

Tension Points:

A Theory & Evidence on Migration in Brexit



University of
BRISTOL

ljwolf.org/post/cdrc-brexit/

Levi John Wolf

Bristol Spatial Modelling Group

18 April 2018



Consumer
Data
Research
Centre

An ESRC Data
Investment

Data challenge!

**THE CHALLENGE PROMPT
ITS IMPLICIT THEORY
TWO MEASURES**

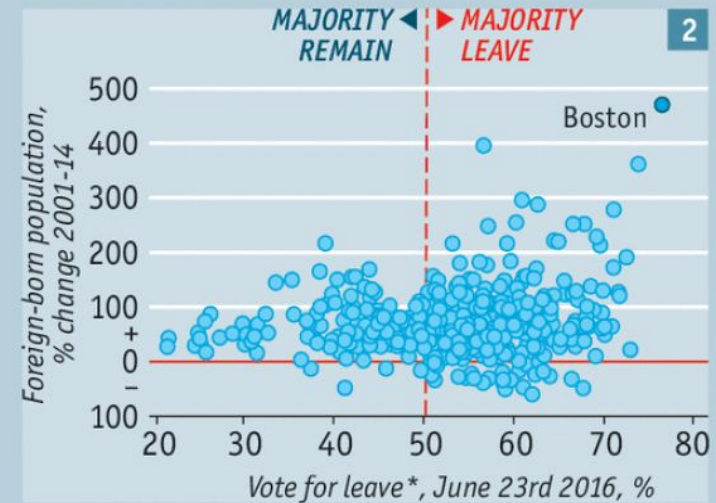
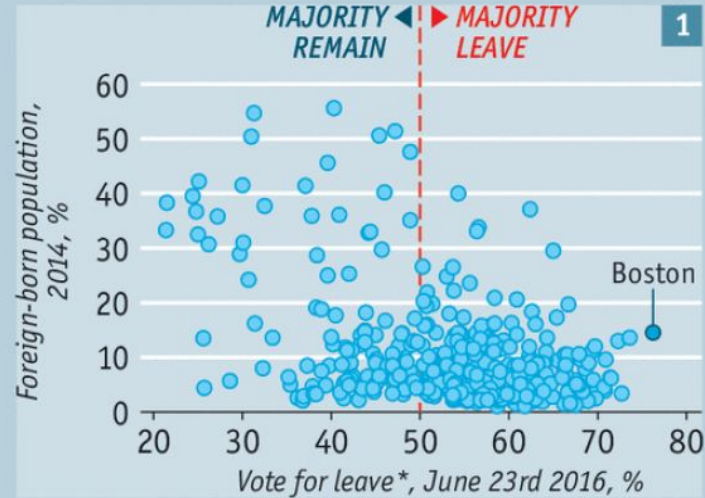
Bregman divergences

Direct rate of changes

PRELIMINARY RESULTS

Poles apart

Britain's EU referendum results



Sources: Electoral Commission; ONS

*By local authority area

Economist.com

**“High numbers of migrants
don’t bother Britons**

high rates of change do”

Get off my lawn or I’ll leave the EU

**“High numbers of migrants
don’t bother Britons**

high rates of change do”

The real theory

All non-UK born are “migrants,” but:

*“Change” implies people who are new/different
Naturalization + within-UK migration means “old” Britons
might still move around, & small communities make
this sizeable.*

Neither examines the “volatility” of the population mix

**“High numbers of migrants
don’t bother Britons**

high rates of change do”

The real theory about people

Change of community identity: *specific tension points*

No one remembers the old pub or the shop before the Tesco's

I don't know my neighbors anymore

My neighbors aren't like me; they

Celebrate different holidays

Go to a different church (or don't go at all)

Have hard-to-pronounce names

**“High numbers of migrants
don't bother Britons**

high rates of change do”

Tension Points: real theory for places → people

Non-UK born population (“not like me”)

Migrants from outside the UK (new to Britain)

Migrants within the UK (new to community)

Population structure volatility (new community)

high rates of change do”

Separate the points

Non-UK born population (“not like me”)

Migrants from outside the UK (new to Britain)
Migrants within the UK (new to community)
**Direct effect & year-on-year change
obtained/derived from APS**

Separate the points: not like me

Migrants from outside the UK (new to Britain)

Migrants within the UK (new to community)



Home	Business, industry and	Economy	Emp and
------	------------------------	---------	---------

Home > People, population and community > Population and mig

Local Area Migration Indicators, UK

Dataset:

Local Area Migration Indicators,

Since 2004:

- ***to LA from outside UK***
- ***to LA from within UK***
- ***from LA to somewhere outside UK***
- ***from LA to somewhere else within UK***
(among other measurements)

Separate the points: newcomers

Migrants from outside the UK (new to Britain)

Migrants within the UK (new to community)



Since 2004:

→ *to LA from outside UK*

→ *to LA from within UK*

→ *from LA to somewhere outside UK*

→ *from LA to somewhere else within UK*

Internal & External

Separate the points: newcomers

Migrants from outside the UK (new to Britain)

Migrants within the UK (new to community)

$$net_t = \frac{(inflow_t - outflow_t)}{population_t}$$

Average net_t from 2011 to 2016 for

Internal & External

Separate the points: newcomers

IN GENERAL:

*Internal leave London,
head for the South*

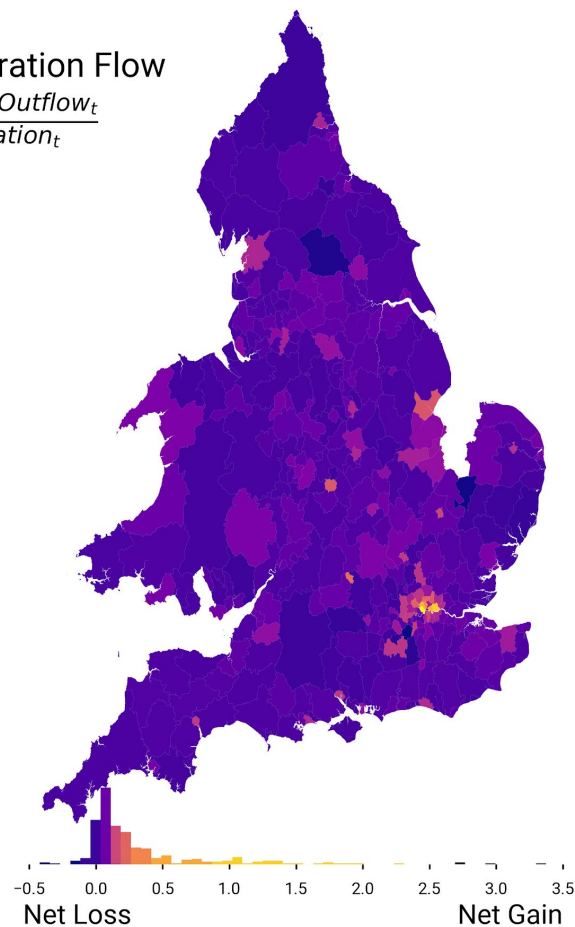
*External migrants
go exclusively London*

Average Net Immigration Flow

$$net_t = \frac{Inflow_t - Outflow_t}{Population_t}$$



Within UK



Outside UK

Migrants from outside the UK (new to Britain)

Migrants within the UK (new to community)

Non-UK born population (“not like me”)

Population structure volatility (new community)



An ESRC Data
Investment



Separate the points: structural change

Migrants from outside the UK (new to Britain)

Migrants within the UK (new to community)

Non-UK born population (“not like me”)

Population structure volatility (new community)



An ESRC Data
Investment



Separate the points: structural change

Population structure volatility (new community)

We do a slight aggregation on these second-level ethnicity categories. We then aggregate by 2011 LSOA (SOA for NI, Data Zones for Scotland). Category populations less than 5 are set to 0. The results are then divided by the total population and rounded to the nearest 0.005 (i.e. 0.5%).

Our aggregated ethnicity categories used are (with codes used in the data files):

- WBR - White: British (including English/Welsh/Scottish/Northern Irish)
- WIR - White: Irish
- WAO - White: Any Other
- ABD - Asian/Asian British: Bangladeshi
- ACN - Asian/Asian British: Chinese
- AIN - Asian/Asian British: Indian
- APK - Asian/Asian British: Pakistani
- AAO - Asian/Asian British: Any Other
- BAF - Black/Black British: African
- BCA - Black/Black British: Caribbean
- OXX - Any Other Ethnic Group (including Mixed; Black/Black British: Any Other; Arab; All Other Ethnicities; &c.)

Separate the points: structural change

Population structure volatility (new community)

We do a slight aggregation on these second-level ethnicity categories. We then aggregate by 2011 LSOA (SOA for NI, London Zones for Scotland), Gaelic speakers less than 5 are set to 0. The results are then divided by population to get the percentage of the population in each category.

Percentage breakdowns

11 ethnic categories

Aggregated to LSOA

Since 1998

Volatility

In ethnic mix

At local authority

In the run-up to Brexit

- WBR - White: British (including English/Welsh/Scottish/Northern Irish)
- WBP - White: British: Pakistani
- ABD - Asian/Asian British: Bangladeshi
- ABC - Asian/Asian British: Chinese
- AIN - Asian/Asian British: Indian
- APK - Asian/Asian British: Pakistani
- AAO - Asian/Asian British: Any Other
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Separate the points: structural change

Population structure volatility (new community)

We do a slight aggregation on these second-level ethnicity categories. We then aggregate by 2011 LSOA (SOA for NI, London Zones for Scotland). Categories with less than 5 are set to 0. The results are then divided by the population to get the percentage breakdown.

Percentage breakdowns → ? → **Volatility**

Aggregating ethnicity categories used in the data files):

11 ethnic categories → **In ethnic mix**

Aggregated to LSOA → **At local authority**

Since 1998 → **In the run-up to Brexit**

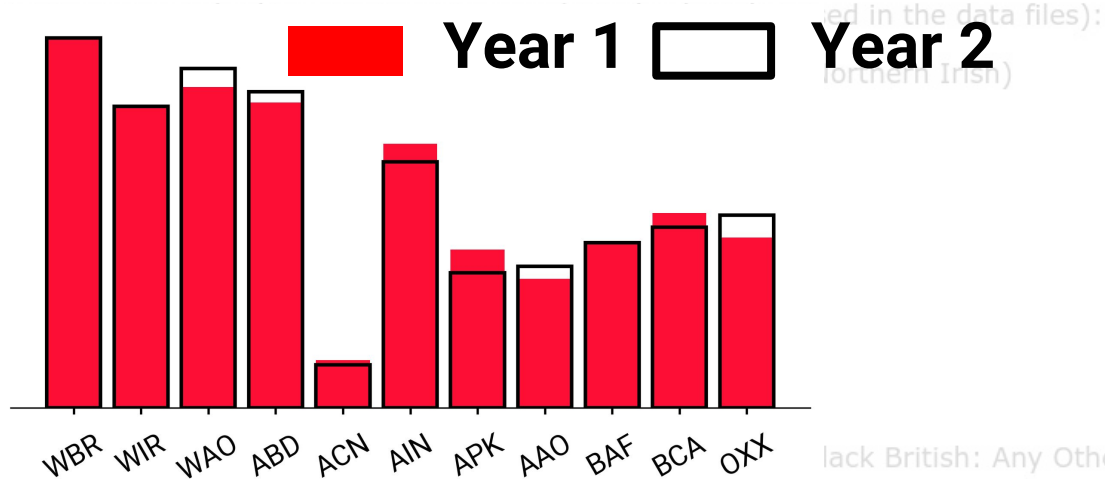
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Percentage breakdowns → ? ← **Volatility**

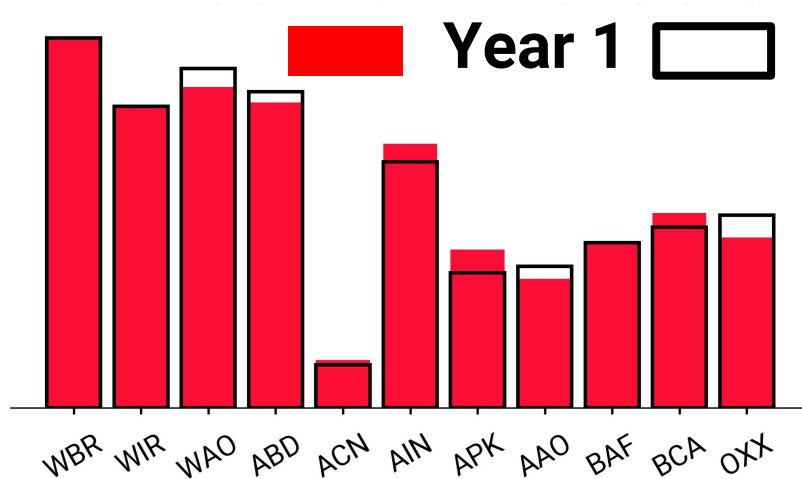


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Percentage breakdowns → ? ← **Volatility**



How to measure the magnitude of total change from Year 2 to Year 1?

Separate the points: structural change

Population structure volatility (new community)

We do a slight aggregation on these second-level ethnicity categories. We then aggregate by 2011 LSOA (SOA for NI, ...). The results are then divided by ...

Percentage breakdowns $\longrightarrow ? \longleftarrow$ **Volatility**

Structure and information in spatial segregation



How to measure the magnitude of total change from Year 2 to Year 1?

Philip S. Chodrow

PNAS October 31, 2017. 114 (44) 11591-11596; published ahead of print October 20, 2017
<https://doi.org/10.1073/pnas.1708201114>

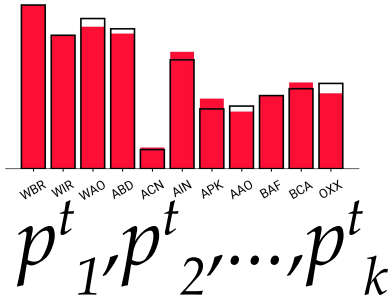
Edited by Michael F. Goodchild, University of California, Santa Barbara
(received for review May 17, 2017)

**STATISTICAL
DIVERGENCE**

Separate the points: structural change

Population structure volatility (new community)

Percentage breakdowns $\longrightarrow ? \longleftarrow$ **Volatility**

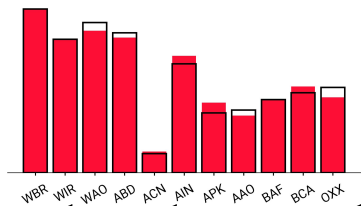


*Fraction of population in
category $i = 1, 2, \dots, k$ in time t*

Statistical Divergences

Population structure volatility (new community)

Percentage breakdowns $\longrightarrow ? \longleftarrow$ **Volatility**



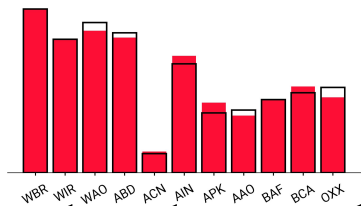
$$p_1^t, p_2^t, \dots, p_k^t = h_t$$

Frequency vector describing k categories in time t

Statistical Divergences

Population structure volatility (new community)

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$$p_1^t, p_2^t, \dots, p_k^t = h_t$$

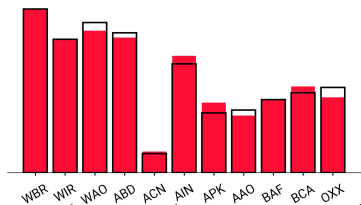
Frequency vector describing k categories in time t

$$p_1^{t+1}, p_2^{t+1}, \dots, p_k^{t+1} = \quad \text{and again in time } t+1$$

Statistical Divergences

Population structure volatility (new community)

Percentage breakdowns $\longrightarrow ? \longleftarrow$ Volatility



$$p_1^t, p_2^t, \dots, p_k^t = h_t$$

$$p_1^{t+1}, p_2^{t+1}, \dots, p_k^{t+1} =$$

Divergence D is a function:

$$D(h_t \parallel h_{t+1}) = m$$

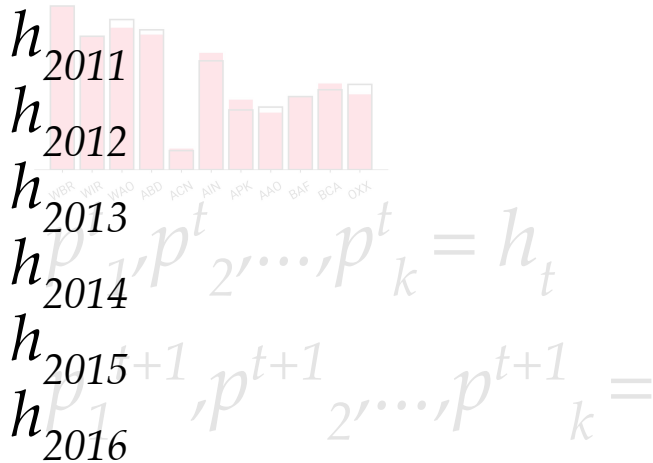
Where $m \geq 0$

And $m = 0$ iff $h_t = h_{t+1}$

^h
Statistical Divergences

Population structure volatility (new community)

Percentage breakdowns $\longrightarrow ? \longleftarrow$ **Volatility**



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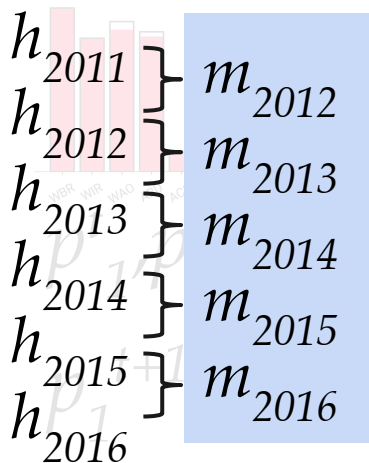
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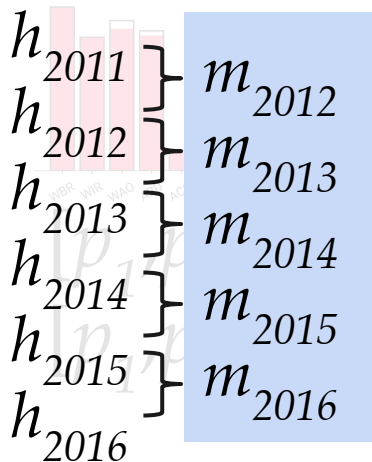
Where $m \geq 0$

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Statistical Divergences

Population structure volatility (new community)

Percentage breakdowns $\longrightarrow ? \longleftarrow$ Volatility



Magnitude of yearly change in population mix over the entire population distribution.

i.e. the volatility of pop mix!

Statistical Divergences

Common Divergences

- Kullback-Leibler (KL)
- Mahalanobis Distance
- Wasserstein/Earth Mover's Distance

*(NOTE: A “divergence” can be asymmetric, so $D(h_t \parallel h_{t+1}) \neq D(h_{t+1} \parallel h_t)$
but any “distance” usually implies a metric, which must be symmetric)*

Common Divergences

→ Kullback-Leibler (KL)

→ Mahalanobis Distance

→ **Wasserstein/Earth Mover's Distance**

$$\sum_j^k |p_j^{t+1} - p_j^t| = \text{EMD}(h_t \parallel h_{t+1})$$

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Change in % category between years

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***Absolute** Change in % category between years*

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***Absolute Change in % category between years
summed over all categories***

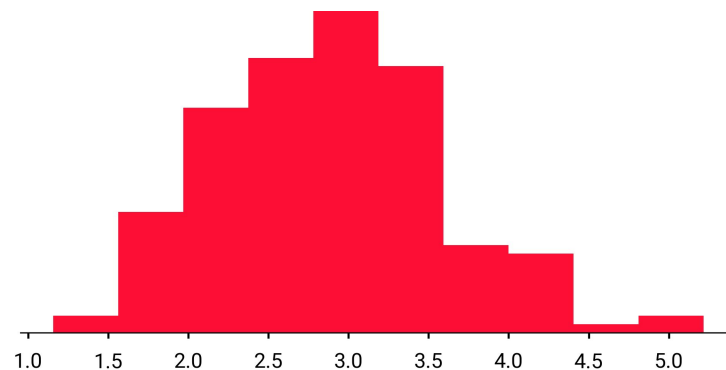
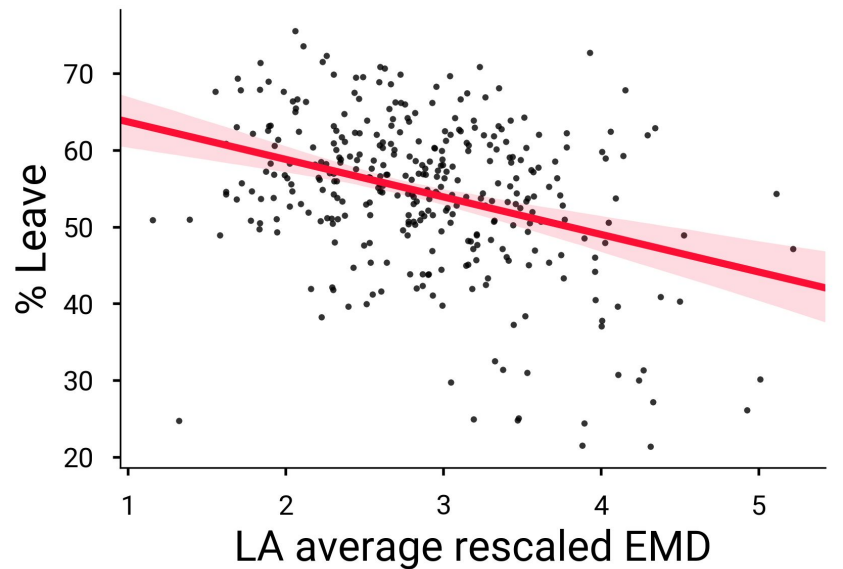
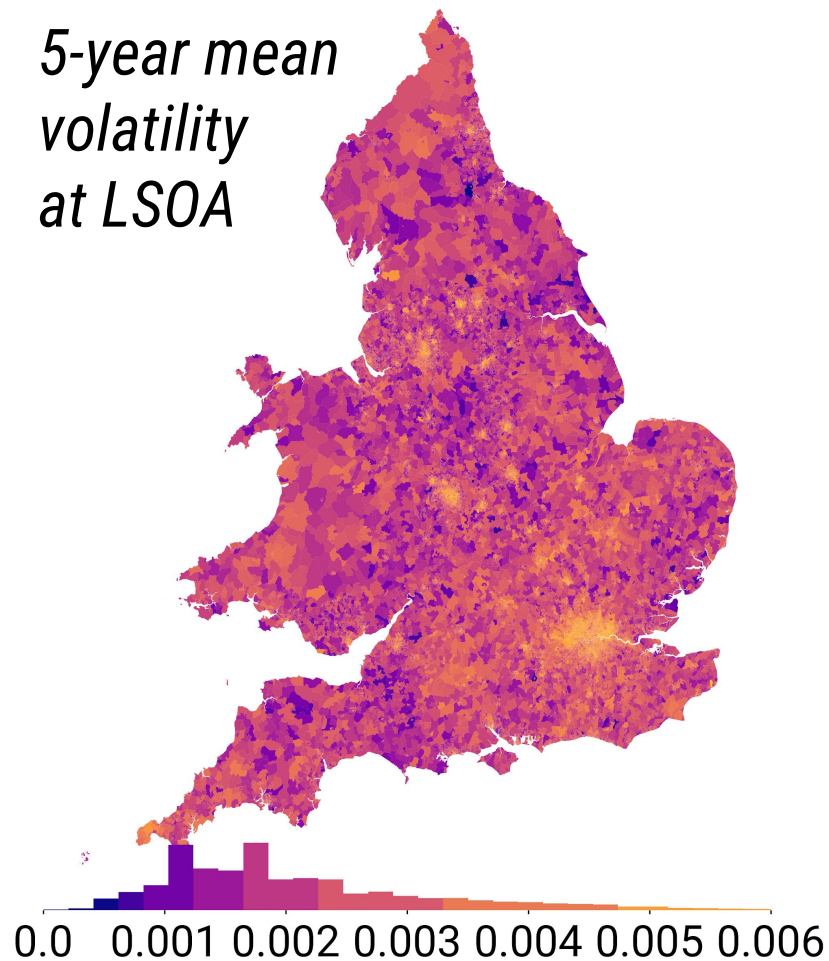
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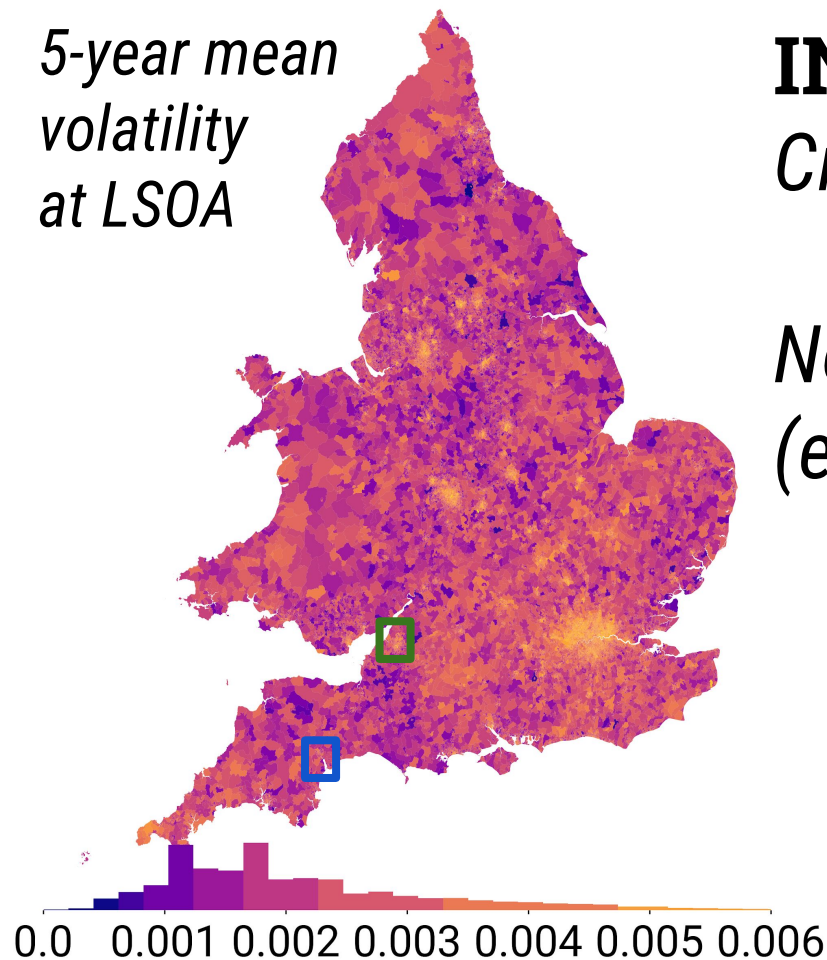
$$\sum_j^k |p_j^{t+1} - p_j^t| = \text{EMD}(h_t \parallel h_{t+1})$$

Total probability mass that must be moved.

*5-year mean
volatility
at LSOA*



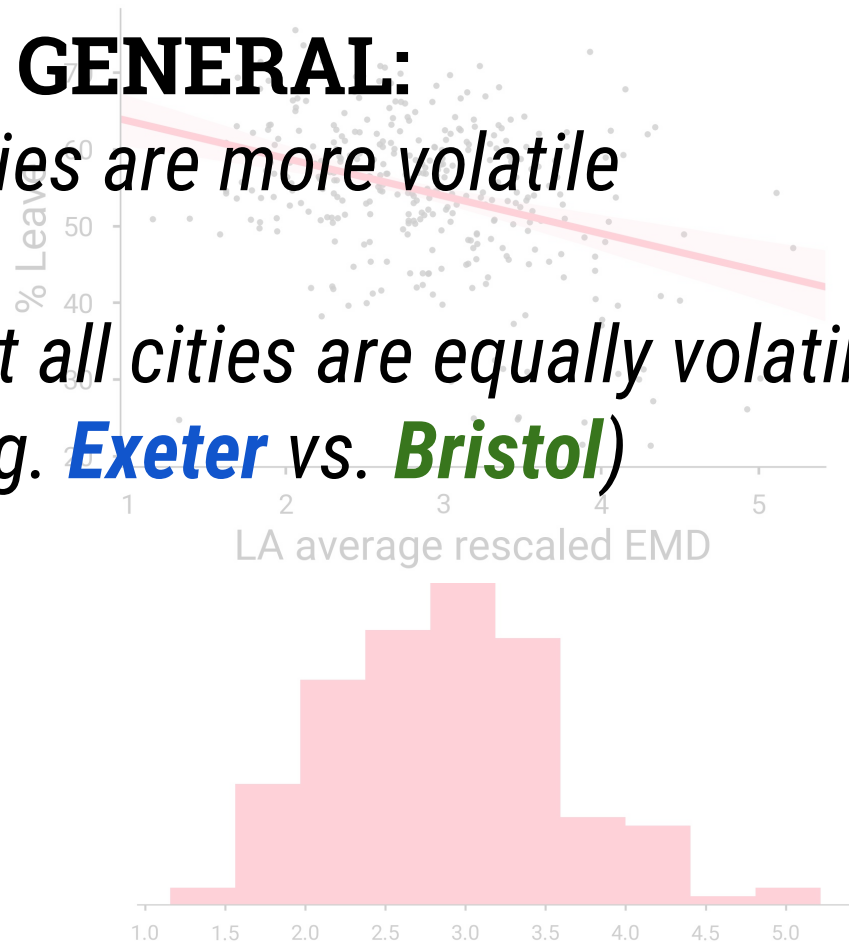
5-year mean
volatility
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IN GENERAL:

Cities are more volatile

*Not all cities are equally volatile
(e.g. **Exeter** vs. **Bristol**)*



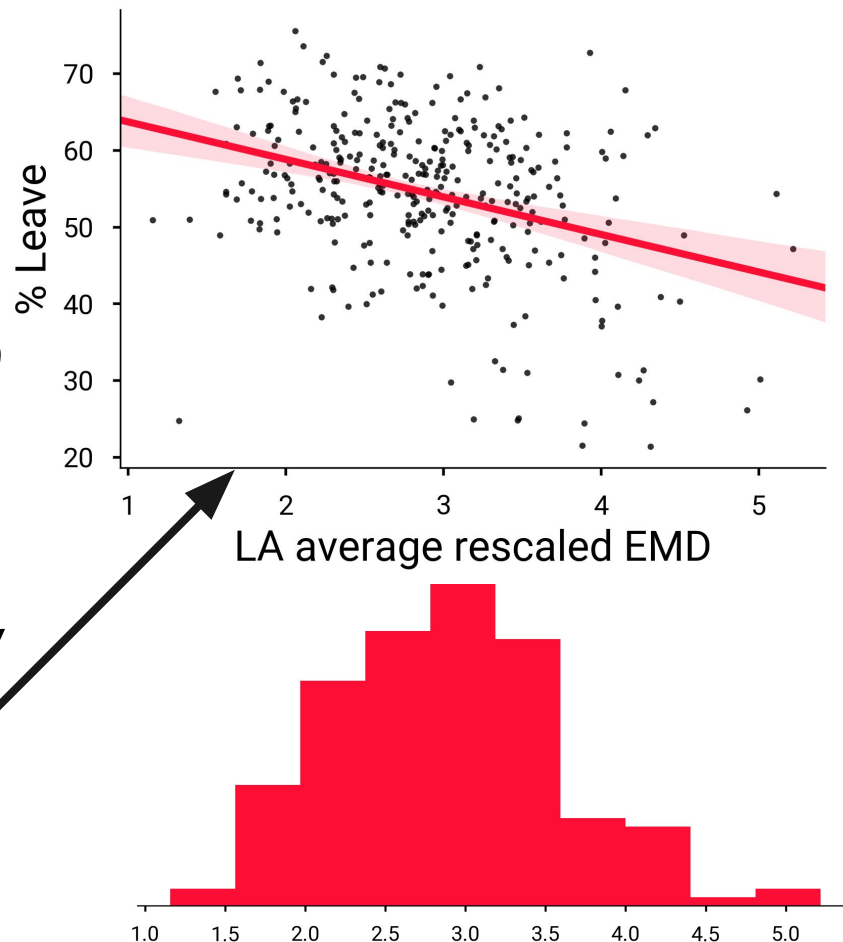
IN GENERAL:

Cities are more volatile

*Not all cities are eq. volatile
(e.g. **Exeter** vs. **Bristol**)*

*Volatility alone is negatively
related to Leave voting
at local authority*

0.0 0.001 0.002 0.003 0.004 0.005 0.006



No Monocausal Explanations

→ Also control for:

- ◆ *Education level: no qualifications & uni degree %*
- ◆ *Change in % manufacturing since 2011*
- ◆ *White Unemployment*
- ◆ *Age distributions (youngs & old only)*
- ◆ *Number of Votes cast (large LAs may be more Remain)*

Model Specification

Varying intercept/Region RE model:

$$y = R\alpha_j + R\zeta + X\beta + \varepsilon$$

$$\zeta \sim N(0, \tau^2)$$

$$\varepsilon \sim N(0, \sigma^2)$$

ljwolf.org/post/cdrc-brexite/

Model Specification

Varying intercept/Region RE model:

$$y = R\alpha_j + R\zeta + X\beta + \varepsilon$$

$\zeta \sim N(0, \sigma^2)$ **Typical data & marginal effects for N LAs**

$$\varepsilon \sim N(0, \sigma^2)$$

ljwolf.org/post/cdrc-brexit/

Model Specification

Varying intercept/Region RE model:

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Aggregation matrix from N LAs to J regions

$$\varepsilon \sim N(0, \sigma^2)$$

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Model Specification

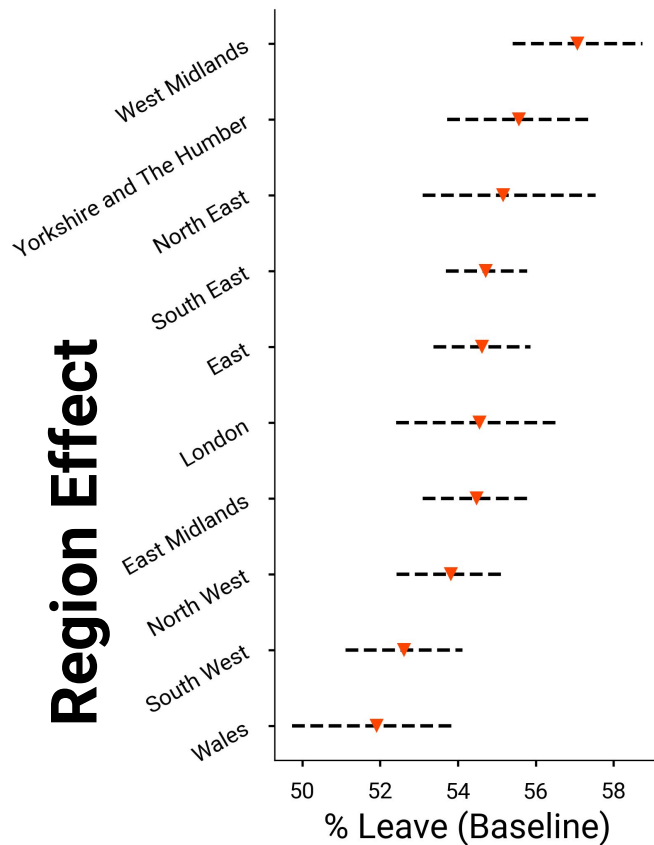
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$$\zeta \sim N(0, \tau^2) \quad \textbf{Regionally-unique intercept}$$

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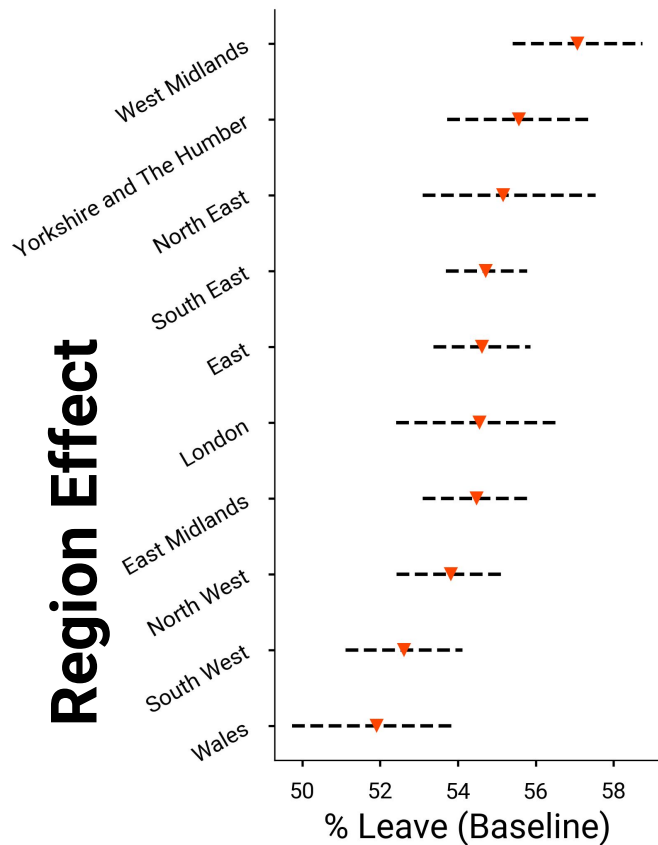
ljwolf.org/post/cdrc-brexit/



	Median	2.5%	97.5%	Δ IQR
% No Qualifications	-.0629	-.2627	.1392	-.2516
% Uni Degree	-.7631	-.8402	-.6848	-10.72
Δ % Manuf. Emp.	-.0751	-.2208	.0698	-.2628
White Unemp %	.2076	-.0488	.4662	.6019
% 16 to 19	-.4353	-.7749	-.1051	-.7942
% 20 to 24	-.3908	-.6366	-.1410	-1.151
% 50 and Up	-.0252	-.1283	.0756	-.2623
Votes Cast	-.0164	-.0270	-.0057	-.8001

$R^2 = .81$

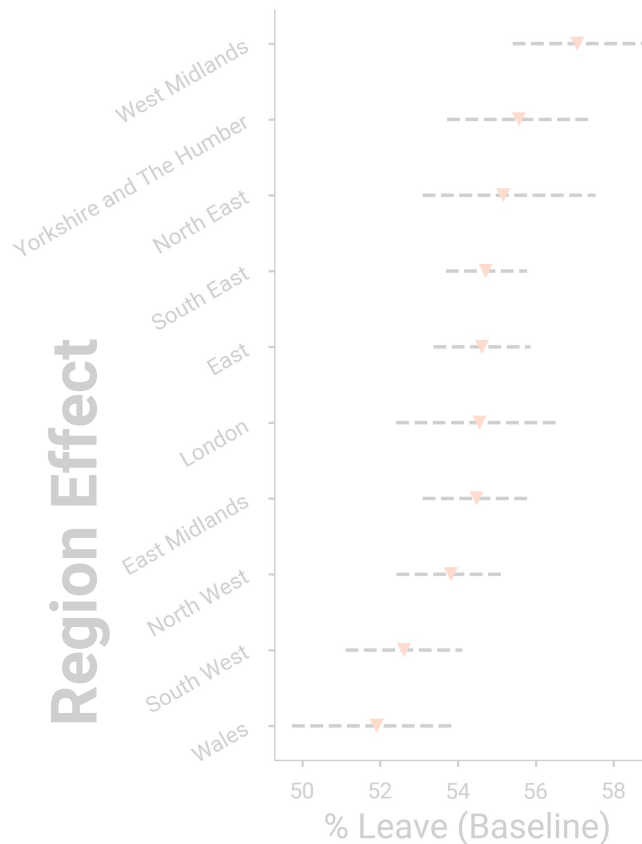
Parameter Estimates: Confounders/Controls



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Parameter Estimates: Confounders/Controls

	Median	2.5%	97.5%	ΔIQR
% Ethnic Non-UK born	.0842	-.0505	.2249	.4801
Change in $\uparrow$	1.249	.3624	2.164	.4538
% White Non-UK born	.0639	-.0977	.2256	.3162
Change in $\uparrow$	1.572	.5323	2.638	.7858
Volatility	-.8064	-1.640	0.011	-.7724
Mean Net External	-1.562	-3.125	-.0460	-.4720
Mean Net Internal	1.794	.2091	3.298	1.081

Parameter Estimates: Change effects

Total non-UK is not strongly associated.

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Parameter Estimates: The Economist's Empirics

***Change in non-UK,
regardless of
ethnicity, is strongly
associated Leave.***

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Parameter Estimates: The Economist's Empirics

More migrants from within the UK is associated with Leave.

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Parameter Estimates: Migration from inside UK

***More migrants from
outside the UK is
associated with
Remain, not Leave!***

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Parameter Estimates: Migration from outside UK

***Volatility is weak,
95-99% of posterior
is below 0 during
re-simulation.***

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Parameter Estimates: Migration from outside UK

- not like me
 L RoC not like me
 - not like me
 L RoC not like me
 Rw Volatility
 R New to country
 L New to community

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Mean Net Internal	1.794	.2091	3.298	1.081

Parameter Estimates: Change effects

“High numbers of migrants
don’t bother Britons,
high rates of change

*in their community’s national backgrounds or
in the people new to their community from
elsewhere in the UK*

do.”

The Economist correct on some points

But, high rates of change in
other types of migration &
social structures, like

*in the community's racial/ethnic mix or
in the people new to the country*

**may actually do the
opposite.**

The Economist correct on some points

QUESTIONS ON:

Tension Points:

A Theory & Evidence on Migration in Brexit



University of
BRISTOL

ljwolf.org/post/cdrc-brexit/

Levi John Wolf

Bristol Spatial Modelling Group

18 April 2018



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Data challenge!