

Migration patterns of Europeans after Brexit

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Introduction

- **June 2016** : Brexit Referendum
- **31 december 2020** : Brexit

➡ How has the Brexit reshaped migration patterns from EU citizens ?

➡ How has the UK attractiveness changed among different categories of migrants ?



Outline

- 1 Litterature
- 2 Data
- 3 Logit model
- 4 Nested models
- 5 Placebo

Litterature

→ **Diff in diff approaches** : focus on macro changes of migration flows

- [1] Basile, R., F. Licari, C. Reynaud and E. Tucci (2022) Brexit and migration diversion: Evidence from Italy
- [2] Clifton-Sprigg, J., I. Homburg, J. James and S. Vujic (2021) A bad break-up? assessing the effects of the 2016 brexit referendum on migration, IZA Discussion Paper, (16468).
- [3] Di Iasio, V. and J. Wahba (2023) Expecting brexit and uk migration: Should i go?, European Economic Review.

Our approach

1) Simple logit models :

→ Micro economic approach based on individual preferences

2) Nested logit models :

→ To capture substitution patterns based on individual's and destination's characteristics

[4] Michel A. R. Beine, Michel Bierlaire, and Frederic Docquier. New york, Abu Dhabi, London or stay at home ? using a cross-nested logit model to identify complex substitution patterns in migration. SSRN, March 2022.

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Data

Gallup World Poll Data (2023) : representative of 99 % of the world's adult population

Migration related questions :

- WP1325: *Ideally, if you had the opportunity, would you like to move permanently to another country, or would you prefer to continue living in this country?*
- WP3120: *To which country would you like to move? (Asked only of those who would like to move to another country.)*

Data

⇒ 17% of respondents express a desire to relocate

Top 15 selected destinations

Country Name	Share of migration intentions (%)
Germany	12.2
United Kingdom	10.4
United States of America	9.5
Australia	6.6
Spain	6.5
Canada	4.9
Switzerland	4.7
France	4.5
Italy	3.9
Austria	3.8
Sweden	3.5
Norway	3.2
Netherlands	2.4
Denmark	1.6
Ireland	1.5

Data

Variables

Variables and sources

Variable	Source	Type
Age	GWP	Numeric
Individual income	GWP and processing	Numeric
Education	GWP	3 levels
Gender	GWP	2 levels
Language proximity	CEPII	Numeric
Population	United Nations	Numeric
Diaspora	United Nations	Numeric
GDP	World Bank	Numeric
Distance	Computed	Numeric
Contiguity	Added manually	Dummy
OECD	Added manually	Dummy
English speaking	Added manually	Dummy
Schengen area	Added manually	Dummy

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Logit model

Discrete choice model framework

Utility for country c , individual n :

$$U_{c,n} = V_{c,n} + \epsilon_{c,n}$$

where $V_{c,n}$ is deterministic and $\epsilon_{c,n}$ distributed

Random utility maximization principle where \mathcal{C}_n is the individual choice set :

$$P_n(c|\mathcal{C}_n) = P(U_{c,n} > U_{j,n} \forall j \neq c, j \in \mathcal{C}_n)$$

$\implies P_n(c|\mathcal{C}_n)$ depends on the distribution of the $\epsilon_{c,n}$

Logit model

Expression

Assumption : $\epsilon_{c,n}$ iid EV(0, $\mu = 1$) across c and n

Derivated probability :

$$P_n(c|C_n) = \frac{e^{\mu V_{c,n}}}{\sum_{j \in C_n} e^{\mu V_{j,n}}}$$

Logit model

Utility to stay

Variables in the utility to stay

- Age
- Education level
- Income
- Gender

Logit model

Utility to move, country c

Variables in the utility to move to a country c

- Diaspora
- Population
- GDP
- Distance
- Language proximity $\in [0, 1]$
- Contiguity \cdot GDP difference between c and origin country

Logit model

Utility to move, UK

Additional variables in the utility to move to the UK

- Uncertainty period · Education level
 - Post-Brexit · Education level
 - Education level
 - Origin specific constants
-
- Pre-Brexit period : 2012 - June 2016
 - Uncertainty period : June 2016 - 31 december 2020
 - Post-Brexit period : 1st January 2021 - 31 december 2022

Logit model

Estimation

- Estimation done with the Biogeme software
- Sample is of size 96685 (60000 sampled intended stayers + 36685 intended movers in the base)
- Common choice set of 150 countries of destination

Logit model

Results - 1st model

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit Hs After	-0.322	0.0946	-3.4	0.000664
Brexit Hs Uncert	-0.263	0.0847	-3.11	0.0019
Brexit Ls After	-0.362	0.171	-2.12	0.0341
Brexit Ls Uncert	-0.139	0.107	-1.3	0.194
Brexit Ms After	-0.371	0.0703	-5.27	1.33e-07
Brexit Ms Uncert	-0.209	0.0527	-3.97	7.23e-05
Contiguous GDP	0.178	0.0253	7.05	1.73e-12
Diaspora Hs	0.252	0.00486	51.8	0
Diaspora Ls	0.397	0.00931	42.7	0
Diaspora Ms	0.313	0.00414	75.6	0
Distance	-0.0908	0.0064	-14.2	0
Gdp Hs	0.867	0.0165	52.4	0
Gdp Ls	0.708	0.0292	24.3	0
Gdp Ms	0.789	0.0122	64.8	0
Language	-0.56	0.0526	-10.6	0
Population	0.33	0.00482	68.3	0
Hs UK	0.477	0.112	4.26	2.08e-05
Ms UK	0.363	0.107	3.4	0.000663
Ls UK	0.405	0.117	3.47	0.000527

Table: Intended movers coefficients

→ Intended stayers' utility coefficients are consistent with the literature

→ Need to include group destination constants for future nests : OECD, Schengen, English-speaking

Logit model

Results - Adding group destination constants

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	-0.301	0.0945	-3.19	0.00143
Brexit HS Uncert	-0.266	0.0846	-3.15	0.00166
Brexit MS After	-0.349	0.0703	-4.97	6.61e-07
Brexit MS Uncert	-0.212	0.0526	-4.04	5.42e-05
Brexit LS After	-0.333	0.171	-1.95	0.0507
Brexit LS Uncert	-0.143	0.107	-1.34	0.181
English	-5.04	0.26	-19.4	0
OECD	1.5	0.101	14.9	0
Schengen	1.23	0.188	6.56	5.27e-11
Contiguous PIB	0.133	0.0128	10.4	0
Diaspora HS	0.212	0.0054	39.2	0
Diaspora LS	0.372	0.00977	38	0
Diaspora MS	0.279	0.00457	61	0
Distance	0.0746	0.0206	3.62	0.000295
Distance English	0.631	0.0302	20.9	0
Distance OECD	-0.148	0.0137	-10.8	0
Distance Schengen	-0.0598	0.0234	-2.56	0.0105
Language	-0.65	0.0574	-11.3	0
GDP HS	0.567	0.0226	25.1	0
GDP LS	0.33	0.035	9.45	0
GDP MS	0.456	0.0189	24.1	0
HS UK	1.38	0.118	11.7	0
LS UK	1.31	0.122	10.7	0
MS UK	1.27	0.113	11.2	0
Population	0.312	0.00614	50.8	0

Table: Intended movers coefficients

Logit model

Limitations

Limitations of the multinomial logit model :

- ⇒ Irrelevance from independent alternatives (IIA) property : cross-elasticity for destination j is the same across all other destinations
- ⇒ We need models that can capture better the substitution patterns

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Nested models

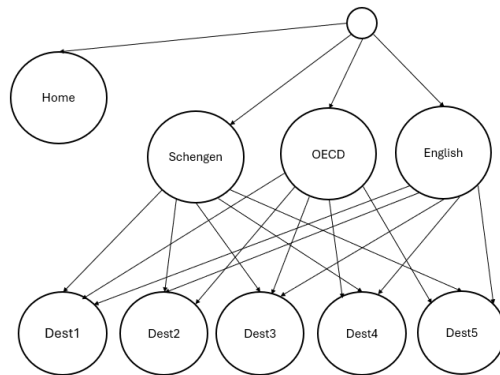
Nesting structure idea

Nested structure : capture unobserved shared attributes between alternatives

- ➡ Intended movers might share unobserved characteristics that differ from intended stayers
→ Exclusive nests : **nested logit model**
- ➡ English-speaking countries, Schengen countries, OECD countries might as well share unobserved characteristics that differ → Overlapping nests : **cross-nested logit model**

Nested models

Illustration - Cross nested



Cross nested structure

Nested models

Cross nested

Name	Value	Rob. Std err	Rob. t-test	Rob. p-value
MU English Official	1.24	0.0159	77.6	0
MU OECD	1.97	0.0219	90	0
MU Schengen	1.76	0.0103	171	0
Brexit Hs After	-0.205	0.0682	-3.01	0.00262
Brexit Hs Uncert	-0.197	0.0616	-3.19	0.00142
Brexit Ms After	-0.252	0.0514	-4.92	8.8e-07
Brexit Ms Uncert	-0.148	0.0385	-3.84	0.000121
Brexit Ls After	-0.234	0.125	-1.87	0.062
Brexit Ls Uncert	-0.101	0.0787	-1.29	0.197
English Official	-4.45	0.217	-20.5	0
OECD	-1.52	0.091	-16.7	0
Schengen	2.75	0.157	17.5	0
Contiguous GDP	0.0893	0.0154	5.79	7.03e-09
Diaspora Hs	0.163	0.00361	45	0
Diaspora Ms	0.207	0.00307	67.3	0
Diaspora Ls	0.263	0.00598	44	0
Distance	-0.117	0.0157	-7.5	6.48e-14
Distance English	0.574	0.0277	20.8	0
Distance Oecd	0.29	0.0132	22.1	0
Distance Schengen	-0.0995	0.0207	-4.81	1.51e-06
Population	0.222	0.00444	50	0
Language	-0.472	0.0367	-12.9	0
Gdp Hs	0.547	0.0134	40.8	0
Gdp Ms	0.489	0.0107	45.6	0
Gdp Ls	0.433	0.0232	18.7	0
Hs UK	1.49	0.0847	17.6	0
Ms UK	1.41	0.0808	17.5	0
Ls UK	1.44	0.0877	16.4	0

Cross nested model - Movers

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Placebo

Ideas and hypotheses

H1 : Brexit affected people's migration patterns only through the visa channel

- Only citizens from EU are affected → previous models showing a negative impact of Brexit
- Non EU citizens entry conditions haven't changed → Brexit shouldn't have an effect

H2 : Brexit reduced global attractiveness of the UK

- Citizens from EU are affected → previous models showing a negative impact of Brexit
- Non EU citizens are also affected → Brexit should have a negative effect



Placebo

Results on 5 countries

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	0.0793	0.642	0.124	0.902
Brexit HS Uncert	0.0827	0.605	0.137	0.891
Brexit MS After	0.0841	0.2	0.421	0.674
Brexit MS Uncert	0.0936	0.176	0.531	0.596
Brexit LS After	0.078	0.446	0.175	0.861
Brexit LS Uncert	0.0847	0.392	0.216	0.829
English	0.00793	0.016	0.496	0.62
OECD	0.223	0.0196	11.4	0
Schengen	-0.0519	0.0165	-3.14	0.00166
Diaspora HS	0.156	0.00553	28.3	0
Diaspora LS	0.223	0.00486	45.9	0
Diaspora MS	0.284	0.00293	96.7	0
Distance	-0.000623	0.00017	-3.66	0.00025
GDP HS	-0.0426	0.00696	-6.12	9.17e-10
GDP LS	-0.0322	0.0071	-4.54	5.64e-06
GDP MS	-0.183	0.00425	-42.9	0
Population	-0.0744	0.00531	-14	0
HS UK	0.0874	0.358	0.244	0.807
MS UK	0.113	0.121	0.938	0.348
LS UK	0.0919	0.214	0.429	0.668
Contiguous GDP	0.111	0.0218	5.11	3.18e-07
Language	-0.0492	0.145	-0.339	0.735

Table: Intended movers - Full choice set

TRANSP-OR

→ 5 non EU countries : Albania, South Africa, Turkey, Nigeria, Australia

→ Problem : Significant missing data for diaspora that biases the estimation

→ Solution : Restrict the choice set to countries for which we have the data

Placebo

Restrict choice set

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	0.18	0.196	0.919	0.358
Brexit HS Uncert	0.141	0.173	0.816	0.414
Brexit MS After	0.00809	0.105	0.0774	0.938
Brexit MS Uncert	-0.136	0.0837	-1.63	0.103
Brexit LS After	-0.669	0.19	-3.52	0.000433
Brexit LS Uncert	0.177	0.127	1.39	0.164
English	1.06	0.0369	28.6	0
OECD	0.708	0.0388	18.2	0
Schengen	-0.158	0.0307	-5.16	2.49e-07
Diaspora HS	0.0741	0.0104	7.13	1.01e-12
Diaspora LS	0.222	0.0102	21.6	0
Diaspora MS	0.127	0.007	18.1	0
Distance	-1.14	0.0207	-55.2	0
GDP HS	1.2	0.048	25.1	0
GDP LS	0.802	0.036	22.3	0
GDP MS	0.898	0.0237	38	0
Population	0.715	0.0113	63.4	0
HS UK	-0.322	0.141	-2.28	0.0224
MS UK	-0.033	0.0882	-0.374	0.708
LS UK	-0.193	0.113	-1.71	0.088
Contiguous GDP	0.48	0.0731	6.56	5.28e-11
Language	1.67	0.254	6.59	4.47e-11

Table: Intended movers - restricted choice set

TRANSP-OR

→ Diaspora, GDP and Population have consistent signs

→ Most of the Brexit coefficients are not significant → H1

→ Except for Low skilled after for which we have a negative effect → H2

Placebo

Placebo Australia

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	0.127	0.828	0.154	0.878
Brexit HS Uncert	0.202	0.869	0.232	0.816
Brexit MS After	0.147	0.767	0.192	0.848
Brexit MS Uncert	0.319	0.78	0.409	0.683
Brexit LS After	-0.0749	0.238	-0.315	0.753
Brexit LS Uncert	-0.0774	1.61	-0.0479	0.962
English	0.763	0.118	6.47	1.01e-10
OECD	1.26	0.165	7.62	2.6e-14
Schengen	0.571	0.16	3.57	0.000354
Diaspora HS	0.174	0.0504	3.45	0.000554
Diaspora LS	0.313	0.236	1.33	0.185
Diaspora MS	0.194	0.0416	4.66	3.11e-06
Distance	-1.23	0.129	-9.51	0
GDP HS	0.197	0.11	1.79	0.074
GDP LS	0.0183	0.441	0.0415	0.967
GDP MS	0.161	0.0832	1.94	0.0523
Population	0.311	0.0452	6.87	6.28e-12
HS UK	0.498	0.452	1.1	0.27
MS UK	0.598	0.337	1.78	0.0756
LS UK	-0.0403	1.67	-0.0241	0.981

Table: Intended movers coefficients - full choice set



Placebo

Albania

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	-0.165	0.305	-0.541	0.589
Brexit HS Uncert	0.507	0.232	2.18	0.0293
Brexit MS After	-0.00453	0.203	-0.0223	0.982
Brexit MS Uncert	-0.0701	0.146	-0.479	0.632
Brexit LS After	-0.829	0.241	-3.44	0.000579
Brexit LS Uncert	-0.249	0.137	-1.82	0.0686
English	-2.06	0.541	-3.81	0.000138
OECD	0.63	0.106	5.94	2.78e-09
Schengen	2.03	0.521	3.9	9.81e-05
Diaspora HS	0.697	0.0418	16.7	0
Diaspora LS	0.888	0.0404	22	0
Diaspora MS	0.795	0.0389	20.5	0
Distance	1.64	0.167	9.83	0
GDP HS	0.824	0.144	5.72	1.08e-08
GDP LS	-0.00391	0.0827	-0.0473	0.962
GDP MS	0.409	0.109	3.76	0.000173
Population	0.5	0.0362	13.8	0
HS UK	3.92	0.331	11.9	0
MS UK	4.5	0.297	15.2	0
LS UK	4.96	0.301	16.5	0
Contiguous GDP	0.357	0.089	4.01	6.11e-05
Language	-15.1	1.74	-8.65	0

Table: Updated intended movers coefficients - restricted choice set

Placebo

South Africa

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	-0.194	0.573	-0.339	0.735
Brexit HS Uncert	-0.0833	0.532	-0.157	0.875
Brexit MS After	-0.399	0.298	-1.34	0.181
Brexit MS Uncert	-0.34	0.209	-1.63	0.104
Brexit LS After	-0.127	0.871	-0.146	0.884
Brexit LS Uncert	-0.104	0.574	-0.181	0.857
English	-0.319	0.118	-2.71	0.00675
OECD	1.36	0.15	9.08	0
Schengen	-0.749	0.11	-6.79	1.15e-11
Diaspora HS	0.31	0.058	5.34	9.4e-08
Diaspora LS	0.36	0.0644	5.58	2.35e-08
Diaspora MS	0.289	0.0361	8.01	1.11e-15
Distance	-2.46	0.134	-18.3	0
GDP HS	0.644	0.1	6.44	1.16e-10
GDP LS	0.52	0.11	4.75	2.02e-06
GDP MS	0.764	0.0911	8.38	0
Population	0.836	0.0351	23.8	0
HS UK	-0.196	0.301	-0.649	0.516
MS UK	-0.254	0.133	-1.92	0.055
LS UK	-0.459	0.309	-1.49	0.137
Contiguous GDP	0.53	0.13	4.07	4.62e-05
Language	-0.319	0.118	-2.71	0.00675

Table: Updated intended movers coefficients restricted choice set



Placebo

Nigeria

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	2.07	0.576	3.59	0.000335
Brexit HS Uncert	-1.1	0.428	-2.58	0.00993
Brexit MS After	0.0864	0.155	0.557	0.577
Brexit MS Uncert	-0.139	0.129	-1.08	0.28
Brexit LS After	0.338	0.405	0.833	0.405
Brexit LS Uncert	0.461	0.374	1.23	0.217
English	0.521	0.0842	6.19	6.08e-10
OECD	0.513	0.082	6.26	3.8e-10
Schengen	-0.919	0.0716	-12.8	0
Diaspora HS	0.405	0.0652	6.21	5.38e-10
Diaspora LS	0.387	0.0369	10.5	0
Diaspora MS	0.338	0.0224	15.1	0
Distance	-0.787	0.0767	-10.3	0
GDP HS	0.477	0.0992	4.81	1.5e-06
GDP LS	0.443	0.0649	6.82	8.9e-12
GDP MS	0.642	0.0406	15.8	0
Population	0.529	0.0271	19.5	0
HS UK	-0.846	0.419	-2.02	0.0435
MS UK	-0.195	0.0753	-2.59	0.00948
LS UK	-0.58	0.228	-2.54	0.0109
Contiguous PIB	3.58	0.575	6.23	4.77e-10
Language	0.521	0.0842	6.19	6.08e-10

Table: Updated intended movers coefficients - restricted choice set

Placebo

Turkey

Name	Value	Rob. Std Err	Rob. t-test	Rob. p-value
Brexit HS After	0.712	0.434	1.64	0.101
Brexit HS Uncert	-0.15	0.446	-0.337	0.736
Brexit MS After	0.79	0.403	1.96	0.0503
Brexit MS Uncert	-0.371	0.368	-1.01	0.314
Brexit LS After	-2.68	0.618	-4.34	1.45e-05
Brexit LS Uncert	0.303	0.709	0.427	0.669
English	-0.00468	0.157	-0.0299	0.976
OECD	0.37	0.0802	4.62	3.85e-06
Schengen	0.163	0.0985	1.65	0.0987
Diaspora HS	0.174	0.026	6.72	1.82e-11
Diaspora LS	0.478	0.0465	10.3	0
Diaspora MS	0.297	0.0223	13.3	0
Distance	-0.0923	0.0696	-1.33	0.184
GDP HS	1.33	0.11	12.1	0
GDP LS	0.316	0.171	1.85	0.0643
GDP MS	0.883	0.0893	9.89	0
Population	0.44	0.0337	13.1	0
HS UK	0.185	0.259	0.715	0.475
MS UK	-0.0835	0.185	-0.452	0.651
LS UK	-0.0827	0.372	-0.222	0.824
Contiguous PIB	-0.841	0.379	-2.22	0.0265
Language	-5.73	1.23	-4.64	3.41e-06

Table: Updated intended movers coefficients - restricted choice set

Conclusion

Conclusion :

- > Low skilled workers : decrease of UK attractiveness after implementation of measure
- > Middle and high skilled workers : decrease of UK attractiveness in both periods
- > Placebo countries : differentiated effect around the globe

Further steps

- > Nested models estimation
- > Investigate other countries for the Placebo

