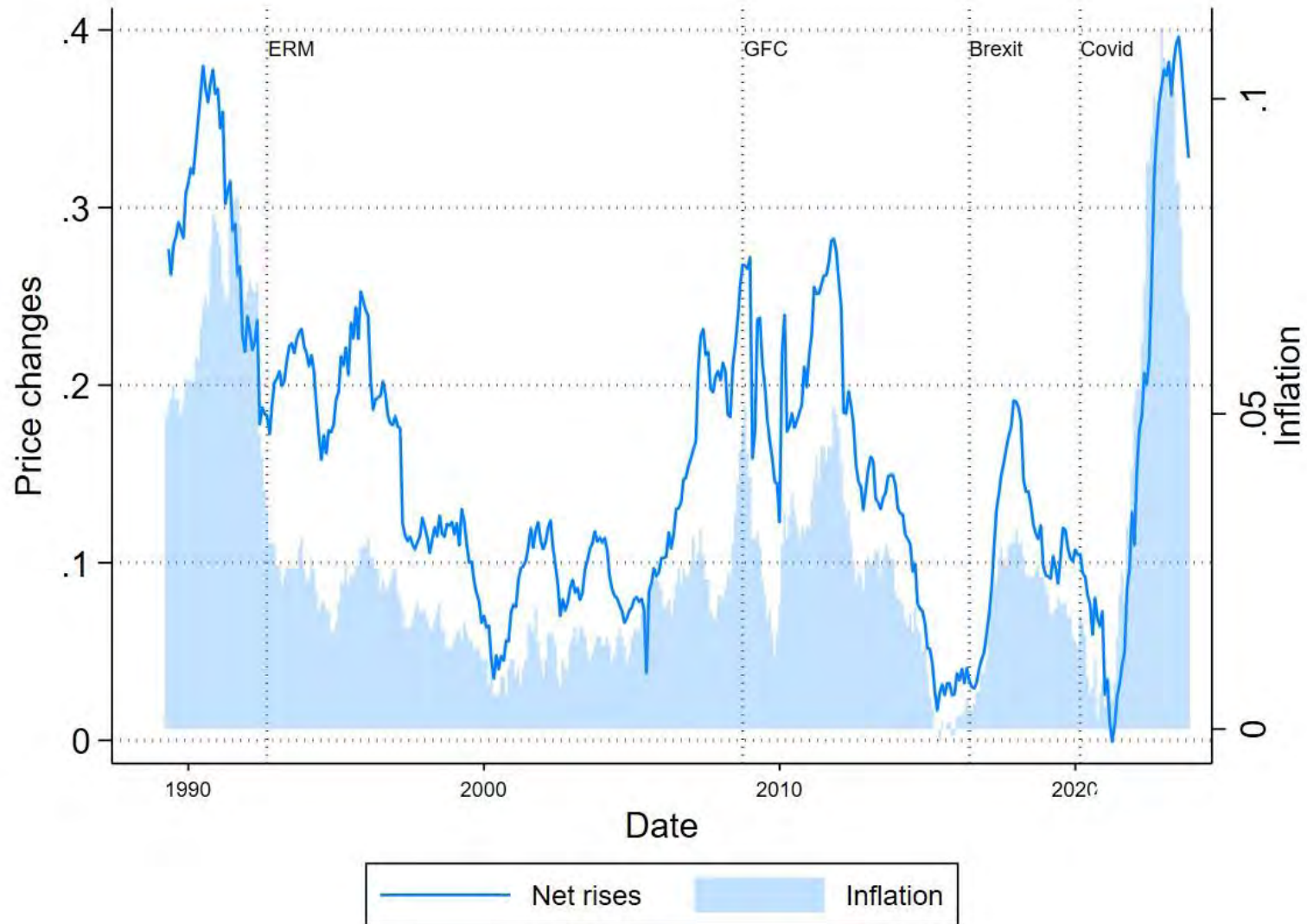
Contact:
Helen Sands
cpi@ons.gov.uk
+44 1633 456900

Release date:
22 March 2023

Next release:
To be announced

118 pages of decisions, assumptions etc!

A pause: what drives inflation?



A simple measure, the net share of price rises, is a strong predictor of the official (weighted, linked, Jevons, etc) ONS inflation rate.

Q. How does this metric look, when we examine our matched trade and CPI data?

Price changes: four EU exposure buckets

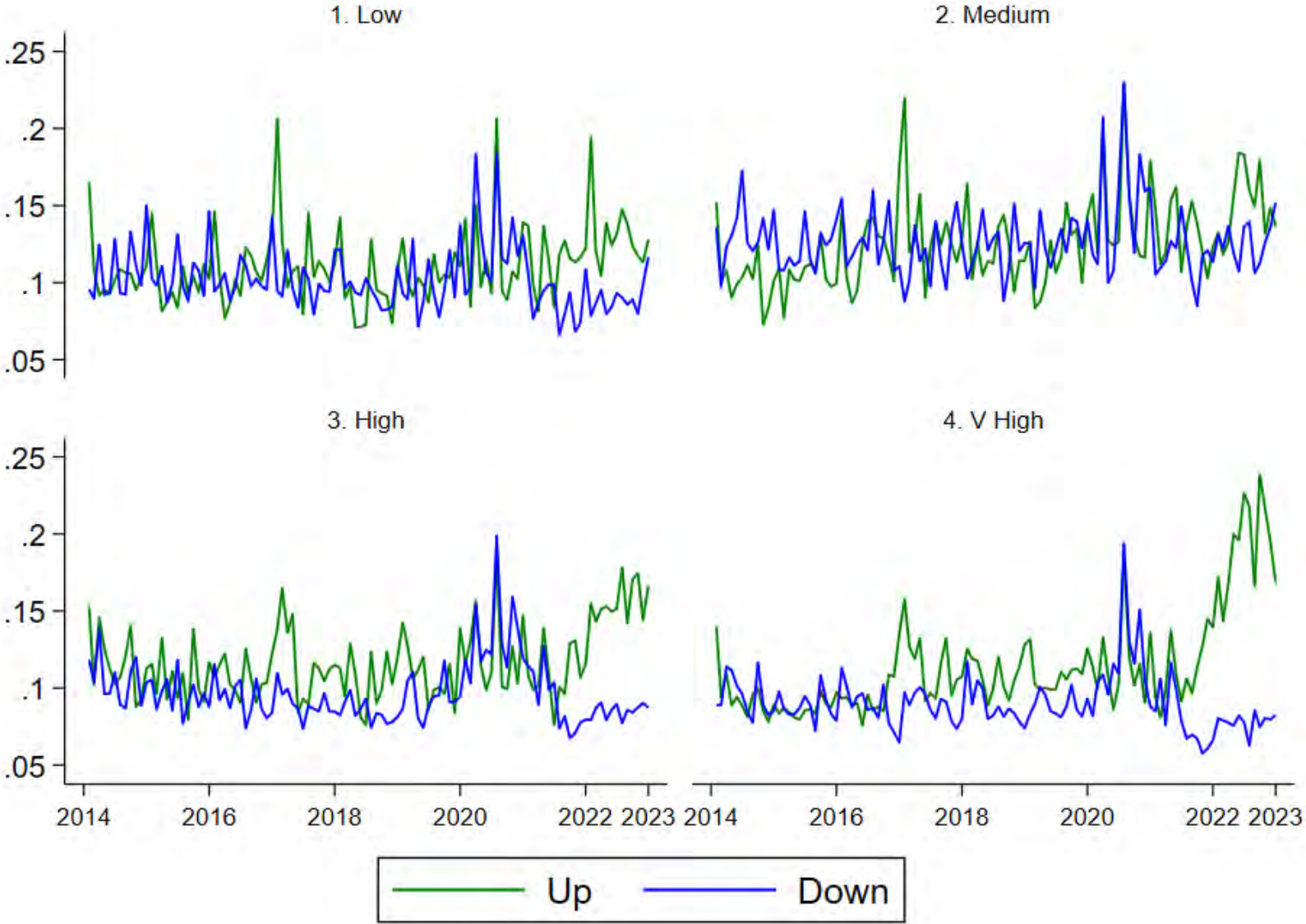


Figure is the proportion of prices, analysed at the firm-good-region level, which are rising or falling compared to their previous monthly value. Consumer items are split by EU exposure with low (0-40%), medium (40%-60%), high (60%-80%) and very high (80%+) groupings.

NTBs due to Brexit

- After Brexit, goods subject to customs checks, SPS measures, TBTs, etc
- Firms face fixed costs of adjustment
- Two measures of NTB AVE estimates:
 - GTAP: EU-Canada
 - World Bank: Unilateral EU

Event study

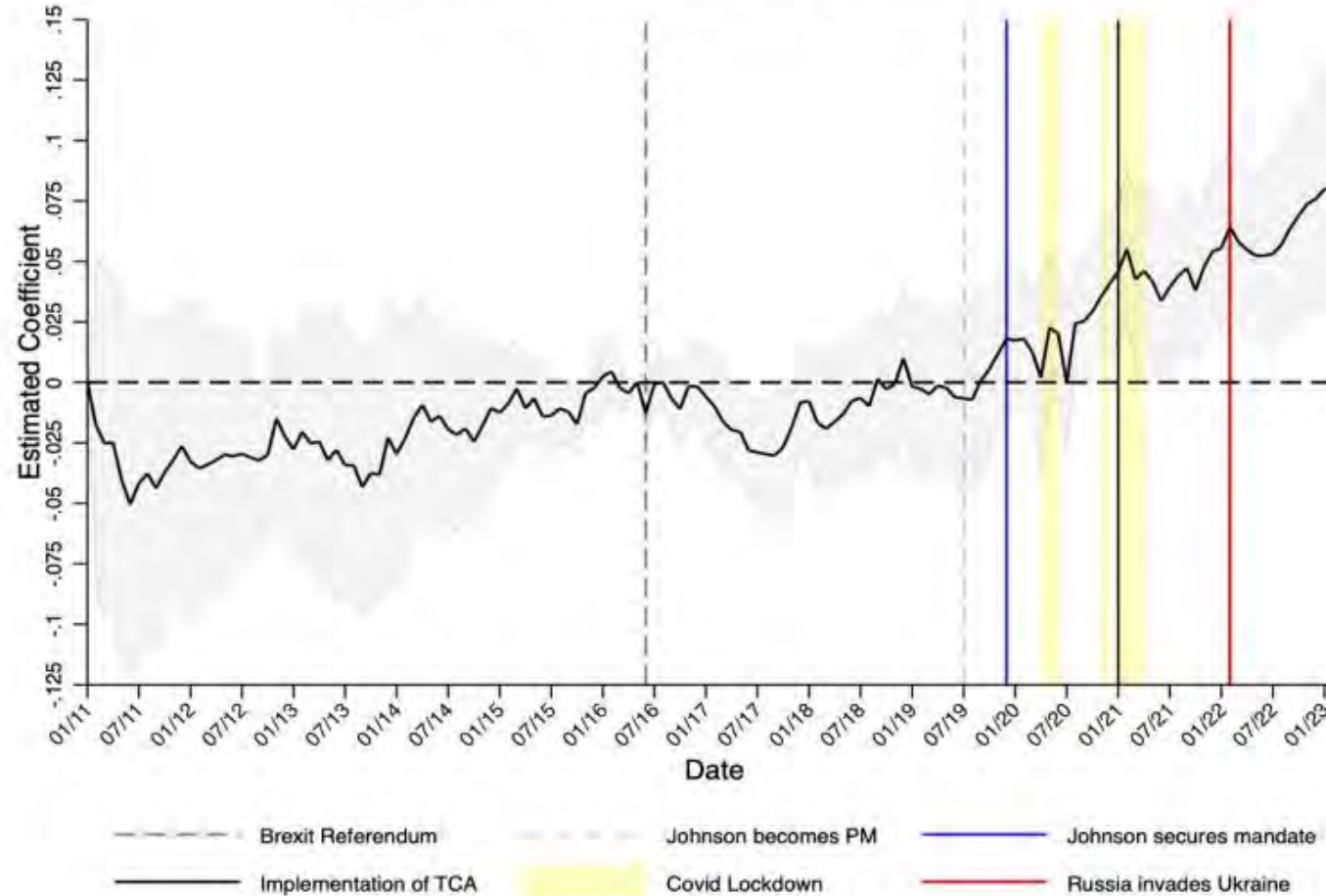
Regression specification:

$$\log(P_{it}) = \sum_{k \neq \text{May}2016}^K \beta^k \log \left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{\text{Total}}} \right) \times \mathbb{1}\{t = k\} + \alpha_j + \tau_t + [\alpha_j \times \gamma_m] + \varepsilon_{it} \quad (1)$$

- $\frac{M_{i,2015}^{EU}}{M_{i,2015}^{\text{Total}}}$: quantity import share from the EU
- α_j : product FE
- τ_t : year-month FE
- γ_m : month of the year FE

Event study

Figure 1: EU Exposure and Food Prices



Notes: The figure presents price differences for food products more and less exposed to Brexit via EU import exposure. Specifically, the figure presents the estimates of $\hat{\beta}^k$ from equation 1 and 95% confidence intervals based on the standard errors clustered at the product level.

Mechanism: Specification

$$\begin{aligned}\log(P_{it}) = & \beta_H^E \times Post_t^E \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i > NTB^{p50}\} \\ & + \beta_L^E \times Post_t^E \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i \leq NTB^{p50}\} \\ & + \beta_H^B \times Post_t^B \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i > NTB^{p50}\} \\ & + \beta_L^B \times Post_t^B \times \log\left(\frac{M_{i,2015}^{EU}}{M_{i,2015}^{Total}}\right) \times \mathbb{1}\{NTB_i \leq NTB^{p50}\} \\ & + Post_t^E \times NTB_i + Post_t^B \times NTB_i + \alpha_i + \tau_t + [\alpha_i \times \gamma_m] + \varepsilon_{it}\end{aligned}$$

Mechanism: Price effects driven by high NTB products

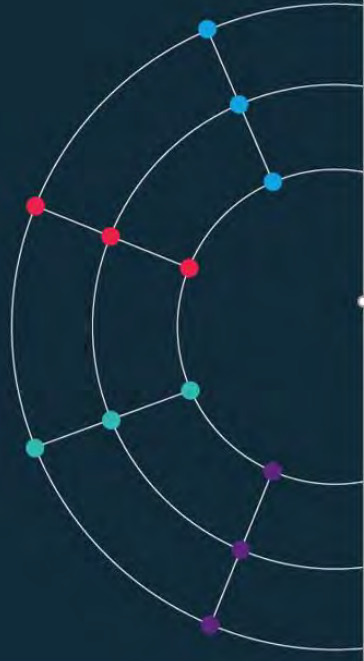
	(1)	(2)	(3)	(4)
	Log Price	Log Price	Log Price	Log Price
Low NTB × Log EU Share × Post Brexit	-0.0268 (0.0325)	-0.0282 (0.0327)	0.0343 (0.0312)	0.0327 (0.0312)
High NTB × Log EU Share × Post Brexit	0.0887*** (0.0110)	0.0890*** (0.0110)	0.0845*** (0.00931)	0.0848*** (0.00927)
Low NTB × Log EU Share × Post Election	-0.0343 (0.0236)	-0.0354 (0.0237)	0.0152 (0.0267)	0.0137 (0.0265)
High NTB × Log EU Share × Post Election	0.0619*** (0.00892)	0.0610*** (0.00900)	0.0525*** (0.00905)	0.0520*** (0.00906)
Year-Month FE	Yes	Yes	Yes	Yes
Product FE	Yes	No	Yes	No
Product-Month FE	No	Yes	No	Yes
Observations	8593	8593	8593	8593
R^2	0.987	0.989	0.987	0.989
NTB Data Source	World Bank	World Bank	GTAP	GTAP

Welfare calculation

- Simple framework.
- Essentially micro 101 – supply shifts in, loss of consumer surplus.
- We have prices [as above] get quantities from expenditure data.
- Loss is £210 per household.
 - Rises (c50%) with expenditure share on food (10th v 90th centile).
- *Question: this is static. What if the proper way to account for a shift upwards in prices?*

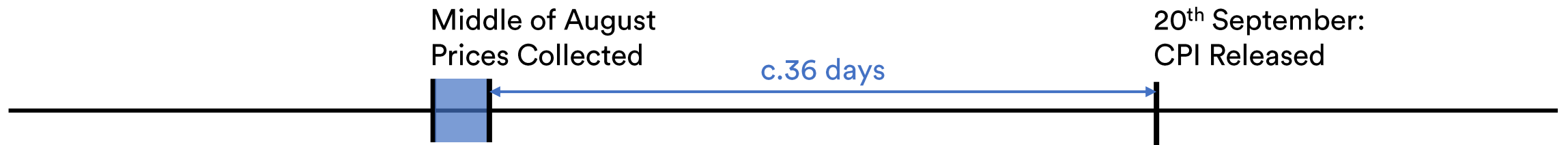
Paper 2 – sources of inflation

Can automated data collection help?



Motivation: timing

Creating a daily CPI measure



Prices that changed after mid July

- Collected mid August
- Incorporated in CPI 20th September
- At least a month before the MPC gets access

Motivation: a wider range of prices

Collection, a wide range

Date	Item	Store	Price	Relative Price
Jul-23	SIX BREAD ROLLS-WHITE/BROWN	801	1	1.053
Jul-23	SIX BREAD ROLLS-WHITE/BROWN	802	1.15	1.15
Jul-23	SIX BREAD ROLLS-WHITE/BROWN	803	0.79	1
Jul-23	SIX BREAD ROLLS-WHITE/BROWN	808	1.4	1
Jul-23	SIX BREAD ROLLS-WHITE/BROWN	814	0.9	0.919
Jul-23	SIX BREAD ROLLS-WHITE/BROWN	60	1.79	1



150 Bread Roll Prices
July 2023, ONS

>1500 Bread Roll Prices
August 2023, Us

Motivation: sources of inflation

Understanding where price changes come from

Supermarket web sites include lots of extra data not included in CPI.

Where made

Where packaged

Various sizes, shapes.

Could this help us identify where inflation is coming from?

In particular, not all NTBs are in place (aim is 2024 for many) – can we track their price impact? ([IFG blog](#))



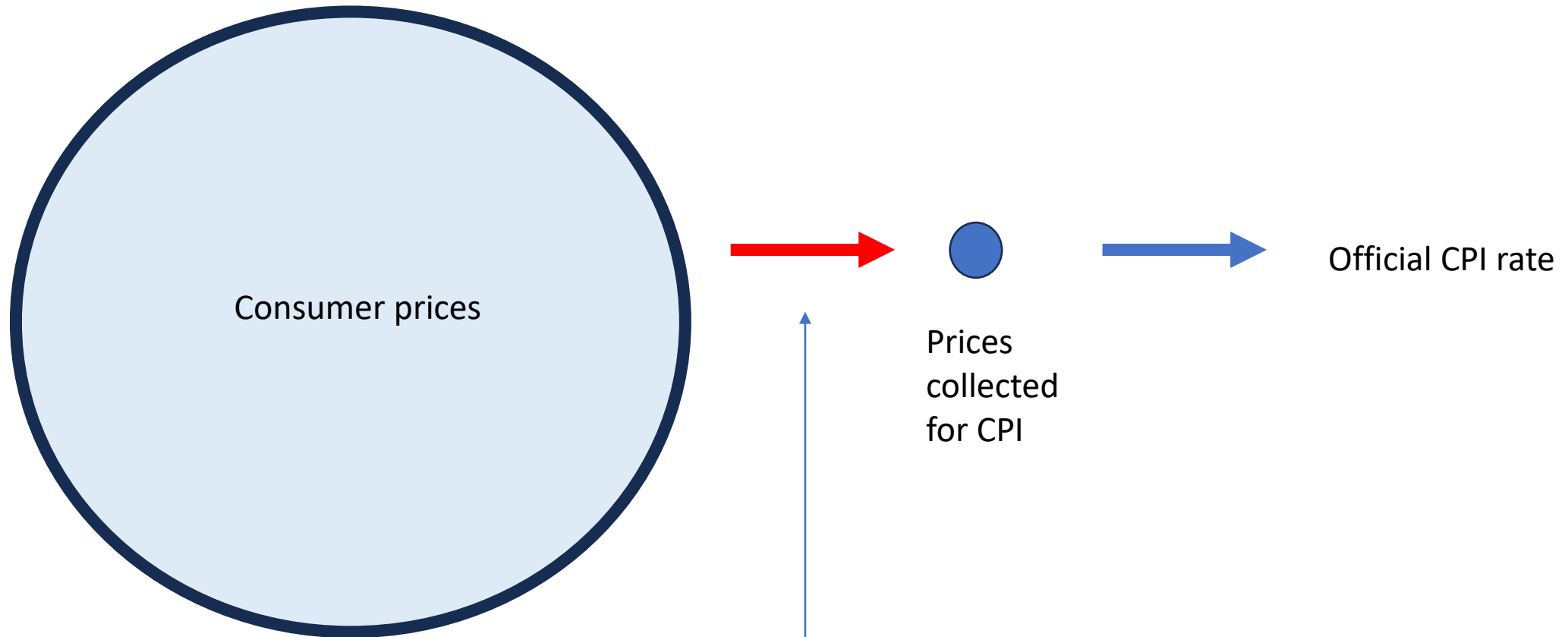
Policy takeaway / question

What prices should we track?



Policy takeaway / question

What prices should we track?



This step is due to costs. But costs have dropped. What information is lost here, and could it improve policy?

Literature

Others' attempts at automated price collection

- **Narodowy Bank Polski** has collected 159M prices since 2009, with a 0.77 CPI-ECPI correlation.
- **Australian Bureau of Statistics** has used 1 million prices from 65 stores in headline CPI since 2016.
- **Statistik Austria** has combined internet and scanner data for a large product range since 2021.
- **The Bank of Japan** are testing survey response sentiment analysis as a leading inflation measure.
- **The Billion Prices Project** have collected worldwide since 2007 and found bias in Argentinian CPI releases.

The challenge

The test we set ourselves with this project

Others research shows that online prices are highly correlated with those in brick-and-mortar stores.

As a result automated CPIs are close to hand collected CPIs

But they also show that automatic collection is tricky.

Can it be done for the UK?

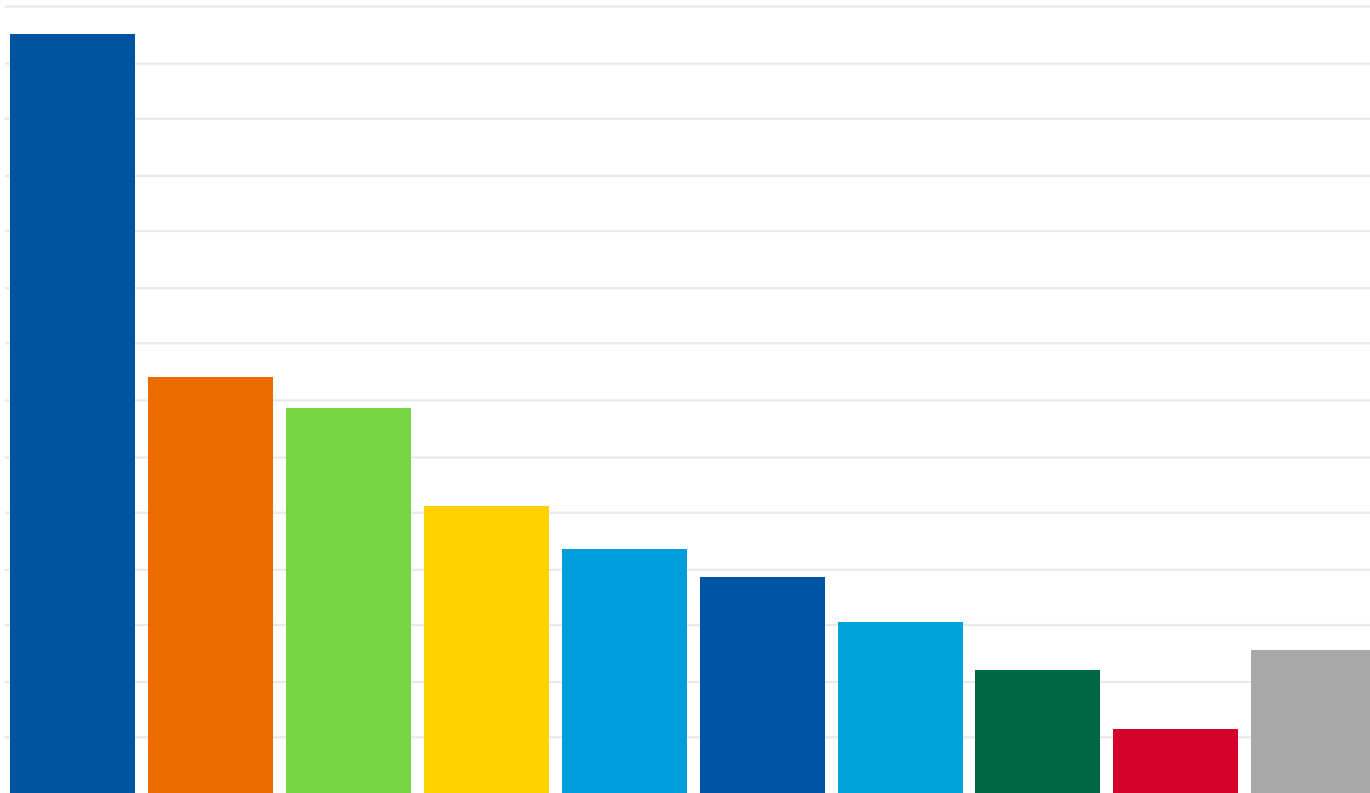
Gathering Prices.

Finding 95,000 prices every day



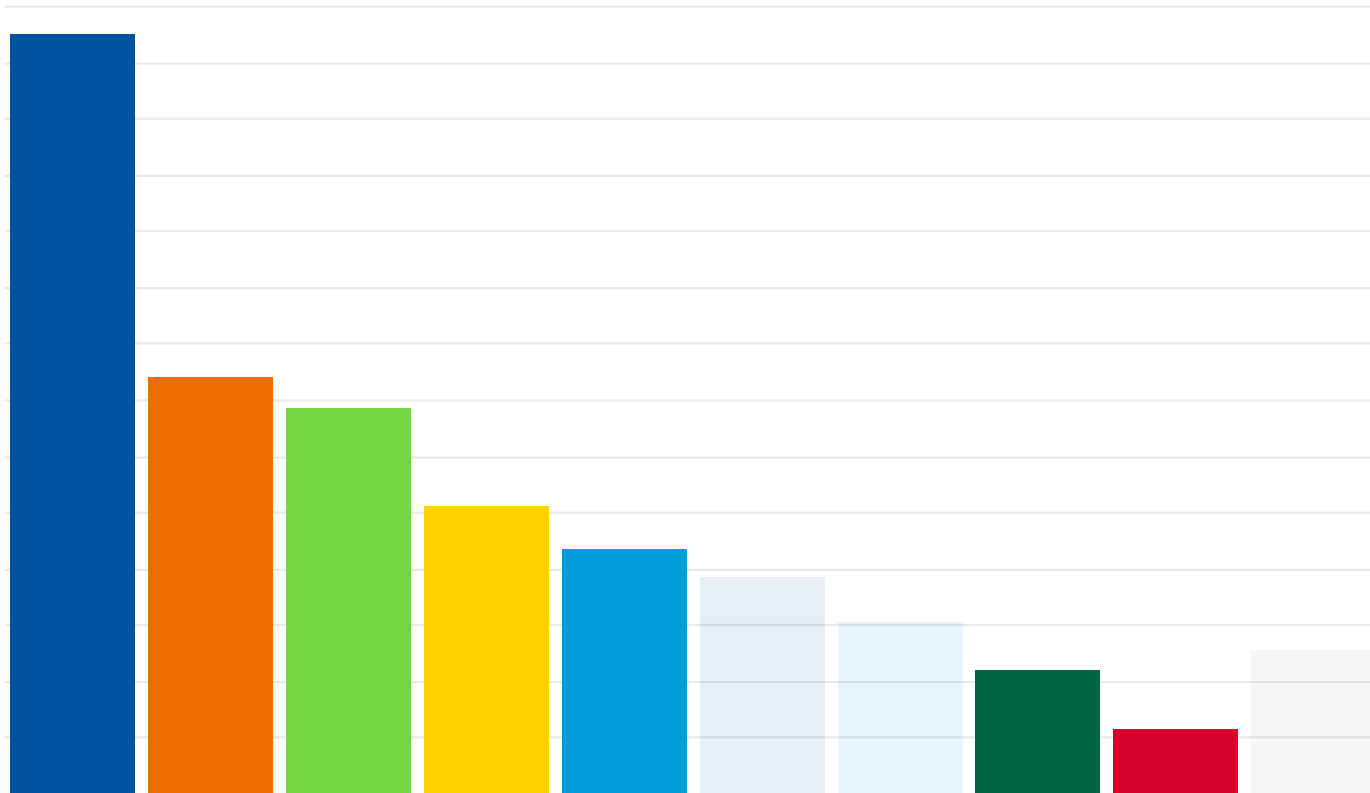
Gathering Prices

Selecting shops



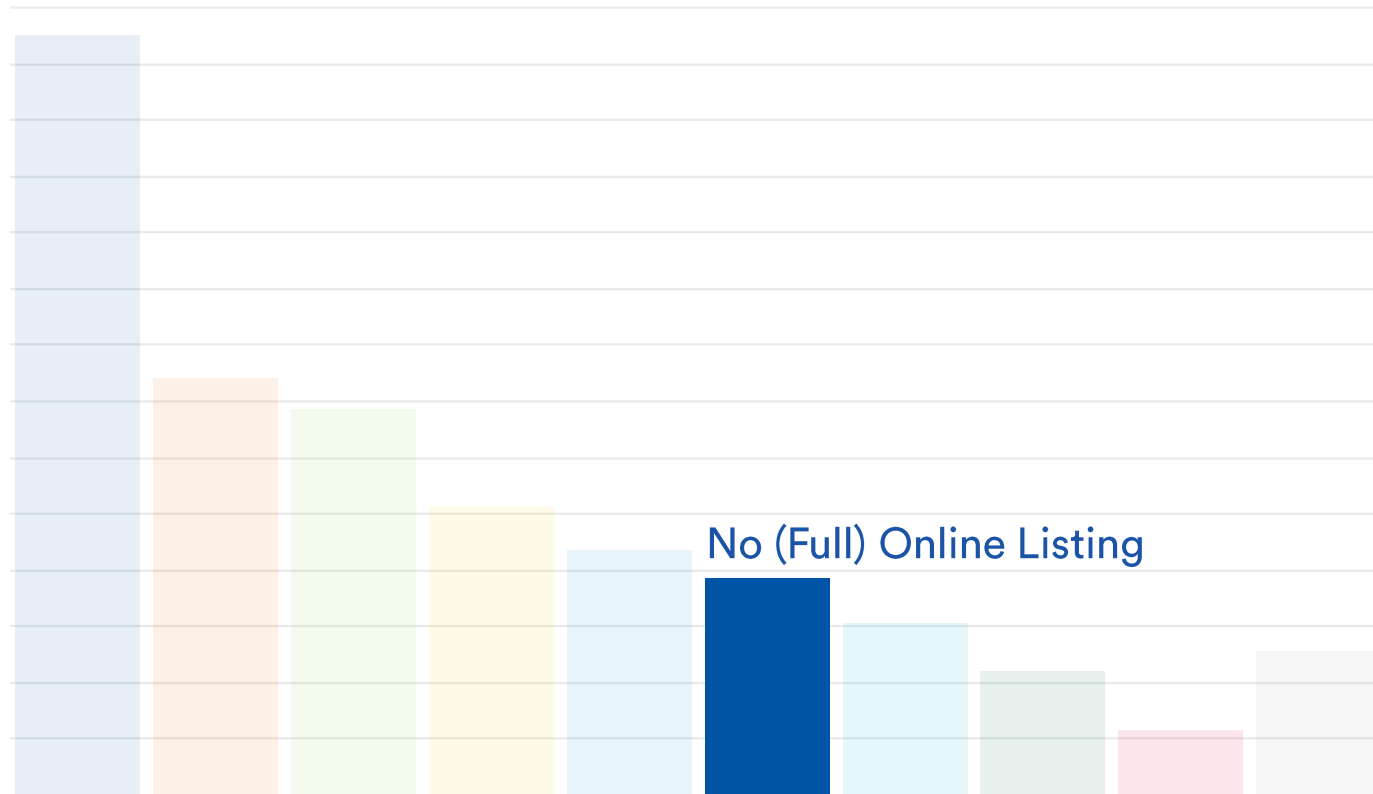
Gathering Prices

Selecting shops



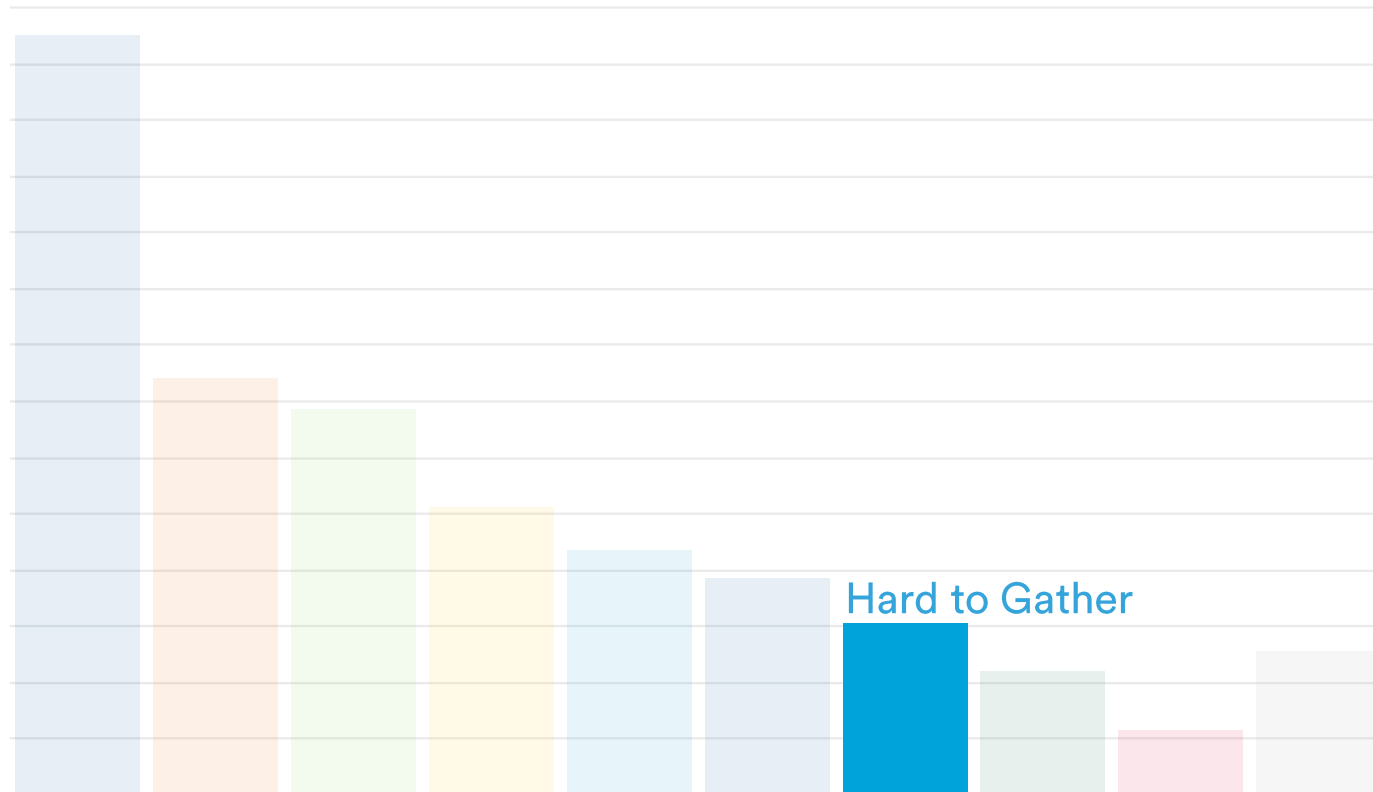
Gathering Prices

Selecting shops



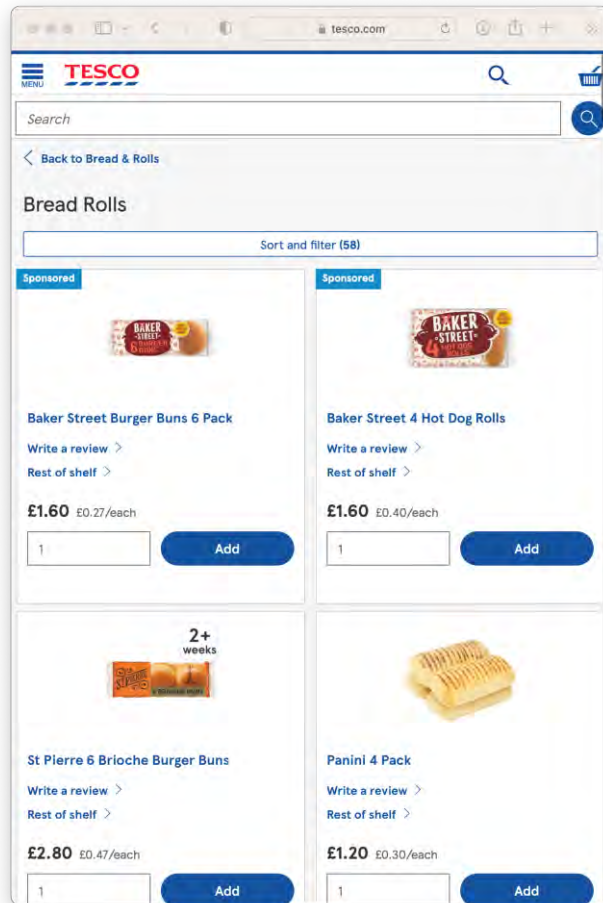
Gathering Prices

Selecting shops



Gathering Prices

From webpages to databases



Product Title	Category	Price	Relative price
Baker Street Burger Buns 6 Pack	Bakery, Bread Rolls	£1.50	£0.27/each
Baker Street 4 Hot Dog Rolls	Bakery, Bread Rolls	£1.60	£0.40/each
St Pierre 6 Brioche Burger Buns	Bakery, Bread Rolls	£2.80	£0.47/each
Panini 4 Pack	Bakery, Bread Rolls	£1.20	£0.30/each

Gathering Prices

One Way

```
1 <div class="product-list-container" data-auto="product-list-container">
2   <div class="product-lists">
3     <div class="product-lists-wrapper">
4       <div>
5         <div class="overlay-spinner--overlay overlay-spinner--large" data-auto="overlay-spinner"></div>
6       </div>
7       <div class="category product-list--page product-list--current-page">
8         <div class="list-page-1">
9           <ul class="product-list grid" data-auto="product-list" data-auto-last-updated="1694687586270">
10            <li class="product-list--list-item first">
11              <div class="styles_StyledVerticalTileWrapper-dvv1wj-0 dtCNPH">
12                <p class="styled_FlashSashContent-sc-9znnul-0 bgPnDo"><strong class="styled_FlashSashText-sc-9znnul-1
13                  ckf5Bk">Sponsored</strong></p>
14                <div data-auto="product-tile" data-auto-type="Quantity" data-auto-available="true"
15                  data-auto-is-restricted-disabled="false" data-auto-is-substitute="false"
16                  class="styles_StyledVerticalTile-dvv1wj-1 fZwbCY">
17                  <div class="styles_StyledTileContentWrapper-dvv1wj-2 bKnhNP ddsweb">
18                    <div id="tile-308463683" data-auto-id="308463683" class="styles_StyledTiledContent-dvv1wj-3
19                      dAeIHg">
20                      <a href="/groceries/en-GB/products/308463683" aria-hidden="true" class="product-image-wrapper"
21                        tabindex="-1" data-di-id="di-id-1ee3aa46-93099dbd">
22                          <div class="product-image__container">
23                            <picture></picture>
31                            </div>
32                          </a>
33                          <div class="product-details--wrapper">
34                            <h3 class="styles_H3-0a5soe-0 gbIAbl"><a href="/groceries/en-GB/products/308463683"
35                              class="styled_Anchor-sc-1i711qa-0 hXcydL ddsweb-link__anchor"
36                              data-auto="product-tile--title" data-di-id="di-id-c64f186d-b1b05b38"><span
37                                class="styled_Text-sc-1i711qa-1 xZAYu ddsweb-link__text">Baker Street Burger Buns 6 Pack</
38                                span></a></h3>
39                            <div class="styles_StyledPromotionsAboveMobile-dvv1wj-7 iPTMu0"></div>
40                            <div class="styles_StyledProductDetailsContent-dvv1wj-5 ddRStS">
41                              <a href="/groceries/en-GB/reviews/submission/308463683?
42                                from=%2Fshop%2Fbakery%2Fbread-and-rolls%2Fbread-rolls" aria-label="Write a review for
43                                Baker Street Burger Buns 6 Pack">Write a review for Baker Street Burger Buns 6 Pack</a>
44                            </div>
45                          </div>
46                        </div>
47                      </div>
48                    </li>
49                  </ul>
50                </div>
51              </div>
52            </div>
53          </div>
54        </div>
55      </div>
56    </div>
57  </div>
58 </div>
```

One Way:

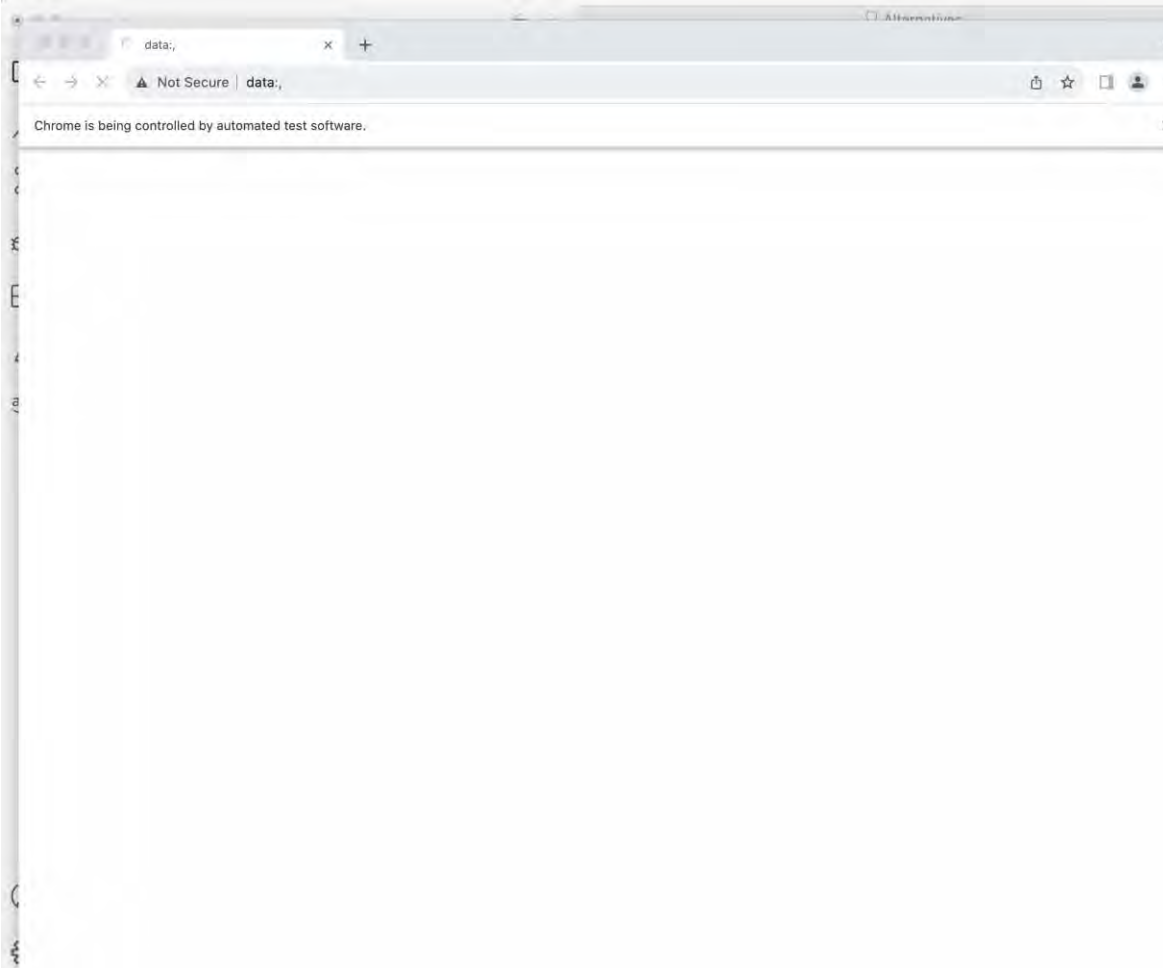
- Requesting webpage source files
- Works by parsing HTML layouts
- Extracting prices right from product grids
- Tools like BeautifulSoup used since 2004

... but:

- Websites check for human users
- Modern pages load data dynamically

Gathering Prices

An Alternative (1)



An alternative:

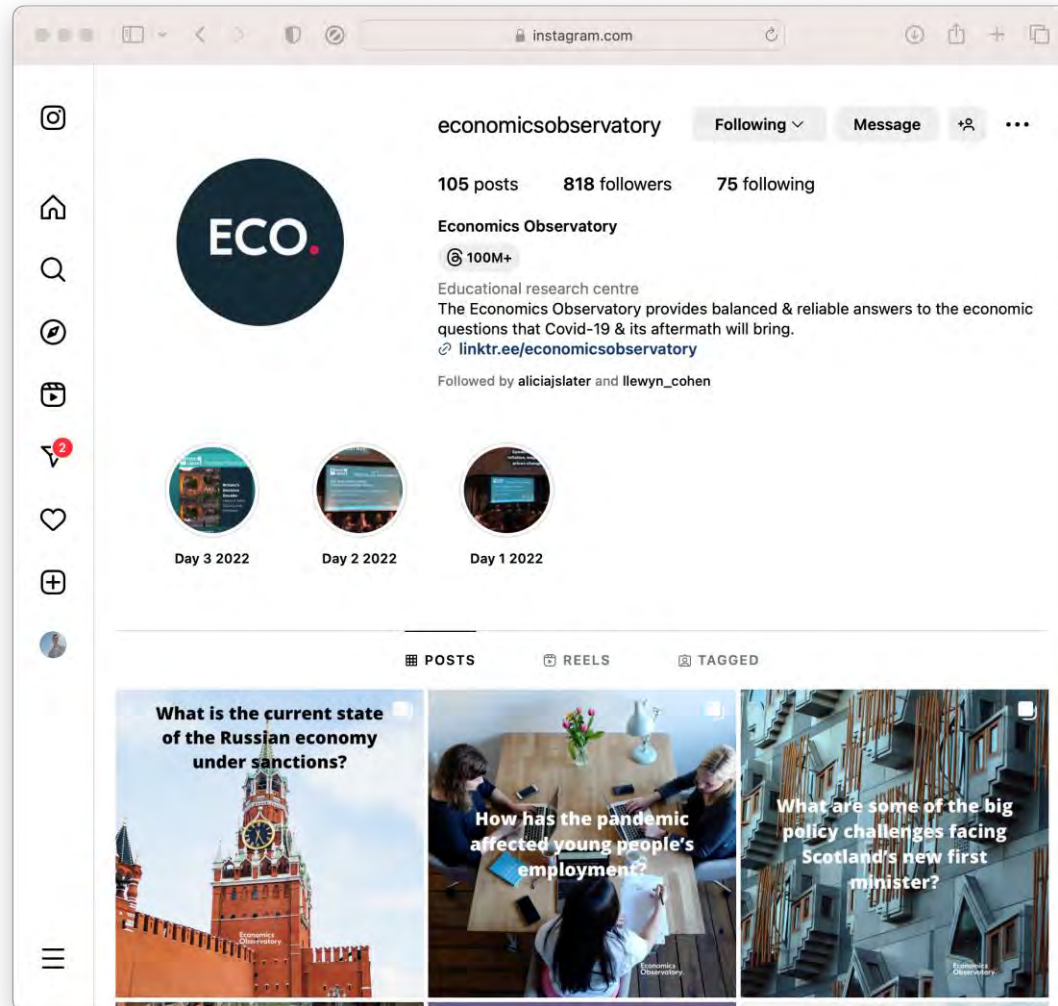
- Controlling a real browser
- W3C Specification and Selenium
- These programmatically control browsers
- We write code to load pages, scroll and click

But...

- Slow
- Resource Intensive
- Messy Data
- Sensitive to Website layout changes

Gathering Prices

An Alternative (2)



An alternative:

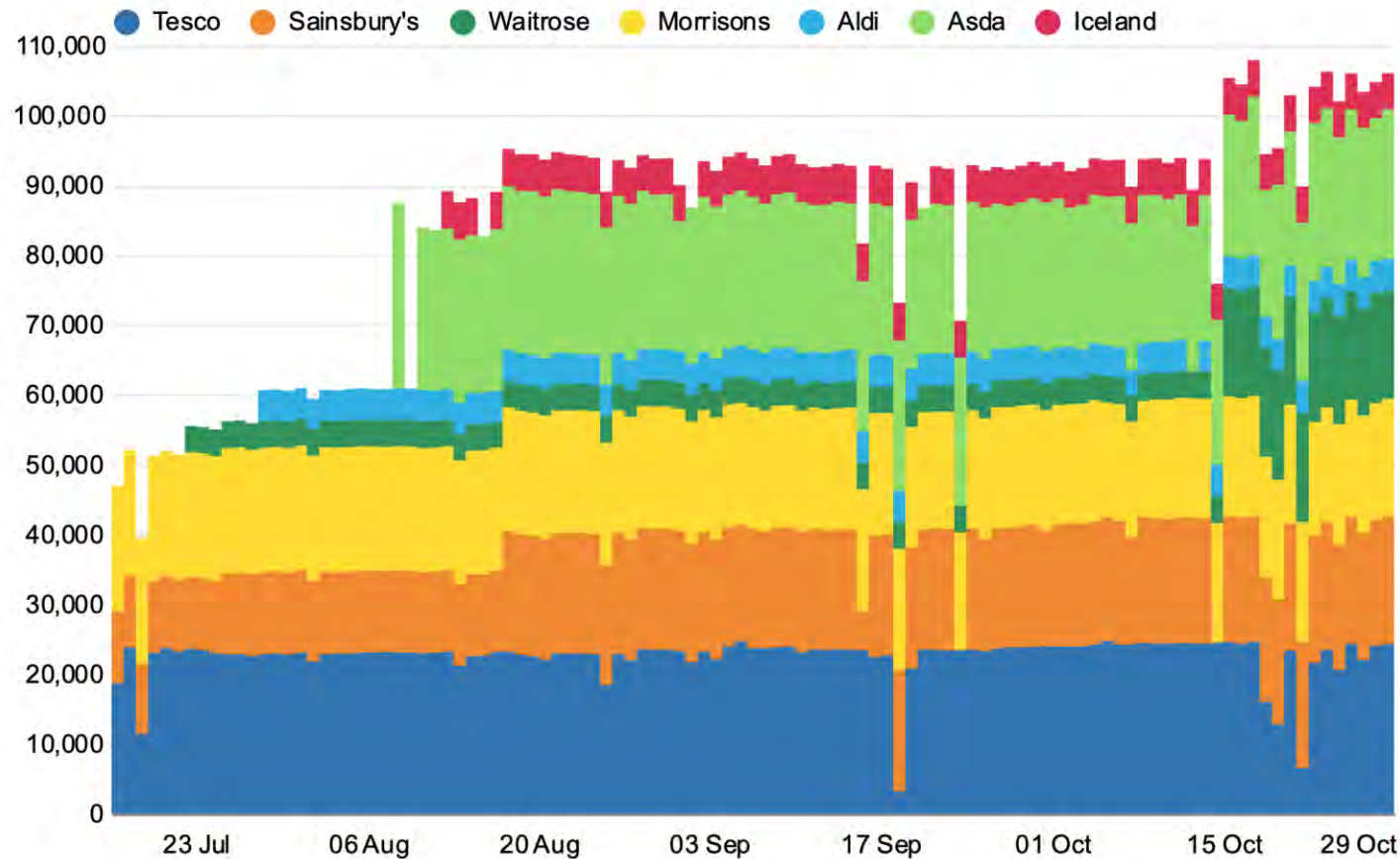
- Modern sites make AJAX Requests for Information
- e.g. Instagram requests new pictures as you scroll
- We can capture and parse the returned data

Gathering Prices

Our Sample

Scraped Products

Unique Products by Store per Day



Our sample:

- C100,000 prices per day
- 5.2M prices since July
- 7 Supermarkets
- >80% of UK Grocery Market Share

Accessing Prices Responsibly

Is Our Method Ethical?

Policy Importance:

- Aimed at public good: improving inflation measurement

Legal Compliance:

- Manual and automated data collection.
- No personal or non-public data involved.

Case Law:

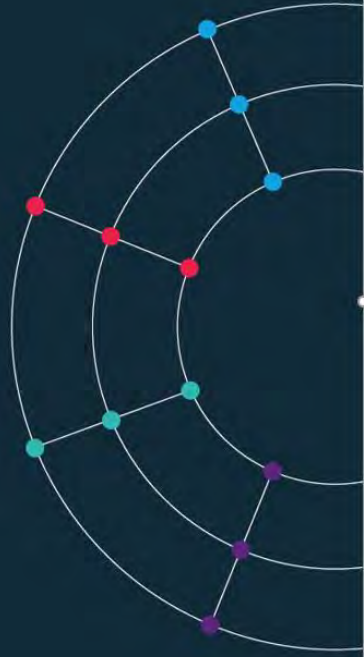
- hiQ Labs vs LinkedIn (US): Web scraping found legal for commercial use; our case is for public good.

Data Anonymisation

- We anonymise any data relating to firms' pricing strategies.

Matching.

Associating CPI Items with Supermarket Products



Matching

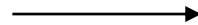
Embeddings?

Embeddings are vector representations of the semantic meaning of raw data.

- They map texts to long (~1500 dimensions) vectors
- Generated on Neural Networks trained on large corpora of text
- Akin to Principal Component Analysis but generated with neural networks

We can then estimate 2 texts' similarity by computing the distance between their embeddings.

Unsliced White
Bread Loaf 800g

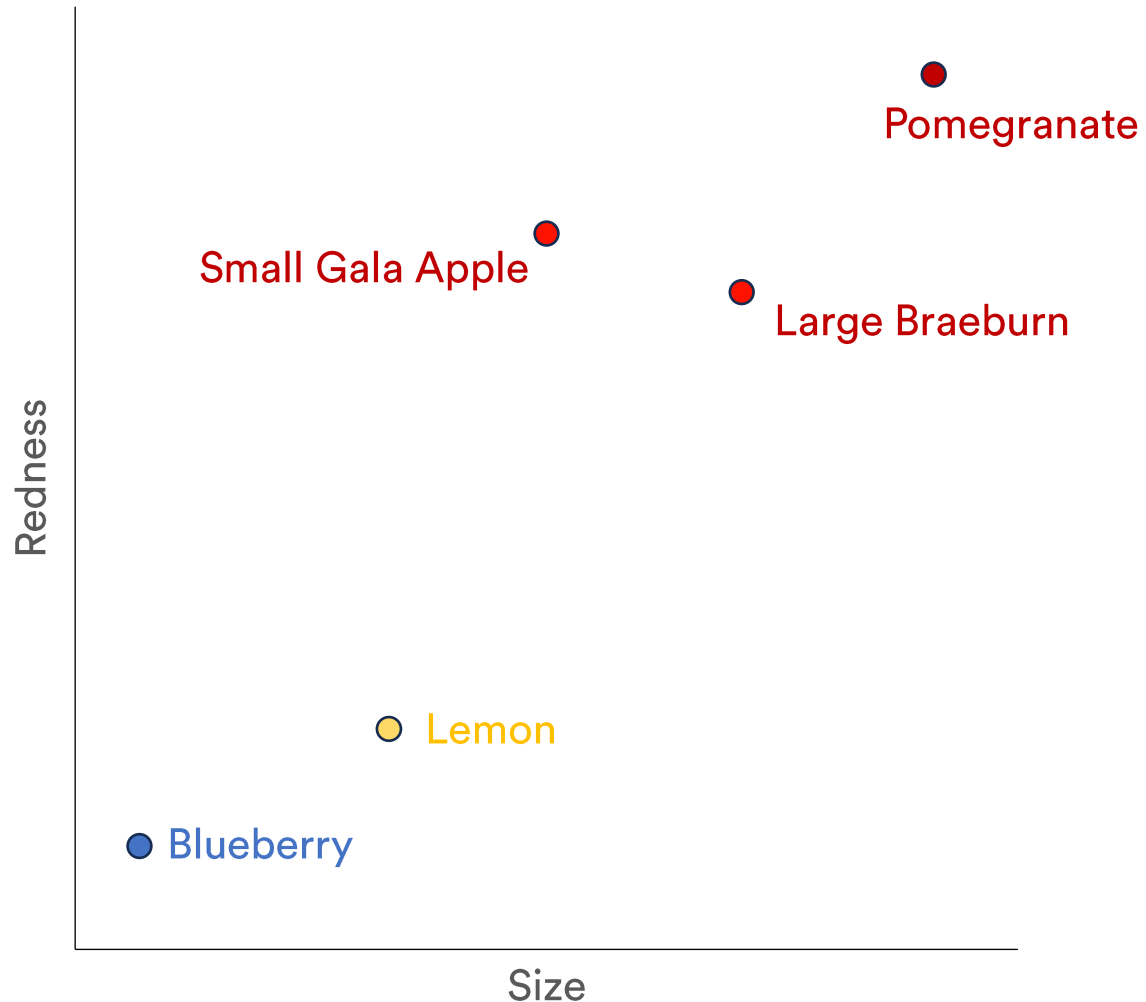


```
[0.016758177429437637, -  
0.018055250868201256, -  
0.0005921947304159403, -  
0.014877422712743282, -  
0.014903363771736622,  
0.0022941972129046917, -  
0.021557345986366272, -  
0.02664187178015709, -  
0.011440180242061615, -  
0.03317911550402641,  
0.01030524168163538,  
0.02825024165213108, -  
0.03330882266163826, -  
0.012866959907114506, -  
0.010454405099153519,  
0.04573477804660797,  
0.0020818014163523912, -
```

(1,500 Dimensions)

Matching

Embeddings – a 2D toy example



Toy embeddings model:

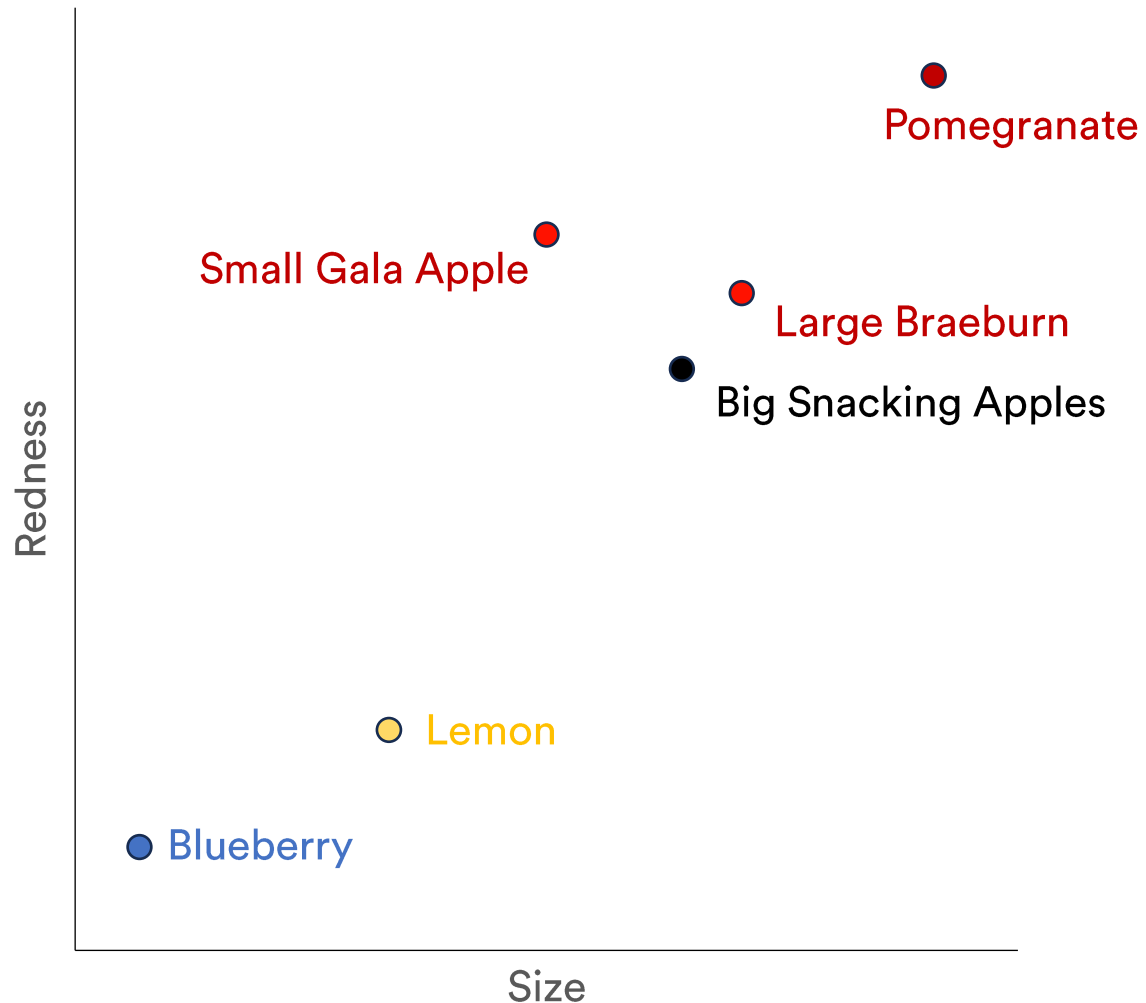
Consider a program that takes a product name and returns its size and how red it is:

Product Name -> [Size, Redness]

1. Map candidate items on 2D Size, Redness Space

Matching

Embeddings – a 2D toy example



Toy embeddings model:

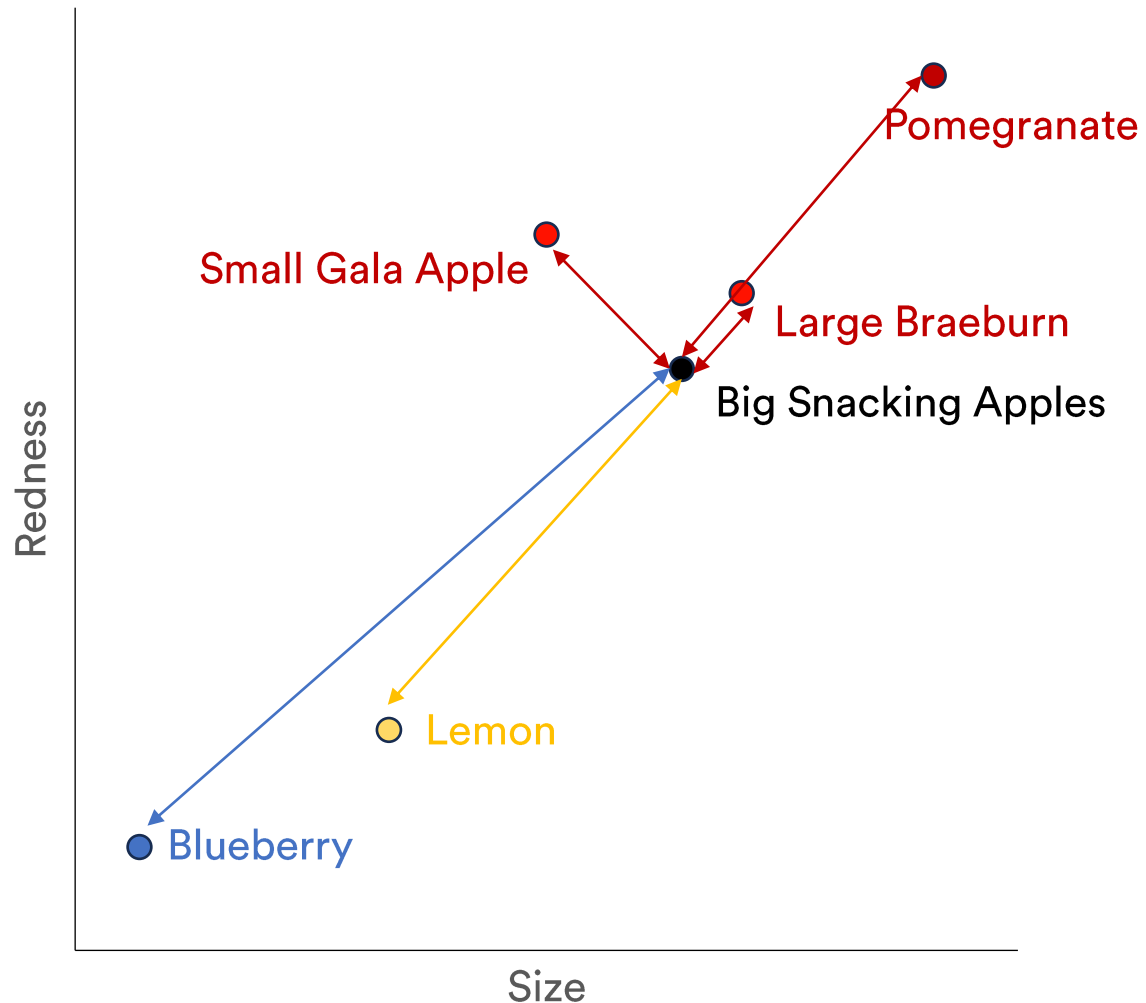
Consider a program that takes a product name and returns its size and how red it is:

Product Name -> [Size, Redness]

1. Map candidate items on 2D Size, Redness Space
2. Map target item to same space

Matching

Embeddings – a 2D toy example



Toy embeddings model:

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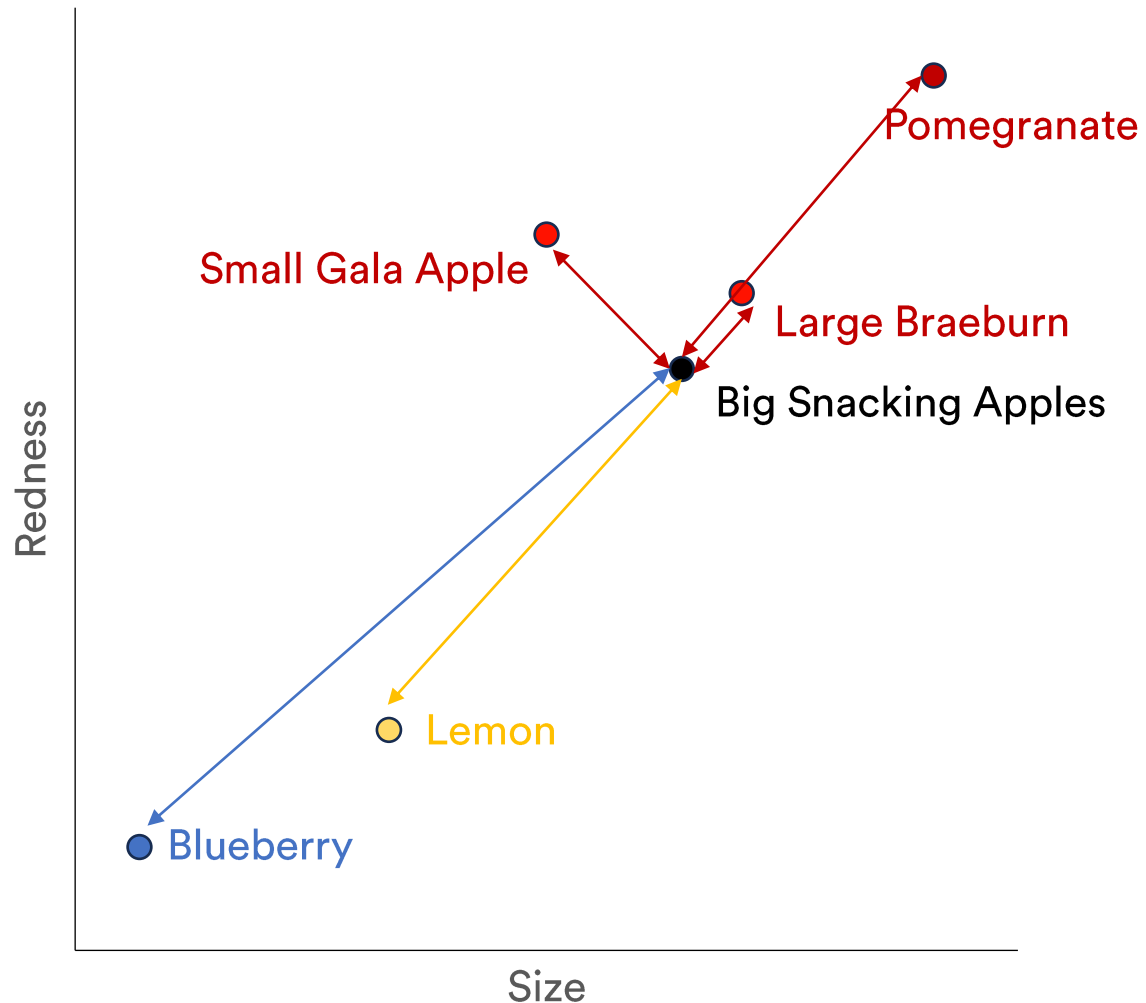
Product Name -> [Size, Redness]

1. Map candidate items on 2D Size, Redness Space
2. Map target item to same space
3. Compute Distances from Target Item to Candidates

	Blueberry	Lemon	Pomegranate	Small Gala Apple	Large Braeburn
Big Snacking Apples	Greatest Distance	Large Distance	Medium Distance	Small Distance	Smallest Distance

Matching

Embeddings – a 2D toy example



Toy embeddings model:

Consider a program that takes a product name and returns its size and how red it is:

Product Name -> [Size, Redness]

1. Map candidate items on 2D Size, Redness Space
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	Blueberry	Lemon	Pomegranate	Small Gala Apple	Large Braeburn
Big Snacking Apples	Greatest Distance	Large Distance	Medium Distance	Small Distance	Smallest Distance

4. Match to Closest Product

Matching

Embeddings – Real World

In the real world:

- Embeddings are much larger (1,500 dimensions)
- Individual Dimensions have no clear meaning

But we use embeddings similarly:

1. Generate Embeddings for CPI Items and ~100K Supermarket Products using Openai's ada-003
2. Compute Distance Matrix (202 CPI items vs all a Supermarket's Products)
3. Match CPI items each store's closest product

To get good matches...

description	LARGE LOAF-WHITE-SLICED-800G	LARGE LOAF-WHITE-UNSLICED-800G	LARGE WHOLEMEAL LOAF-UNSLICED	SIX BREAD ROLLS-WHITE/BROWN
product_title				
Iceland Very Fine Whole Green Beans 1.2kg	0.821737	0.812447	0.796100	0.826213
Hungry Hippo Chocolate Flavoured Milkshake 3 x 200ml	0.831972	0.817149	0.800256	0.828365
Tan y Castell Low Fat Bara Brith	0.823028	0.829185	0.785334	0.793109
Tan y Castell Welshcakes	0.787987	0.784241	0.778665	0.792456
Colgate Max White Luminous Whitening Toothpaste Value Pack 3 x 75ml	0.793506	0.793259	0.781566	0.792274
...
Ragu Original Chunky Bolognese Sauce 500g	0.776950	0.788393	0.776454	0.774133
L'Oreal Paris Shampoo by Elvive Colour Protect for Coloured or Highlighted Hair 700ml	0.750814	0.755943	0.747127	0.742479
Birds Eye 8 Omega 3 Fish Fingers 200g	0.800423	0.806296	0.785390	0.796369
Ragu Authentic Italian Fusilli Wheat Pasta 750g	0.774089	0.795880	0.770517	0.770344
No Meat 2 Ultimate Burgers 226g	0.792535	0.779425	0.774182	0.766422

Matching

Embeddings – Not-a-Number Bread

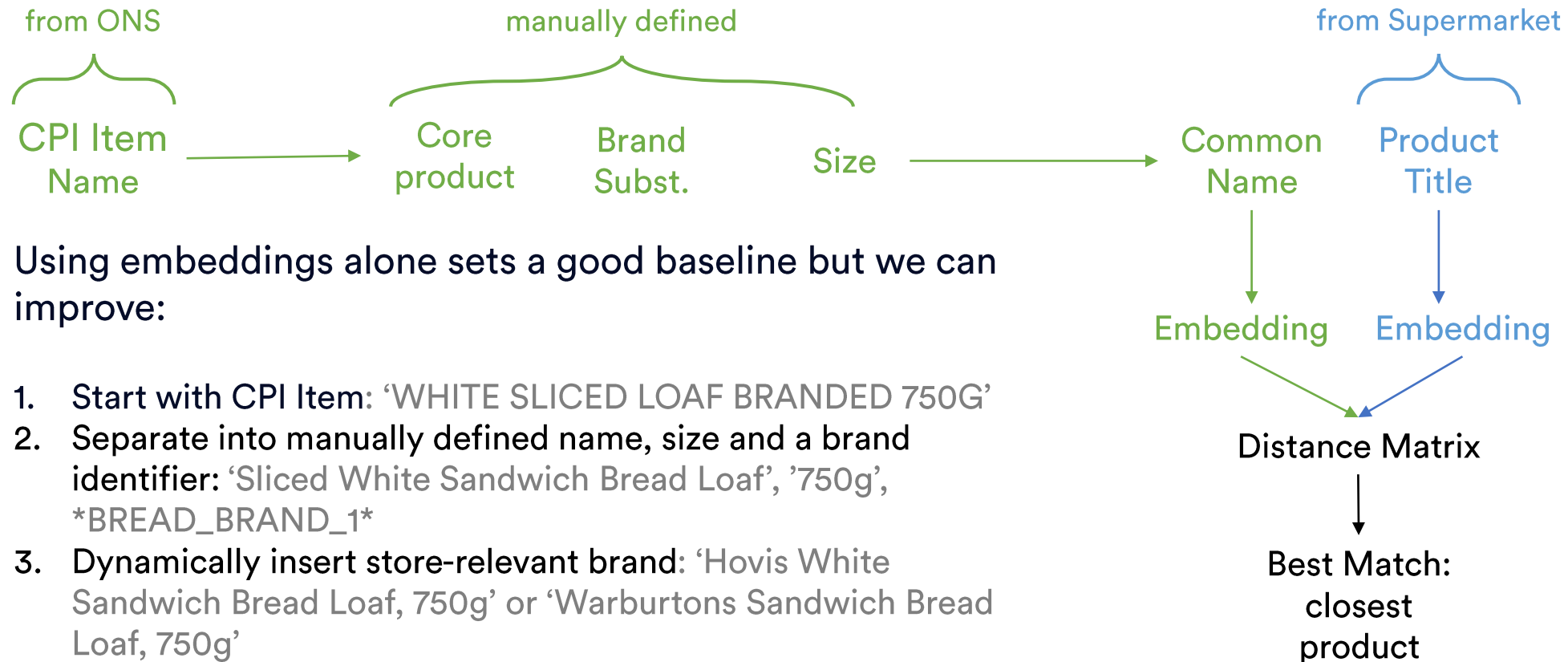


... when the **bugs** are fixed

CREAM LIQUER 70CL-1LT 14-20%	NaN	NaN	NaN	9	6	nan	0.760348	93320	Patak's 4 Flame Baked Plain Mini Naans
N BOTTLE 70CL	NaN	NaN	NaN	9	5	nan	0.760359	33205	Sharwood's 4 Plain Mini Naans
N BOTTLE 70CL	NaN	NaN	NaN	9	6	nan	0.760348	93320	Patak's 4 Flame Baked Plain Mini Naans
'RE MIXED PIRIT 250-330ML	NaN	NaN	NaN	9	5	nan	0.760359	33205	Sharwood's 4 Plain Mini Naans
'RE MIXED PIRIT 250-330ML	NaN	NaN	NaN	9	6	nan	0.760348	93320	Patak's 4 Flame Baked Plain Mini Naans

Matching

Preprocessing – Redefining CPI Items



Using embeddings alone sets a good baseline but we can improve:

1. Start with CPI Item: 'WHITE SLICED LOAF BRANDED 750G'
2. Separate into manually defined name, size and a brand identifier: 'Sliced White Sandwich Bread Loaf', '750g', *BREAD_BRAND_1*
3. Dynamically insert store-relevant brand: 'Hovis White Sandwich Bread Loaf, 750g' or 'Warburtons Sandwich Bread Loaf, 750g'

This helps match unusually define items:

- AVOCADO PEAR -> Avocado, MALTED CHOCOLATE -> MALTESERS and CORN SNACK -> Wotsits

Matching

How do we prevent matches like this?

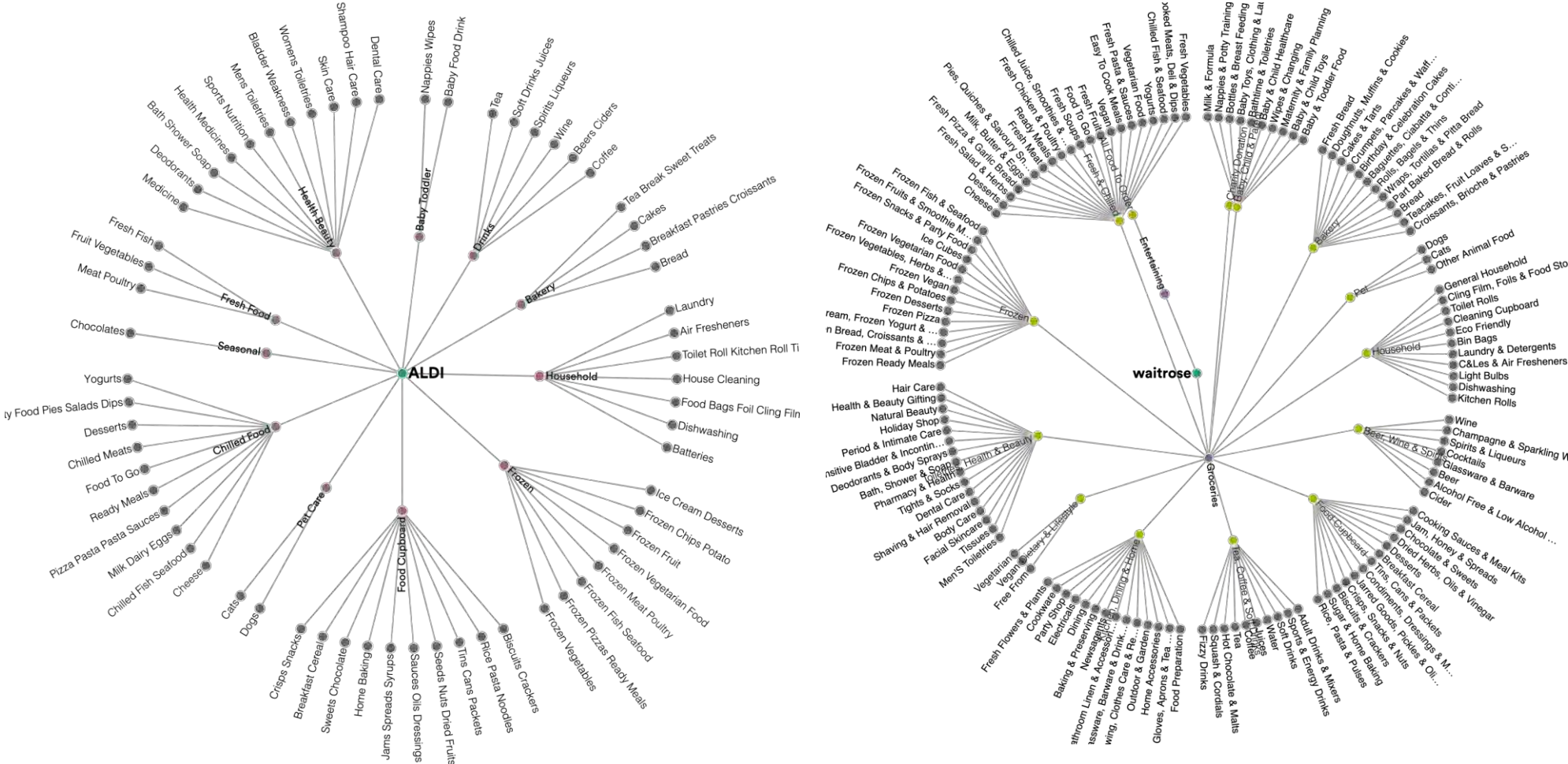
CPI
FRUIT SQUASH



Matching

Preprocessing – unifying categories

We collect detailed category information for each product but category systems vary:



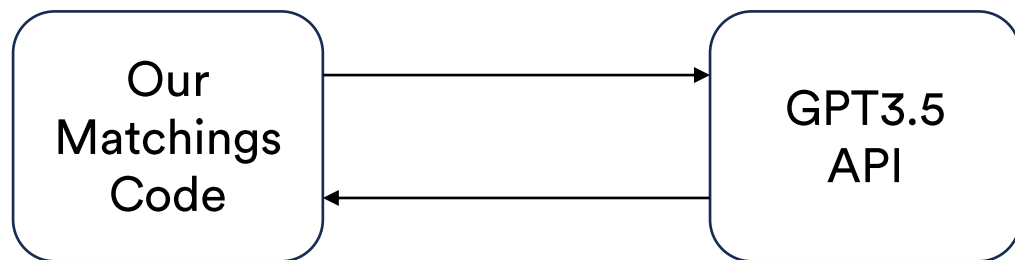
Matching

Further AI enhancements (experimental)

The matchings so far are good – but we can do better.

Using an LLM, we can ‘ask’ what the best match is. You could even just do this with **ChatGPT**.

We do it programmatically with the api instead.



The screenshot shows a chat interface with a header "Default (GPT-3.5)". The first message, from a user (FI), asks: "Which product is the best fit for '1L Fruit Squash'" and lists four options: 1. Tesco Large Butternut Squash, 2. Robinsons Summer Berries Squash, 3. Hubbards Lemon Squash, and 4. Fresh Squash. The second message, from the AI (GPT-3.5), provides a "Best Match:" (option 2), an "Explanation:" (why it's the best match), and a "breakdown of the other options:" (why the others are not the best match).

Which product is the best fit for "1L Fruit Squash"

1. Tesco Large Butternut Squash
2. Robinsons Summer Berries Squash
3. Hubbards Lemon Squash
4. Fresh Squash

Best Match:

2. Robinsons Summer Berries Squash

Explanation:

The best match for "1L Fruit Squash" is option 2, Robinsons Summer Berries Squash. This product is specifically labeled as a fruit squash, and the flavor "Summer Berries" suggests a fruity taste, which aligns with the description "Fruit Squash." It also comes in a 1-liter size, which matches the specified volume.


Here's a breakdown of the other options:

1. Tesco Large Butternut Squash - This is a vegetable (butternut squash) and not a fruit squash, so it does not match the description.
2. Hubbards Lemon Squash - While this is a squash in terms of the name, it is a lemon-flavored drink concentrate and may not be what you're looking for when you want a "Fruit Squash."
3. Fresh Squash - The description is too generic, and it could refer to various types of squashes (both fruit and vegetable). Without additional context, it's not clear what "Fresh Squash" refers to, so it may not be the best match for a "Fruit Squash."

Matching

Further AI enhancements (experimental)

⚡ Default (GPT-3.5) ⓘ

-  Which product is the best fit for "1L Fruit Squash"
1. Tesco Large Butternut Squash
 2. Robinsons Summer Berries Squash
 3. Hubbards Lemon Squash
 4. Fresh Squash

-  Best Match: 
2. Robinsons Summer Berries Squash

Explanation:

The best match for "1L Fruit Squash" is option 2, Robinsons Summer Berries Squash. This product is specifically labeled as a fruit squash, and the flavor "Summer Berries" suggests a fruity taste, which aligns with the description "Fruit Squash." It also comes in a 1-liter size, which matches the specified volume.

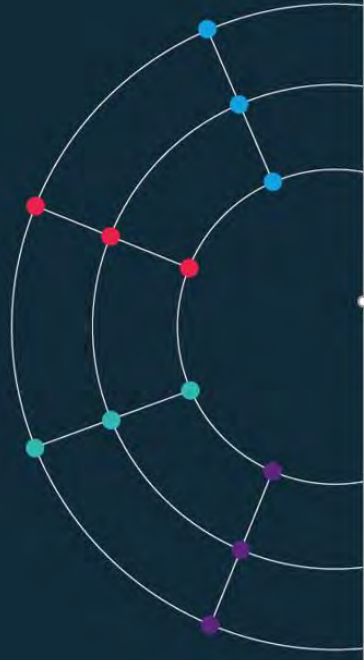
Here's a breakdown of the other options:

1. Tesco Large Butternut Squash - This is a vegetable (butternut squash) and not a fruit squash, so it does not match the description.
2. Hubbards Lemon Squash - While this is a squash in terms of the name, it is a lemon-flavored drink concentrate and may not be what you're looking for when you want a "Fruit Squash."
3. Fresh Squash - The description is too generic, and it could refer to various types of squashes (both fruit and vegetable). Without additional context, it's not clear what "Fresh Squash" refers to, so it may not be the best match for a "Fruit Squash."

GPT3.5 chooses the best candidate of our set.

Sources.

Where are price changes coming from?



Some raw data

It is huge – lots of hard to parse string

```
{'8148354': 'Country of origin: United Kingdom\n\n\nMade in the UK with turkey from farms in the UK',  
'7993668': 'Packed in United Kingdom\nPacked using farmed prawns from Ecuador, Honduras, Indonesia, Nicaragua, Thailand or Vietn  
'8153148': 'Packed in: Ireland',  
'6910013': 'Packed in United Kingdom',  
'7713272': 'Packed in United Kingdom',  
'6600797': 'Packed in United Kingdom',  
'8054445': 'Packed in United Kingdom, the UK',  
'8128056': None,  
'7639001': "Packed in United Kingdom, the UK for Sainsbury's Supermarkets Ltd, London EC1N 2HT using beef from the UK",  
'7425315': 'Packed in United Kingdom, the UK for Sainsbury's Supermarket's Ltd, London EC1N 2HT and Sainsbury's Supermarkets Ltd  
'8104139': None,  
'6582353': 'Packed in United Kingdom',  
'7953120': 'Country of origin: Produce of the EU\n\n\nProduct of EU',  
'7990101': None,  
'2636320': None,  
'3109359': None,  
'7875665': 'Packed in United Kingdom',  
'1111132': 'Grown in Germany, Italy, Spain, United Kingdom',  
'8029933': "Packed in United Kingdom, the UK for Sainsbury's supermarket Ltd, London EC1N 2HT and Sainsbury's Supermarkets Ltd,  
'8149050': 'Packed in United Kingdom',  
'1195477': 'Grown in Egypt, Netherlands, New Zealand, Spain, United Kingdom',  
'7857344': 'Country of origin: United Kingdom\n\n\nMade in the UK',  
'1236644': 'Grown in Israel, Morocco, Netherlands, Spain, United Kingdom',  
'3088005': None,  
'2762166': None,  
...  
'6504647': 'Packed in United Kingdom',  
'8146776': 'Packed in United Kingdom, using pork from the UK.',  
'8048959': 'Packed in United Kingdom',  
'7916550': "Packed in United Kingdom, the UK for Sainsbury's Supermarkets Ltd, London EC1N 2HT using pork from the UK.",
```

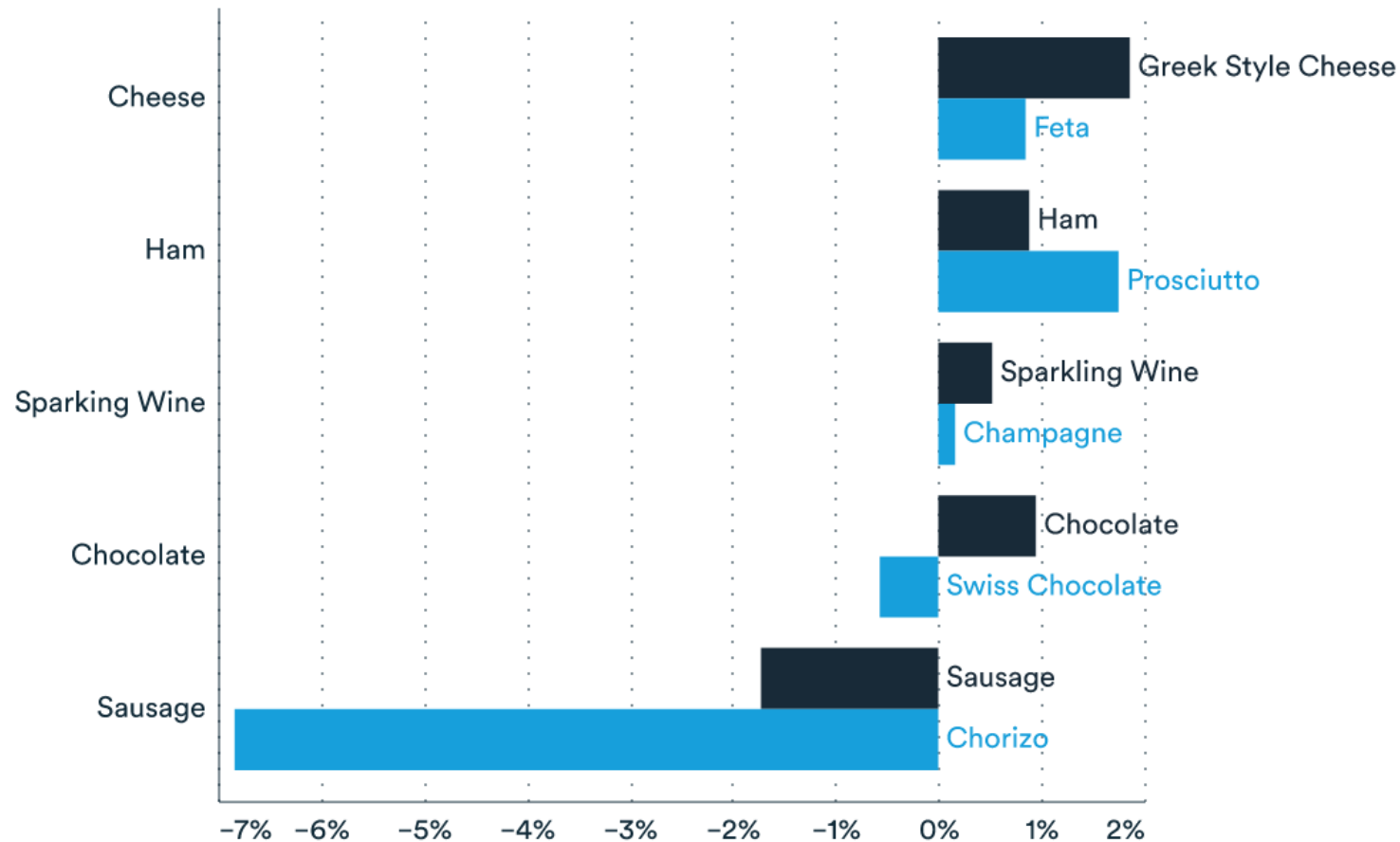
Identifying where products are from

Some initial results

Regional Price Changes

Selected regional and generic products

July-October 2023 Price Changes in UK Supermarkets



Legally protected names

Some initial results

```
match
Scotch Whisky 276
Scotch Beef 34
Melton Mowbray Pork Pie 29
Cornish Clotted Cream 16
Yorkshire Wensleydale 10
Cornish Pasty 10
Newmarket Sausage 6
Blue Stilton cheese 6
Welsh lamb 6
Jersey Royal potatoes 6
Herefordshire cider 5
Anglesey Sea Salt 4
Scotch Lamb 2
Fenland Celery 1
White Stilton cheese 1
West Country farmhouse Cheddar cheese 1
Sherry Scotch Whisky 1
Cornish Sardines 1
Orkney Scottish Island Cheddar 1
```

```
match
Champagne 167
Cognac 40
Bordeaux 35
Chablis 21
Palette 16
...
Saint-Aubin 1
Beaumes de Venise 1
Costieres de Nimes 1
Cadillac 1
Rose d'Anjou 1
```

```
match
Prosecco 141
Sicilia Sicilia 101
Modena 33
Reggiano Parmigiano Reggiano 32
Chianti 21
...
Rubicone 1
Romagna 1
Costa Toscana Toscana 1
Colonna 1
Toscana Finocchiona 1
```

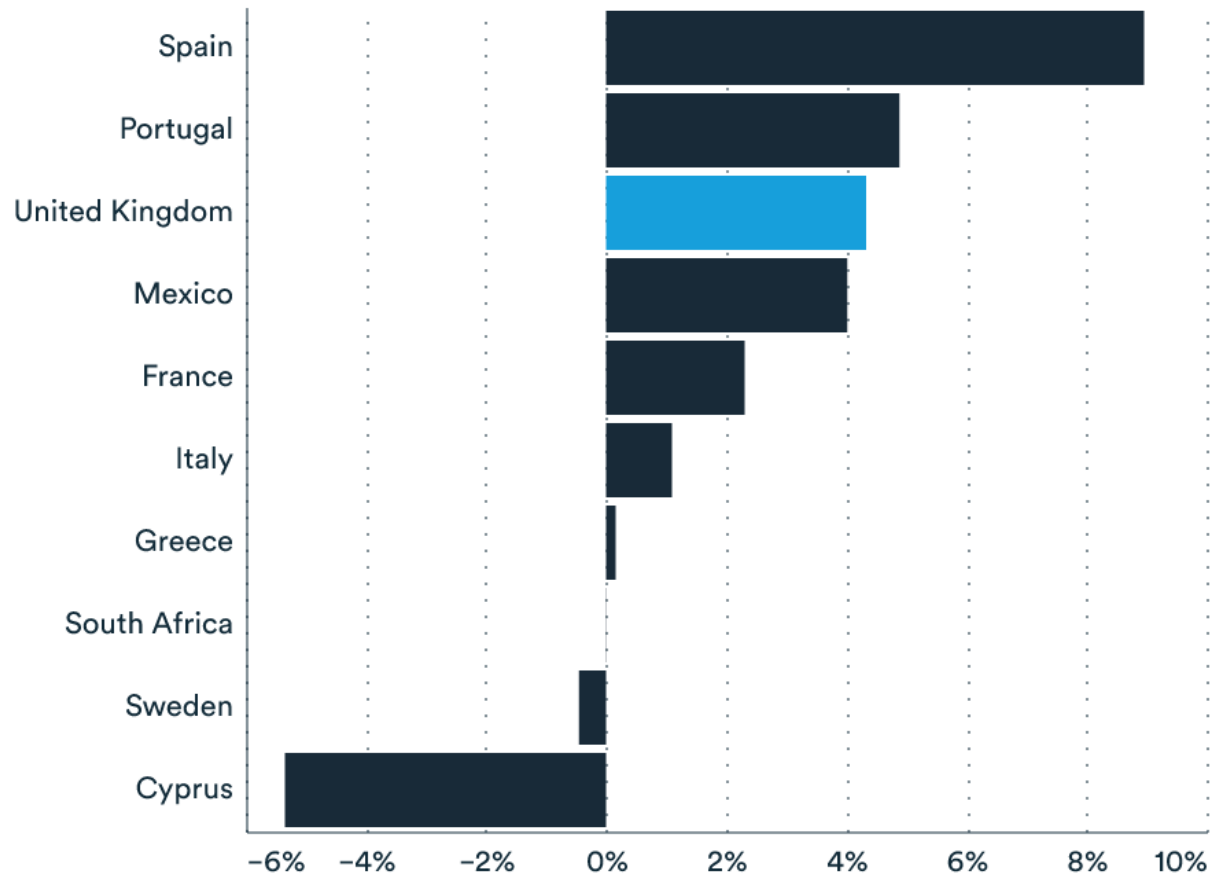
DOP products – inflation rates

Some initial results

Price Changes of Designated Origin Products

Price Changes in UK Supermarkets

July-October 2023



Trade and inflation.

The Brexit impact, and towards automated price collection

Presenter: Richard Davies (LSE)

Joint with:

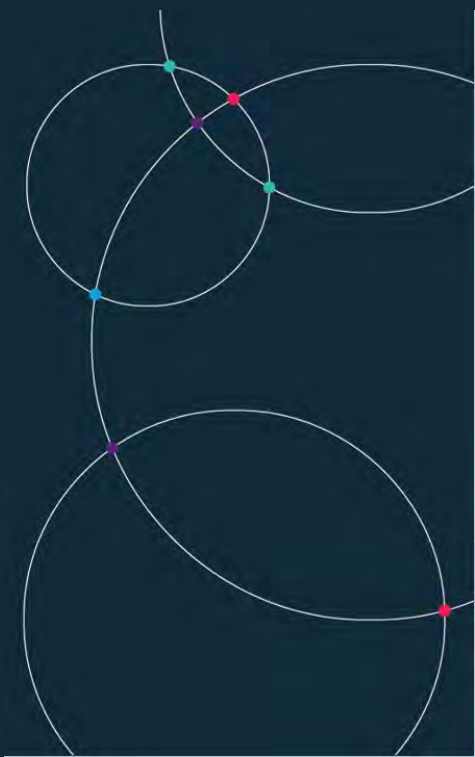
Paper 1: Jan David Bakker (Bocconi & CEP), Nikhil Datta (Warwick & CEP), Josh De Lyon (OECD & CEP)

Paper 2: Josh Hellings (LSE), Finn McEvoy (LSE)

NIESR. Friday 17th November 2023



Economic
and Social
Research Council



The kindness of strangers: Brexit and bilateral financial linkages

Presenter: Pinar Yesin (Swiss National Bank)

Discussant: John Ryan (CESifo)

The Kindness of Strangers: Brexit and Bilateral Financial Linkages

Andreas M. Fischer¹ Pınar Yeşin²

¹LIUC and CEPR ²Swiss National Bank

The views are the authors' and do not necessarily reflect those of the SNB

The Economic Impact of Brexit Conference
National Institute of Economic and Social Research
London, 17 November 2023

Carney (2017) warned after the Brexit vote

"[...] the UK relies on the kindness of strangers at a time when risks to trade, investment, and financial fragmentation have increased."

Economic policy uncertainty increased sharply after the Brexit vote and remained elevated.

Surge in Economic Policy Uncertainty

ECONOMIC POLICY UNCERTAINTY IN THE UK

Public



Source: Monthly UK EPU Index from www.PolicyUncertainty.com



We study the impact of the sudden increase in economic policy uncertainty following the Brexit vote on capital flows using firm-level data.

Brexit vote shock represents an increase in the country risk premium and has potential global implications. We test whether it affects capital flows.

- Have firms in Switzerland invested less in the UK following the Brexit vote?
- Have firms in Switzerland received less investment from the UK?
- Any differences across firms based on size, nationality, industry?

Why study Swiss investment in the UK?

- Switzerland: a microcosmos of international firm activity
 - Home to many MNEs, some of which are the largest global companies
 - MNEs operate in various industries and are heterogenous in terms of employment, value added to the Swiss economy, R&D investment etc. (Federal Statistical Office, 2022)
- Both UK and Switzerland are financial centers
 - Important drivers of international capital flows (Lane and Milesi-Ferretti, 2007)
 - Swiss banking sector heavily exposed to the post-Brexit fragmentation (Stojanovic and Wright, 2021)

Our contribution to the literature

- Extend the growing literature on Brexit and trade to financial linkages, e.g. Corsetti et al. (2022), Fernandes and Winters (2021), Fetzner (2019), Portes and Forte (2017), ...
- First paper to explore **firm-level investment responses to the Brexit vote**
- First paper to make use of the SNB's quarterly cross-border capital linkages survey data

Preview of our findings

- Mark Carney may have been overly cautious concerning the impact of uncertainty on capital flows: The Brexit shock did not permanently disrupt CH investment in the UK
- Parallel behavior of capital in- and outflows at firm level, even in the face of a large shock
- Non-uniform response to the Brexit vote by banks and finance firms compared to firms in other industries shows industry-specific response to the Brexit shock

SNB's cross-border capital linkages surveys

- Quarterly survey INQ (firm-level capital flows)
- Annual survey INP (firm characteristics)

Granular firm-level capital flows data

- 441 local enterprise groups resident in Switzerland
- 2015 Q2 - 2019:Q4: balanced sample
- For company i , vis-à-vis country c , denominated in currency x , during quarter t
 - Capital outflows from Switzerland (net acquisition of financial assets)
 - Capital inflows to Switzerland (net incurrence of liabilities)
- Counterparty country breakdown: 190 countries
- Currency breakdown: 5 major currencies separately (CHF, USD, EUR, GBP, JPY) and all the remaining currencies grouped together
- Total flows, DI equity flows, DI and OI debt flows

Companies in Switzerland: A microcosmos of global multinationals

- Many different nationalities of control (Country of the ultimate controlling institution)
- Different sizes (very small to very large)
- Many different industries
 - 79 banks and finance companies **B & F**
 - 362 companies in other industries **Non-B & Non-F**

Banks and finance companies are studied separately, because they

- tend to have larger and more volatile capital flows relative to companies in other industries
- have special status in the data compilation: they have no direct investment debt positions or flows according to international accounting standards: IMF's BPM6 and OECD's BD4.

Summary stats

	B & F		Non-B & Non-F	
	Pre-Brexit	Post-Brexit	Pre-Brexit	Post-Brexit
Number of firms	79	79	362	362
Number of observations	22515	63042	103170	288876
Number of observed non-zero flows to UK	95	281	1026	3039
Number of non-zero flows denominated in GBP	181	484	2107	5792
Average quarterly Outflows	1.6	-.4	1	0
Average quarterly Inflows	1	-1	.6	-.2
Average quarterly Outflows to the UK	2.3	-.1	-14.8	6.5
Average quarterly Inflows from the UK	18.5	-9.1	-2.4	10.3

Baseline Specification: total capital flows, all currencies pooled

$$\ln(X_{i,c,t}) = \beta(Post_t * UK_c) + \delta_t * \alpha_i + \zeta_c + \epsilon_{i,c,t}, \quad (1)$$

X = capital in- or outflows

Fixed effects: firm i , country c , and time t trends

Errors $\epsilon_{i,c,t}$ clustered at the firm level

Interaction term between the $Post$ (Brexit) dummy and the UK (country) dummy

- $Post = 1$ during 2016 Q3 - 2019 Q4; 0 otherwise
- $UK = 1$ for bilateral flows between the UK and CH; 0 otherwise

The “kindness of strangers” hypothesis

Table: Interpreting β in equation (1)

sign	$\ln(X_{i,c,t})$ in equation (1)	Consistent with Carney (2017)
$\beta < 0$	Outflow from CH to UK	yes
$\beta \geq 0$	Outflow from CH to UK	no
$\beta \leq 0$	Inflow from UK to CH	no
$\beta > 0$	Inflow from UK to CH	no

$X_{i,c,t}$ can be zero or negative: we use inverse hyperbolic sine (IHS or arcsinh) transformation to generate $\ln(X)$

$$IHS(X) = \ln(X + \sqrt{X^2 + 1}) \quad (2)$$

- Zeros remain zeros
- Positive X values are still positive
- Negative X values remain negative

Baseline regressions

	Outflows			Inflows		
	(1) All	(2) B & F	(3) Non-B & Non-F	(4) All	(5) B & F	(6) Non-B & Non-F
Post x UK	0.066 (0.041)	-0.059 (0.097)	0.093** (0.046)	0.047 (0.039)	-0.079 (0.091)	0.075* (0.043)
Observations	477603	85557	392046	477603	85557	392046
R^2	0.045	0.030	0.047	0.041	0.039	0.042

Clustered standard errors at the firm level in parentheses.

***, **, * denote significance at the 1, 5, and 10% level.

B & F denotes banks and finance companies; Non-B & Non-F denotes all the other firms in the sample.

Net flows?

	Net Flows		
	(1) All	(2) B & F	(3) Non-B & Non-F
Post x UK	0.018 (0.046)	-0.083 (0.085)	0.041 (0.052)
Observations	477603	85557	392046
R^2	0.033	0.020	0.035

Clustered standard errors at the firm level in parentheses.

***, **, * denote significance at the 1, 5, and 10% level.

B & F denotes banks and finance companies; Non-B & Non-F denotes all the other firms in the sample.

Robustness: GBP denominated flows

	Outflows			Inflows		
	(1) All	(2) B & F	(3) Non-B & Non-F	(4) All	(5) B & F	(6) Non-B & Non-F
Post x UK	-0.007 (0.033)	-0.173* (0.098)	0.029 (0.034)	-0.025 (0.027)	-0.150* (0.087)	0.003 (0.027)
Observations	477603	85557	392046	477603	85557	392046
R^2	0.025	0.018	0.026	0.025	0.020	0.027

Clustered standard errors at the firm level in parentheses.

***, **, * denote significance at the 1, 5, and 10% level.

B & F denotes banks and finance companies; Non-B & Non-F denotes all the other firms in the sample.

Debt flows versus equity flows: Outflows

	Debt			Equity		
	(1) All	(2) B & F	(3) Non-B & Non-F	(4) All	(5) B & F	(6) Non-B & Non-F
Post x UK	0.058 (0.039)	-0.046 (0.091)	0.081* (0.044)	0.005 (0.016)	-0.015 (0.034)	0.009 (0.018)
Observations	477603	85557	392046	477603	85557	392046
R^2	0.046	0.030	0.047	0.035	0.033	0.035

Clustered standard errors at the firm level in parentheses.

***, **, * denote significance at the 1, 5, and 10% level.

B & F denotes banks and finance companies; Non-B & Non-F denotes all the other firms in the sample.

Debt flows versus equity flows: Inflows

	Debt			Equity		
	(1) All	(2) B & F	(3) Non-B & Non-F	(4) All	(5) B & F	(6) Non-B & Non-F
Post x UK	0.059 (0.039)	-0.037 (0.092)	0.080* (0.043)	-0.006 (0.012)	-0.024 (0.052)	-0.002 (0.010)
Observations	477603	85557	392046	477603	85557	392046
R^2	0.043	0.043	0.043	0.016	0.017	0.016

Clustered standard errors at the firm level in parentheses.

***, **, * denote significance at the 1, 5, and 10% level.

B & F denotes banks and finance companies; Non-B & Non-F denotes all the other firms in the sample.

- Mark Carney was overly cautious concerning the impact of uncertainty on international investment, at least in the bilateral context of CH and UK
 - The Brexit shock did not permanently disrupt CH investment in the UK
- Parallel behavior of capital in- and outflows at firm level even in the face of a large shock
 - Not only foreigners' willingness to invest in the UK is important but also repatriation of UK investment abroad as well
- Non-uniform response to the Brexit vote by banks and finance versus firms in other industries shows industry-specific response to the Brexit shock

Break

17:00 | Trade in services and the trade and co-operation agreement

18:00 | Close

Trade in services and the trade and co-operation agreement

Presenter: Shania Bhalotia (LSE)

Trade in Services and the Trade and Cooperation Agreement

Shania Bhalotia (LSE), Swati Dhingra (LSE, Bank of England*), Danyal Arnold

NIER Workshop
The Economic Impact of Brexit

17/11/2023

*Disclaimer: The expressed views are our own and not necessarily those of the Bank of England or its committees. All errors and omissions are ours.

- ▶ Brexit has led to the biggest reversal of deep international economic integration in the modern era
 - ▶ Under the Trade and Cooperation Agreement (TCA), tariff-free and quota free trade between UK and EU
 - ▶ However, there are non-tariff barriers to trade
- ▶ Understanding of deep trade agreements, in general, and its implication for trade in services, in particular, is limited
- ▶ Trade in services is important for the UK
 - ▶ UK is the second largest services exporter in the world (UNCTAD 2023)
 - ▶ But, share of exports of services to the EU has declined since 2016 (Hale & Fry 2023)
 - ▶ UK is also among the world's largest importers, with about half of UK services imports coming from EU (ONS 2018, Ward & Webb 2023)

- ▶ Understanding and quantifying impact of TCA on trade in services is imperative:
 - ▶ With services contributing to about 80% of total GVA as well as driving GDP growth, and weak productivity growth in services since the financial crisis, barriers to trade and competition can have further impact on the performance of the sector and the economy (Hutton 2022, Mourougane & Kim 2020)
 - ▶ Determining general equilibrium effects of Brexit - quantitative trade models emphasise importance of deep trade agreements and services trade but do not quantify them due to lack of data (Felbermayr et al. 2022, Dhingra et al. 2023)

- ▶ Deep dives into the provisions of the TCA
 - ▶ Provisions relate to cross-border trade in services and investment
 - ▶ UK and individual EU countries take out reservations in the TCA which uphold laws that do not conform with the provisions
 - ▶ Reservations are barriers to trade and investment
 - ▶ These reservations are codified based on the legal text of the TCA
- ▶ Studies the impact of these reservations in the TCA on trade in services of the UK
 - ▶ Creates measures of prevalence of reservations that each country takes out for each provision and service-type
 - ▶ Uses variation in measures of reservations to quantify impact of trade barriers on services trade and obtain trade elasticities
 - ▶ Focus on exports - greater concerns about barriers to exports of services in which UK has a comparative advantage, and more variation in reservations across EU countries

- ▶ Deep trade agreements and non-tariff barriers
 - ▶ Theoretical frameworks - Staiger & Sykes (2021), Grossman et al. (2021)
 - ▶ Empirical methods - Mulabdic et al. (2017), Brienlich et al. (2021), Mattoo et al. (2022), Dhingra et al. (2023)
 - ▶ Breinlich (2018) provides a review of literature on impact of trade agreements

We study the effects of provisions that are widely included in deep trade agreements by creating a measure of reservations taken out on them in the TCA. Such reservations are also present in other trade agreements, like CUSMA

- ▶ Impact of Brexit and TCA on UK:
 - ▶ Post referendum - Van Reenen (2016), Sampson (2017) Dhingra & Sampson (2022)
 - ▶ Post TCA - Ayele et al. (2021), Freeman et al. (2022), Dhingra et al. (2022) Felbermayr et al. (2022)

We codify the reservations in the TCA to estimate impact on services trade

TCA Provisions - Investment

How a country treats investors and enterprises established by investors of other country

- ▶ National Treatment - to treat investors of the other country no less favourably than their own
- ▶ Most Favoured Nation - to give investors of the other country the same benefits they give to a third country
- ▶ Market Access - not to impose limitations on the enterprises established by the other country's investors e.g. on the number of enterprises that can carry out an activity
- ▶ Performance Requirement - not to impose performance requirements on enterprises established by the other country's investor e.g. to export a certain amount
- ▶ Senior Management - not to require enterprises established by investors of the other country to appoint managers/board members of a certain nationality

TCA Provisions - Cross-border Trade in Services

How a country treats services provided by suppliers of other country

- ▶ National Treatment - to treat investors of the other country no less favourably than their own
- ▶ Most Favoured Nation - to give investors of the other country the same benefits they give to a third country
- ▶ Market Access - not to impose limitations on the enterprises established by the other country's investors e.g. on the number of enterprises that can carry out an activity
- ▶ Local Presence - not to require service providers of the other country to maintain a local presence in their jurisdiction

Reservations in the TCA

- ▶ EU countries and UK had domestic laws and measures which did not conform to the provisions above
- ▶ Non-conforming measures were allowed to persist if they are covered by a 'reservation' listed in Annex 19 to the TCA
- ▶ These reservations increase the cost of doing business after Brexit
- ▶ Variation in reservations for each provision, by importing country and service-type (5-digit CPC codes)

Coding the reservations: Example

c) Retail sales of pharmaceuticals, medical and orthopaedic goods and other services provided by pharmacists (CPC 63211)

With respect to Investment liberalisation – Market access, National treatment, Senior management and boards of directors:

In AT: The retail of pharmaceuticals and specific medical goods to the public may only be carried out through a pharmacy. Nationality of a Member State of the EEA or the Swiss Confederation is required in order to operate a pharmacy. Nationality of a Member State of the EEA or the Swiss Confederation is required for leaseholders and persons in charge of managing a pharmacy.

Measures:

AT: Apothekengesetz (Pharmacy Law), RGBI. Nr. 5/1907 as amended, §§ 3, 4, 12; Arzneimittelgesetz (Medication Act), BGBl. Nr. 185/1983 as amended, §§ 57, 59, 59a; and Medizinproduktegesetz (Medical Products Law), BGBl. Nr. 657/1996 as amended, § 99.

Coding the reservations: Example

Country	Cty_Code	CPC	CPC-Desc	EBOPS	MktAccess	NatTreat	MFN	SeniorMgt	PerfReq
Austria	AT	63108	Retail sales of tobacco products		1	1	0	1	0
Austria	AT	63109	Specialized retail sales of food products n.e.c.	10.3.5	1	1	0	1	0
Austria	AT	632	Non-food retailing services	10.3.5	1	1	0	1	0
Austria	AT	6321	Retail sales of pharmaceutical and medical goods and cosmetics	10.3.5	1	1	0	1	0
Austria	AT	63211	Retail sales of pharmaceutical, medical and orthopaedic goods	10.3.5	1	1	0	1	0
Austria	AT	63212	Retail sales of perfumery articles, cosmetic articles and toilet soaps	10.3.5	1	1	0	1	0
Austria	AT	6322	Retail sales of textiles, clothing, footwear and leather goods	10.3.5	1	1	0	1	0
Austria	AT	63221	Retail sales of textiles	10.3.5	1	1	0	1	0
Austria	AT	63222	Retail sales of articles of clothing, articles of fur and clothing accessories	10.3.5	1	1	0	1	0
Austria	AT	63223	Retail sales of footwear	10.3.5	1	1	0	1	0
Austria	AT	63224	Retail sales of leather goods and travel accessories		0	1	0	0	0
Austria	AT	6323	Retail sales of household appliances, articles and equipment	10.3.5	0	1	0	0	0
Austria	AT	63231	Retail sales of household furniture	10.3.5	0	1	0	0	0

- ▶ Reservation - Measure of the prevalence of reservations for an EBOPS code under a provision by importing country

$$Res_Provision = \frac{\text{Number of CPC codes in an EBOPS with reservations}}{\text{Number of CPC codes in the EBOPS}}$$

Varies by importing country and service type (EBOPS)

CUSMA

- ▶ Trade in services - ONS. All UK trade flows by country, service type and quarter, from 2015 Q1 to 2023 Q2, for 66 countries (EU and non-EU)
 - ▶ Level of aggregation of service type at which we can match to reservations data
 - ▶ Pre-2015 data is not at the same level of disaggregation

Reservations: Exports

	mean	sd	min	max
Res_GATS	1.645	1.266	0.000	7.000
Res_SeniorMgt	0.010	0.063	0.000	1.000
Res_PerfReq	0.038	0.192	0.000	1.000
Res_LocalPres	0.066	0.208	0.000	1.000
<i>N</i>	26520			

GATS combines Market Access, Most Favoured Nation, National Treatment - obligations under GATS, often present in old and “new” trade agreements

All

Imports

Corr

Empirical Strategy

Baseline regression (Gravity):

$$\begin{aligned} \ln trade_{sdit} = & \beta_1 (Post21_t \times EU_p \times Res_GATS_{sdi}) \\ & + \beta_2 (Post21_t \times EU_p \times Res_SeniorMgt_{sdi}) + \beta_3 (Post21_t \times EU_p \times Res_PerfReq_{sdi}) \\ & + \beta_4 (Post21_t \times EU_p \times Res_LocalPres_{sdi}) + \beta_5 (Post21_t \times EU_p \times IntraEEASTRI_{sdi}) \\ & + \beta_6 (Post21_t \times nonEU_p \times STRIndex_{sdi}) + \alpha_{pi} + \alpha_{pt} + \alpha_{it} + \varepsilon_{sdit} \end{aligned}$$

- ▶ s = source, d = destination, i = service type, t = quarter, p = trading partner of the UK
- ▶ $Post21_t$ = dummy for 2021 Q1 onwards
- ▶ EU_p = dummy that takes value 1 for EU trading partner
- ▶ $nonEU_p$ = dummy that takes value 1 for non-EU trading partner
- ▶ $\beta_k \approx$ percentage change in trade flows when the share of reserved CPC codes for the provision increases by one percentage point.

Estimates: Exports

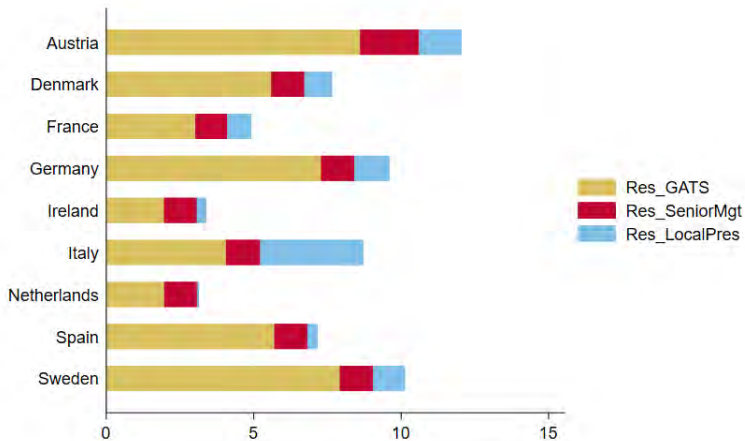
	(1)	(2)	(3)
Post21xEUxRes_GATS	-0.024** (0.009)	-0.035*** (0.009)	-0.032*** (0.009)
Post21xEUxRes_SeniorMgt	-2.248*** (0.410)	-2.295*** (0.410)	-2.273*** (0.410)
Post21xEUxRes_LocalPres	-0.132*** (0.051)	-0.134*** (0.047)	-0.139*** (0.047)
Post21xEUxIntraEEASTRI		-4.278*** (0.511)	-4.252*** (0.514)
Post21xnonEUxSTRIndex			0.297 (0.199)
Observations	44725	44725	44478
Pseudo R^2	0.954	0.954	0.954

Estimates: Exports, with Pre-trends

	(1)	(2)	(3)	(4)
Post21xEUxRes_GATS	-0.024** (0.009)	-0.032*** (0.009)	-0.024** (0.010)	-0.031*** (0.009)
Post21xEUxRes_SeniorMgt	-2.248*** (0.410)	-2.273*** (0.410)	-2.195*** (0.423)	-2.217*** (0.422)
Post21xEUxRes_LocalPres	-0.132*** (0.051)	-0.139*** (0.047)	-0.124** (0.051)	-0.131*** (0.047)
Post21xEUxIntraEEASTRI		-4.252*** (0.514)		-4.254*** (0.514)
Post21xnonEUxSTRIndex		0.297 (0.199)		0.298 (0.199)
Q1Q22015xEUxRes_GATS			0.011 (0.019)	0.013 (0.019)
Q1Q22015xEUxRes_SeniorMgt			0.773 (0.500)	0.802 (0.496)
Q1Q22015xEUxRes_LocalPres			0.124 (0.084)	0.121 (0.082)
Observations	44725	44478	44725	44478
Pseudo R^2	0.954	0.954	0.954	0.954

Change in Exports, by Country

Percentage change in exports of UK due to removal of all reservations by Country



Robustness: Exports

	(1) Baseline	(2) w/o servicetime FE	(3) w/o travel	(4) with PostRefxRes
Post21xEUxRes_GATS	-0.032*** (0.009)	-0.017** (0.009)	-0.006 (0.017)	-0.058*** (0.013)
Post21xEUxRes_SeniorMgt	-2.273*** (0.410)	-2.332*** (0.414)	-2.745*** (0.422)	-2.677*** (0.419)
Post21xEUxRes_LocalPres	-0.139*** (0.047)	-0.099** (0.048)	-0.220*** (0.053)	-0.125** (0.059)
Post21xEUxIntraEEASTRI	-4.252*** (0.514)	-3.938*** (0.520)	-2.936*** (0.848)	-4.263*** (0.514)
Post21xnonEUxSTRIndex	0.297 (0.199)	0.472** (0.218)	0.780*** (0.246)	0.300 (0.199)
PostRefxEUxRes_GATS				-0.034*** (0.012)
PostRefxEUxRes_SeniorMgt				-0.514 (0.422)
PostRefxEUxRes_LocalPres				0.019 (0.050)
Observations	44478	44478	34982	44478
Pseudo R^2	0.954	0.952	0.961	0.954

By Country and Service Type (Business Service)

	(1)		(1)
Post21xEUxRes_GATS	-0.031** (0.013)	Post21xEUxRes_GATS	-0.028*** (0.010)
Post21xEUxRes_GATSxWestEu	-0.004 (0.016)	Post21xEUxRes_GATSxBusn	-0.015 (0.020)
Post21xEUxRes_SeniorMgt	-1.730*** (0.443)	Post21xEUxRes_SeniorMgt	-2.534*** (0.446)
Post21xEUxRes_SeniorMgtxWestEu	-1.065 (0.760)	Post21xEUxRes_SeniorMgtxBusn	1.680 (1.124)
Post21xEUxRes_LocalPres	-0.265*** (0.068)	Post21xEUxRes_LocalPres	0.024 (0.260)
Post21xEUxRes_LocalPresxWestEu	0.276*** (0.088)	Post21xEUxRes_LocalPresxBusn	-0.138 (0.268)
Post21xEUxIntraEEASTRI	-4.347*** (0.514)	Post21xEUxIntraEEASTRI	-4.281*** (0.507)
Post21xnonEUxSTRIndex	0.302 (0.199)	Post21xnonEUxSTRIndex	0.300 (0.199)
Observations	44478	Observations	44478
Pseudo R ²	0.954	Pseudo R ²	0.954

Business services - Financial services, research and development, telecommunications, legal services, other business services. Excluding travel WestEu: Austria, Belgium, France, Germany, Ireland Luxembourg, Netherlands.

Estimates: Imports, Both

	(1)	(2)
	Imports	Exports and Imports
Post21xEUxRes_GATS	-0.154*** (0.035)	-0.104*** (0.014)
Post21xEUxRes_SeniorMgt	-0.363 (0.322)	-1.795*** (0.269)
Post21xEUxRes_LocalPres	0.615*** (0.125)	0.080 (0.060)
Post21xEUxIntraEEASTRI	-0.713 (0.602)	-3.245*** (0.641)
Post21xnonEUxSTRIndex	-0.503* (0.263)	2.749*** (0.283)
Post21xEUxRes_PerfReq		-0.785*** (0.041)
Observations	40104	95248
Pseudo R^2	0.934	0.887

Long-run Effect

	(1)	(2)
	Exports	Imports
Year22xEUxRes_GATS	-0.067*** (0.015)	-0.094** (0.037)
Year22xEUxRes_SeniorMgt	-3.333*** (0.457)	-1.616*** (0.540)
Year22xEUxRes_LocalPres	-0.272*** (0.064)	0.056 (0.151)
Year22xEUxIntraEEASTRI	-4.286*** (0.642)	-2.093*** (0.531)
Year22xnonEUxSTRIndex	-0.463 (0.310)	-2.197*** (0.371)
Observations	8837	7430
Pseudo R^2	0.961	0.941

2015 and 2022 trade only

Conclusion

- ▶ Reservations on provisions has a precisely estimated negative effect on services export of the UK, but the quantitative impact has been small
- ▶ Impact varies with the type of provision - largest elasticity from reservation on provision pertaining to senior management, largest effects of reservations on "GATS" provisions due to more prevalence

Next Steps:

- ▶ Using the gravity estimates in a general equilibrium model - trade elasticity and trade cost for services as inputs
- ▶ Using the measures of reservations to study the impact of the provisions in the TCA on inward and outward investment
- ▶ Analysis at the firm level

Appendix

Reservations: Exports - Correlation

	Res_GATS	Res_SeniorMgt	Res_PerfReq	Res_LocalPres
Res_GATS	1.000			
Res_SeniorMgt	0.078	1.000		
Res_PerfReq	0.157	0.277	1.000	
Res_LocalPres	0.168	-0.043	0.066	1.000

[Back](#)

Reservations: All

	Res_GATS	Res_SeniorMgt	Res_PerfReq	Res_LocalPres
Res_GATS	1.000			
Res_SeniorMgt	0.032	1.000		
Res_PerfReq	-0.307	0.120	1.000	
Res_LocalPres	0.453	-0.046	0.151	1.000

	mean	sd	min	max
Res_GATS	1.202	1.262	0.000	7.000
Res_SeniorMgt	0.016	0.077	0.000	1.000
Res_PerfReq	0.519	0.500	0.000	1.000
Res_LocalPres	0.107	0.278	0.000	1.000
<i>N</i>	53040			

GATS combines Market Access, Most Favoured Nation, National Treatment - obligations under GATS, often present in shallow agreements and “new” agreements

Reservations: Imports

	Res_GATS	Res_SeniorMgt	Res_LocalPres
Res_GATS	1.000		
Res_SeniorMgt	0.054	1.000	
Res_LocalPres	0.864	-0.066	1.000

	mean	sd	min	max
Res_GATS	0.760	1.092	0.000	3.333
Res_SeniorMgt	0.022	0.088	0.000	0.456
Res_PerfReq	1.000	0.000	1.000	1.000
Res_LocalPres	0.148	0.329	0.000	1.000
N	26520			

GATS combines Market Access, Most Favoured Nation, National Treatment - obligations under GATS, often present in shallow agreements and “new” agreements

Robustness: Imports

	(1) Baseline	(2) w/o servicetime FE	(3) w/o travel	(4) with PostRefxRes
Post21xEUxRes_GATS	-0.154*** (0.035)	-0.121*** (0.029)	-0.262*** (0.082)	-0.152*** (0.041)
Post21xEUxRes_SeniorMgt	-0.363 (0.322)	-0.473 (0.310)	-0.134 (0.349)	-0.228 (0.356)
Post21xEUxRes_LocalPres	0.615*** (0.125)	0.590*** (0.105)	0.903*** (0.326)	0.300** (0.146)
Post21xEUxIntraEEASTRI	-0.713 (0.602)	-1.289** (0.624)	4.146*** (1.308)	-0.716 (0.602)
Post21xnonEUxSTRIndex	-0.503* (0.263)	-0.156 (0.268)	1.507*** (0.508)	-0.503* (0.263)
PostRefxEUxRes_GATS				0.003 (0.031)
PostRefxEUxRes_SeniorMgt				0.161 (0.332)
PostRefxEUxRes_LocalPres				-0.386*** (0.113)
Observations	40104	40104	30837	40104
Pseudo R^2	0.934	0.930	0.945	0.934

Robustness: Exports and Imports

	(1) Baseline	(2) w/o servicetime FE	(3) w/o travel	(4) with PostRefxRes
Post21xEUxRes_GATS	-0.104*** (0.014)	-0.096*** (0.012)	-0.135*** (0.022)	-0.176*** (0.016)
Post21xEUxRes_SeniorMgt	-1.795*** (0.269)	-1.928*** (0.263)	-1.732*** (0.286)	-2.553*** (0.297)
Post21xEUxRes_LocalPres	0.080 (0.060)	0.124** (0.059)	0.008 (0.076)	0.077 (0.062)
Post21xEUxRes_PerfReq	-0.785*** (0.041)	-0.788*** (0.039)	-0.933*** (0.047)	-0.836*** (0.042)
Post21xEUxIntraEEASTRI	-3.245*** (0.641)	-3.664*** (0.596)	-4.571*** (1.040)	-3.288*** (0.643)
Post21xnonEUxSTRIndex	2.745*** (0.282)	2.759*** (0.291)	3.494*** (0.382)	2.765*** (0.283)
PostRefxEUxRes_GATS				-0.148*** (0.013)
PostRefxEUxRes_SeniorMgt				-1.306*** (0.235)
PostRefxEUxRes_LocalPres				0.084* (0.050)
PostRefxEUxRes_PerfReq				-0.691*** (0.022)
Observations	95214	95214	73892	95214
Pseudo R ²	0.887	0.885	0.896	0.892

Fixed Effects: Exports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CountryxServ	CountryxTime	ServxTime	CountryxServ CountryxTime	CountryxServ ServxTime	ServxTime CountryxTime	All FE
Post21xEUxRes_GATS	0.017* (0.010)	-0.398*** (0.029)	-0.457*** (0.037)	-0.017** (0.009)	-0.034*** (0.011)	-0.160*** (0.027)	-0.032*** (0.009)
Post21xEUxRes_SeniorMgt	-2.327*** (0.395)	-12.329*** (0.555)	-10.777*** (0.738)	-2.332*** (0.414)	-2.330*** (0.399)	-10.695*** (0.738)	-2.273*** (0.410)
Post21xEUxRes_PerfReq	-0.386*** (0.115)	0.000 (.)	-2.462*** (0.123)	0.000 (.)	-0.333*** (0.111)	0.000 (.)	0.000 (.)
Post21xEUxRes_LocalPres	-0.111** (0.056)	-0.042 (0.102)	-0.038 (0.115)	-0.099** (0.048)	-0.152*** (0.055)	-0.301*** (0.114)	-0.139*** (0.047)
IntraEEASTRI	0.000 (.)	-0.441 (0.612)	4.644*** (0.652)	0.000 (.)	0.000 (.)	5.861*** (0.609)	0.000 (.)
nonEUxSTRIndex	0.000 (.)	-3.849*** (0.364)	-0.213* (0.110)	0.000 (.)	0.000 (.)	-1.573*** (0.284)	0.000 (.)
Post21xEUxIntraEEASTRI	3.386*** (0.378)	-3.148*** (1.023)	0.088 (1.103)	-3.938*** (0.520)	-2.489*** (0.446)	-3.546*** (1.071)	-4.252*** (0.514)
Post21xnonEUxSTRIndex	1.144*** (0.069)	0.046 (0.637)	-1.315*** (0.266)	0.472** (0.218)	-0.359*** (0.108)	0.317 (0.541)	0.297 (0.199)
Observations	44796	56498	57932	44505	44796	56498	44505
Pseudo R ²	0.944	0.576	0.167	0.952	0.950	0.694	0.954

Fixed Effects: Imports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CountryxServ	CountryxTime	ServxTime	CountryxServ CountryxTime	CountryxServ ServxTime	SectorxTime CountryxTime	All FE
Post21xEUxRes_GATS	-0.124*** (0.035)	-0.900*** (0.089)	-0.399*** (0.100)	-0.121*** (0.029)	-0.152*** (0.038)	-0.346*** (0.088)	-0.154*** (0.035)
Post21xEUxRes_SeniorMgt	-0.620* (0.324)	-10.346*** (0.862)	-10.582*** (0.744)	-0.473 (0.310)	-0.433 (0.327)	-10.091*** (0.689)	-0.363 (0.322)
Post21xEUxRes_PerfReq	0.261*** (0.032)	0.000 (.)	0.195* (0.113)	0.000 (.)	-0.296*** (0.055)	0.000 (.)	0.000 (.)
Post21xEUxRes_LocalPres	0.656*** (0.123)	1.508*** (0.288)	-0.079 (0.333)	0.590*** (0.105)	0.683*** (0.133)	-0.284 (0.301)	0.615*** (0.125)
IntraEEASTRI	0.000 (.)	5.658*** (0.622)	10.271*** (0.700)	0.000 (.)	0.000 (.)	9.230*** (0.620)	0.000 (.)
nonEUxSTRIndex	0.000 (.)	-1.726*** (0.330)	0.257 (0.273)	0.000 (.)	0.000 (.)	0.726** (0.317)	0.000 (.)
Post21xEUxIntraEEASTRI	-1.313* (0.717)	-0.930 (1.144)	-3.905*** (1.496)	-1.289** (0.624)	-0.657 (0.620)	-3.122** (1.294)	-0.713 (0.602)
Post21xnonEUxSTRIndex	1.824*** (0.091)	-0.195 (0.549)	-0.125 (0.527)	-0.156 (0.268)	-0.720*** (0.261)	-0.868 (0.559)	-0.503* (0.263)
Observations	40488	55118	57649	40104	40488	55118	40104
Pseudo R ²	0.919	0.545	0.103	0.930	0.928	0.607	0.934

Export: Individual Provision Reservations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post21xEUxRes_GATS	-0.040*** (0.009)			-0.040*** (0.009)	-0.032*** (0.009)		-0.032*** (0.009)
Post21xEUxRes_SeniorMgt		-2.269*** (0.410)		-2.253*** (0.410)		-2.291*** (0.410)	-2.273*** (0.410)
Post21xEUxRes_LocalPres			-0.189*** (0.047)		-0.137*** (0.047)	-0.191*** (0.047)	-0.139*** (0.047)
Post21xEUxIntraEEASTRI	-4.241*** (0.513)	-4.082*** (0.514)	-4.118*** (0.515)	-4.248*** (0.513)	-4.244*** (0.514)	-4.127*** (0.514)	-4.252*** (0.514)
Post21xnonEUxSTRIndex	0.288 (0.198)	0.340* (0.198)	0.345* (0.198)	0.283 (0.199)	0.299 (0.199)	0.339* (0.198)	0.293 (0.199)
Observations	44444	44444	44444	44444	44444	44444	44444
Pseudo R^2	0.954	0.954	0.954	0.954	0.954	0.954	0.954

Back

By Service Type (Financial Services)

	(1)
Post21xEUxRes_GATS	-0.039*** (0.009)
Post21xEUxRes_GATSxFin	-0.251*** (0.029)
Post21xEUxRes_SeniorMgt	-2.462*** (0.410)
Post21xEUxRes_SeniorMgtxFin	0.000 (.)
Post21xEUxRes_LocalPres	-0.039 (0.045)
Post21xEUxRes_LocalPresxFin	0.131 (0.123)
Post21xEUxIntraEEASTRI	-4.319*** (0.498)
Post21xnonEUxSTRIndex	0.376* (0.199)
Observations	44471
Pseudo R^2	0.955

- ▶ STRI is a measure of trade restrictiveness – quantifies restrictions on foreign entry and the movement of people, barriers to competition, regulatory transparency and other discriminatory measures that impact the ease of doing business
 - ▶ As we are studying the effects of the TCA we are interested in the impact of specific provisions (cross border trade in services and investment) rather than the barriers
 - ▶ STRI measures MFN restrictions, does not take into account any specific concessions such as regional trade agreements or mutual recognition agreements
- ▶ Some of the TCA provisions match well to STRI subcomponents (e.g. Senior Management), while some don't (Most Favoured Nation, National Treatment)
- ▶ Coding the reservations gives us much more sectoral variation than STRI does
- ▶ IntraEEA STRI is a measure of trade restrictiveness within the EEA

	Res_GATS	Res_SeniorMgt	Res_PerfReq	Res_LocalPres	IntraEEASTRI	STRIndex
Res_GATS	1.000					
Res_SeniorMgt	0.032	1.000				
Res_PerfReq	-0.307	0.120	1.000			
Res_LocalPres	0.453	-0.046	0.151	1.000		
IntraEEASTRI	-0.002	-0.045	-0.300	-0.212	1.000	
STRIndex	0.085	-0.025	-0.270	-0.044	0.784	1.000

	mean	sd	min	max
IntraEEASTRI	0.045	0.031	0.000	0.167
<i>N</i>	53040			

	mean	sd	min	max
STRIndex	0.224	0.091	0.057	1.000
<i>N</i>	132210			

GATS combines Market Access, Most Favoured Nation, National Treatment - obligations under GATS, often present in shallow agreements and “new” agreements

CUSMA: Example

Reservation I-C-20

Sector: Transportation

Sub-Sector: Land Transportation

Obligations Concerned: National Treatment (Article 15.3), Local Presence (Article 15.6)

Level of Government: Central

Measures: Motor Vehicle Transport Act, R.S.C. 1985, c. 29 (3rd Supp.), as amended by S.C. 2001, c. 13. Canada Transportation Act, S.C. 1996, c. 10 Customs Tariff, S.C. 1997, c. 36

Description: Cross-Border Trade in Services

Only a person of Canada using Canadian-registered and either Canadian-built or duty-paid trucks or buses, may provide truck or bus services between points in the territory of Canada.

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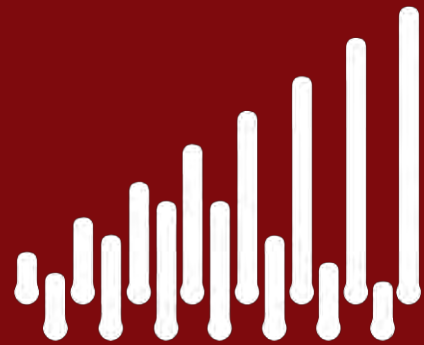
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