

The impact of the EU-Turkey agreement on the
number of lives lost at sea
(SUPPLEMENTARY MATERIAL)

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Table S1(a): List of Treated nationalities' crossings on the Eastern Route using the Median rule (baseline model specification)
Pre-treatment period = 2011-01 - 2016-03
Post-treatment period = 2016-04 - 2017-02

Treated nationalities	Number of migrants on the Eastern Route		Sum
	Pre-treatment period	Post-treatment period	
Afghanistan	300241	4410	304651
Albania	529	167	696
Algeria	8366	1676	10042
Armenia	54	8	62
Bangladesh	12525	358	12883
Burkina Faso	142	5	147
Cameroon	1600	323	1923
Central African Republic	118	7	125
China	263	18	281
Comoros	747	17	764
Congo (Brazzaville)	3183	636	3819
Congo (Kinshasa)	1196	122	1318
Côte d'Ivoire	1470	52	1522

Dominica	226	0	226
Dominican Republic	1173	210	1383
Egypt	1649	261	1910
Equatorial Guinea	2	0	2
Eritrea	4143	411	4554
Ethiopia	268	127	395
Gambia	381	54	435
Georgia	707	62	769
Ghana	1141	73	1214
Guinea	239	59	298
Guinea-Bissau	10	0	10
India	1205	70	1275
Iran	29033	1046	30079
Iraq	120803	3477	124280
Jordan	130	29	159
Lao People's Democratic Republic	61	0	61
Lebanon	2649	111	2760

Libya	683	8	691
Mali	1291	98	1389
Mauritania	162	11	173
Moldova	38	1	39
Mongolia	68	0	68
Morocco	11068	430	11598
Myanmar	431	25	456
Nepal	409	81	490
Niger	53	8	61
Nigeria	1646	169	1815
Pakistan	46304	4202	50506
Palestine^	11101	816	11917
Papua New Guinea	0	0	0
Russia	65	5	70
Rwanda	168	1	169
Senegal	881	31	912
Sierra Leone	282	45	327
Somalia	9857	193	10050

South Sudan	13	0	13
Sri Lanka	788	70	858
Stateless	96	14	110
Sudan	1043	40	1083
Syria	624763	9498	634261
Togo	109	5	114
Tunisia	1164	78	1242
Turkey	804	247	1051
Uganda	244	12	256
Ukraine	57	13	70
Unknown	144	1	145
Vietnam	66	10	76
Yemen	479	21	500

Table S1(b): List of Non-treated (control) nationalities' crossings on the Eastern Route using the Median rule (baseline model specification)

Pre-treatment period = 2011-01 - 2016-03

Post-treatment period = 2016-04 - 2017-02

Non-treated (control) nationalities	Number of migrants on the Eastern Route		Sum
	Pre-treatment period	Post-treatment period	
Angola	36	9	45
Argentina	0	0	0
Australia	1	0	1
Azerbaijan	5	2	7
Belarus	1	0	1
Benin	16	1	17
Bhutan	1	0	1
Bolivia	3	1	4
Bosnia and Herzegovina	0	0	0
Brazil	4	1	5
Burkina Faso	142	14	156
Cambodia	1	0	1
Canada	1	1	2
Chad	1	0	1

Colombia	13	2	15
Cuba	17	2	19
Djibouti	1	1	2
Ecuador	8	0	8
French Guiana	0	0	0
Gabon	22	4	26
Guyana	0	1	1
Haiti	38	23	61
Hong Kong	6	0	6
Indonesia	2	0	2
Israel	2	0	2
Jamaica	7	2	9
Japan	0	1	1
Kazakhstan	7	0	7
Kenya	37	1	38
Kiribati	1	0	1
Kosovo*	25	0	25
Kuwait	79	94	173

Kyrgyzstan	1	0	1
Liberia	59	3	62
Macao	0	0	0
Madagascar	0	0	0
Malawi	1	0	1
Malaysia	6	0	6
Maldives	2	0	2
Mauritius	17	0	17
Mexico	0	1	1
Montenegro	0	0	0
North Korea	5	0	5
North Macedonia	16	4	20
Oman	1	0	1
Panama	0	1	1
Paraguay	0	0	0
Peru	3	0	3
Philippines	18	0	18
Saint Helena	0	0	0

Sao Tome and Principe	0	0	0
Saudi Arabia	35	10	45
Serbia	13	10	23
Seychelles	0	0	0
South Africa	23	1	24
South Korea	2	0	2
Suriname	0	0	0
Swaziland	0	0	0
Taiwan	1	0	1
Tajikistan	13	0	13
Tanzania	55	1	56
Thailand	2	0	2
Turkmenistan	9	0	9
United Arab Emirates	2	0	2
United Kingdom	0	0	0
United States	2	0	2
Unspecified sub-Saharan nationals	1	0	1
Uruguay	0	0	0

Uzbekistan	35	1	36
Venezuela	1	0	1
Virgin Islands, British	0	0	0
Western Sahara	27	7	34
Zambia	9	0	9
Zimbabwe	2	15	17

Full Table of the Main model

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: median

Estimator: Matrix Completion

Covariates: No

Table S2: Summary of Average Treatment Effects on the Treated (ATT) by Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	198.19	59.61	81.36	315.02	0.0009
Eastern Borders Route	0.96	1.31	-1.61	3.52	0.4647
Eastern Mediterranean Route	-66.73	38.12	-141.43	7.98	0.0800
Western African Route	1.65	1.26	-0.83	4.12	0.1928
Western Mediterranean Route	6.55	3.06	0.55	12.55	0.0324

Robustness checks: varying thresholds and covariates

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: median

Estimator: Matrix Completion

Covariates : Yes

Table S3: Summary of Average Treatment Effects on the Treated (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	193.79	58.93	78.30	309.28	0.0010
Eastern Borders Route	-3.04	3.10	-9.12	3.05	0.3279
Eastern Mediterranean Route	-80.52	52.68	-183.77	22.73	0.1264
Western African Route	-4.24	4.77	-13.58	5.10	0.3737
Western Mediterranean Route	1.06	5.22	-9.18	11.30	0.8395

Time period: 2011.01.01 - 2017.02.01

Treatment threshold : first quartile

Estimator: Matrix Completion

Covariates : No

Table S4: Summary of Average Treatment Effects on the Treated (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	146.77	44.75	59.06	234.47	0.0010
Eastern Borders Route	2.74	2.69	-2.52	8.01	0.3070
Eastern Mediterranean Route	-42.59	24.45	-90.51	5.34	0.0816
Western African Route	3.26	2.73	-2.10	8.62	0.2339
Western Mediterranean Route	6.99	3.33	0.47	13.52	0.0358

Time period: 2011.01.01 - 2017.02.01

Treatment threshold : first quartile

Estimator: Matrix Completion

Covariates : Yes

Table S5: Summary of Average Treatment Effects on the Treated (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	138.17	44.87	50.22	226.12	0.0021
Eastern Borders Route	-2.81	2.44	-7.58	1.97	0.2489
Eastern Mediterranean Route	-55.65	33.08	-120.48	9.18	0.0925
Western African Route	-4.76	4.46	-13.51	3.99	0.2863
Western Mediterranean Route	-0.61	4.73	-9.89	8.67	0.8968

Time period: 2011.01.01 - 2017.02.01

Treatment threshold : third quartile

Estimator: Matrix Completion

Covariates : No

Table S6: Summary of Average Treatment Effects on the Treated (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	257.69	109.88	42.32	473.06	0.0190
Eastern Borders Route	-5.94	2.49	-10.81	-1.07	0.0169
Eastern Mediterranean Route	-133.73	72.66	-276.14	8.69	0.0657
Western African Route	-4.87	2.50	-9.78	0.03	0.0516
Western Mediterranean Route	0.49	4.70	-8.73	9.71	0.9169

Time period: 2011.01.01 - 2017.02.01

Treatment threshold : third quartile

Estimator: Matrix Completion

Covariates : Yes

Table S7: Summary of Average Treatment Effects on the Treated (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	261.74	114.49	37.33	486.14	0.0223

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Eastern Borders Route	-8.50	4.02	-16.38	-0.62	0.0345
Eastern Mediterranean Route	-158.29	83.98	-322.89	6.30	0.0594
Western African Route	-9.03	4.19	-17.24	-0.82	0.0312
Western Mediterranean Route	-7.16	4.98	-16.91	2.59	0.1503

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: Top 20 nationalities

Estimator: Matrix Completion

Covariates : No

Table S8: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	245.53	128.99	-7.29	498.35	0.0570
Eastern Borders Route	-8.98	3.10	-15.06	-2.90	0.0038
Eastern Mediterranean Route	-177.93	99.42	-372.80	16.94	0.0735
Western African Route	-7.23	3.08	-13.26	-1.20	0.0188
Western Mediterranean Route	-1.22	5.66	-12.32	9.88	0.8294

Robustness checks: Varying time window

Time period: 2011.01.01 - 2018.02.01

Treatment threshold: median

Estimator: Matrix Completion

Covariates : No

Table S9: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI Lower	CI Upper	p-value
Central Mediterranean Route	131.68 72098	40.1110 23	53.0710498	210.303370	0.001026839
Eastern Borders Route	0.6246 834	1.25088 4	-1.8270046	3.076371	0.617502237
Eastern Mediterranean Route	-65.584 0874	43.1797 39	-150.2148204	19.046646	0.128797102
Western African Route	1.4636 443	1.18133 6	-0.8517323	3.779021	0.215355340
Western Mediterranean Route	12.784 2319	4.92607 6	3.1292994	22.439164	0.0094531

Time period: 2011.01.01 - 2018.02.01

Treatment threshold: first quartile

Estimator: Matrix Completion

Covariates : No

Table S10: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p.value
Central Mediterranean Route	98.31139 3	31.098436	37.359579	159.263208	0.001570682
Eastern Borders Route	2.564503	2.598322	-2.528114	7.657121	0.323650277
Eastern Mediterranean Route	-41.6956 23	24.371360	-89.462610	6.071364	0.087109695
Western African Route	3.160651	2.533928	-1.805756	8.127058	0.212275483

Western Mediterranean Route	11.89384 9	4.700573	2.680895	21.106803	0.011396577
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Time period: 2011.01.01 - 2018.02.01

Treatment threshold: third quartile

Estimator: Matrix Completion

Covariates : No

Table S11: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p.value
Central Mediterranean Route	173.54233 7	73.8904 95	28.719628	318.36504 72	0.0188420 02
Eastern Borders Route	-4.947079	1.87620 1	-8.624366	-1.269791 9	0.0083703 83
Eastern Mediterranean Route	-132.1186 64	78.1532 30	-285.2961 80	21.058852 3	0.0909308 01
Western African Route	-3.327782	1.90217 4	-7.055974	0.4004109	0.0802111 43
Western Mediterranean Route	10.743594	8.71954 5	-6.346401	27.833588 8	0.2179013 49

Time period: 2011.01.01 - 2018.02.01

Treatment threshold: Top 20 nationalities

Estimator: Matrix Completion

Covariates : No

Table S12: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	161.70	91.26	-17.16	340.56	0.0764
Eastern Borders Route	-7.25	2.12	-11.40	-3.10	0.0006
Eastern Mediterranean Route	-186.89	100.24	-383.35	9.57	0.0623
Western African Route	-5.73	2.01	-9.67	-1.79	0.0044
Western Mediterranean Route	11.47	11.04	-10.17	33.11	0.2990

Robustness checks: Including Syrians in the treated group

Time period: 2011.01.01 - 2017.02.01

Treatment threshold : median

Nationalities: Yes syrians

Estimator: Matrix Completion

Covariates : No

Table S13: Summary of Average Treatment Effects (ATT) on Migration Routes with Syrians

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	164.677424	62.520584	42.1393314	287.215516	0.008439262
Eastern Borders Route	1.855160	2.130734	-2.3210008	6.031322	0.383935758

Eastern Mediterranean Route	-137.938432	87.864976	-310.1506211	34.273757	0.116440480
Western African Route	2.516083	2.068780	-1.5386511	6.570817	0.223902714
Western Mediterranean Route	7.060781	3.551359	0.1002453	14.021316	0.046790539

Time period: 2011.01.01 - 2018.02.01

Treatment threshold : median

Nationalities: Yes syrians

Estimator: Matrix Completion

Covariates : No

Table S14: Summary of Average Treatment Effects (ATT) on Migration Routes with Syrians

Route	ATT	S.E.	CI.lower	CI.upper	p-value
Central Mediterranean Route	111.9225683	39.697074	34.1177338	189.727403	0.004811111
Eastern Borders Route	0.6859203	1.258373	-1.7804450	3.152286	0.585694965
Eastern Mediterranean Route	-135.8014735	75.229657	-283.2488923	11.645945	0.071049845

Western African Route	1.4999232	1.171969	-0.7970936	3.796940	0.200604238
Western Mediterranean Route	12.0445408	5.016552	2.2122792	21.876802	0.016352126

PRE-TREND TESTS

Placebo Tests #1

Placebo in-time 4 months ahead - Matrix completion - Central route

We test whether the estimated ATT in this range (the blue dots) differs significantly from zero.

For the first test, if the p-value is not significant, then the placebo test is passed.

For the second test (Placebo equivalence test) if the p-values are significant then the test is passed. The model passes all the tests.

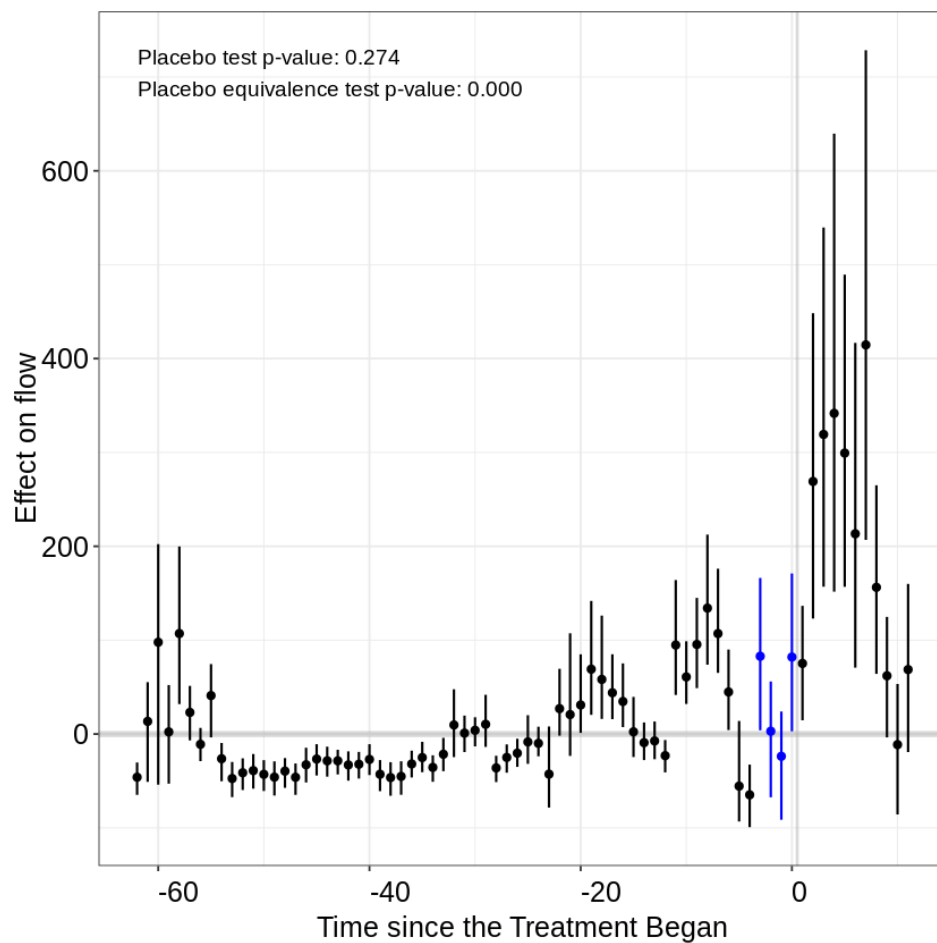


Figure S1: Placebo in time 4 months ahead

Placebo in-time 6 months ahead - Matrix Completion - Central route

We test whether the estimated ATT in this range (the blue dots) differs significantly from zero.

For the first test, if the p-value is not significant, then the placebo test is passed.

For the second test (Placebo equivalence test) if the p-values are significant then the test is passed. The model passes all the tests.

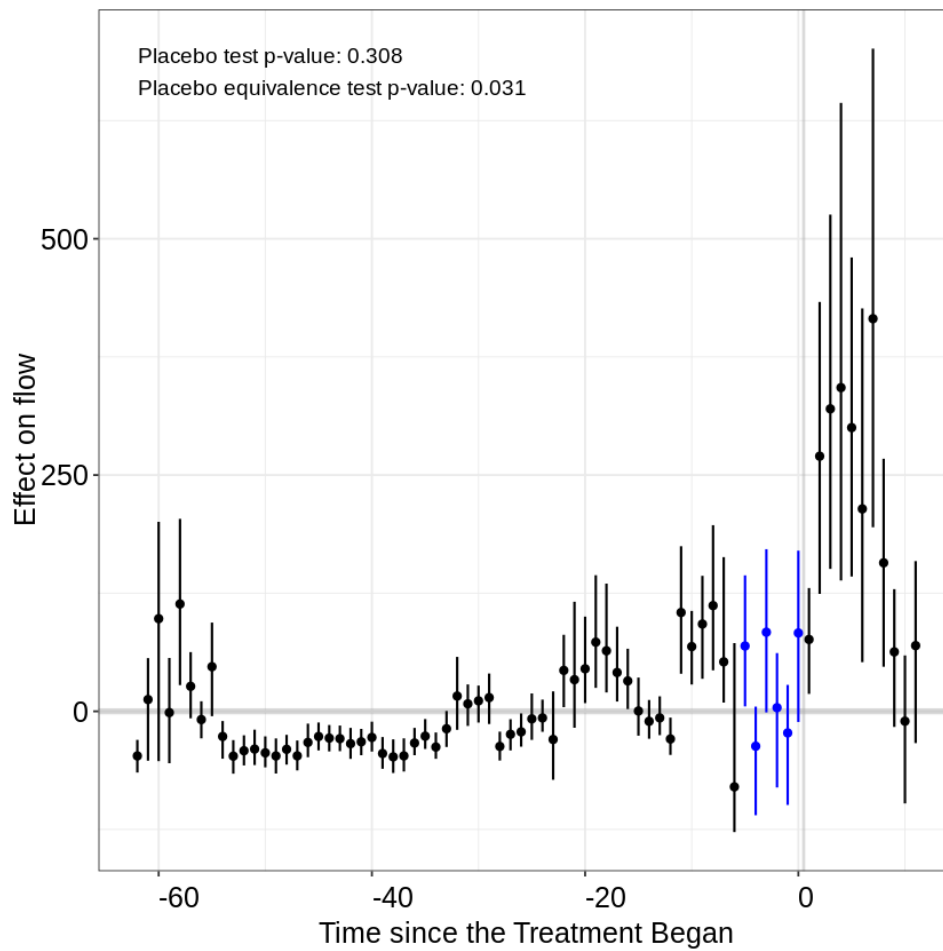


Figure S2: Placebo in time 6 months ahead

Placebo in-time 4 months ahead - Matrix completion with Covariates - Central route

We test whether the estimated ATT in this range (the blue dots) differs significantly from zero.

For the first test, if the p-value is not significant, then the placebo test is passed.

For the second test (Placebo equivalence test) if the p-values are significant then the test is passed. The model passes all the tests.

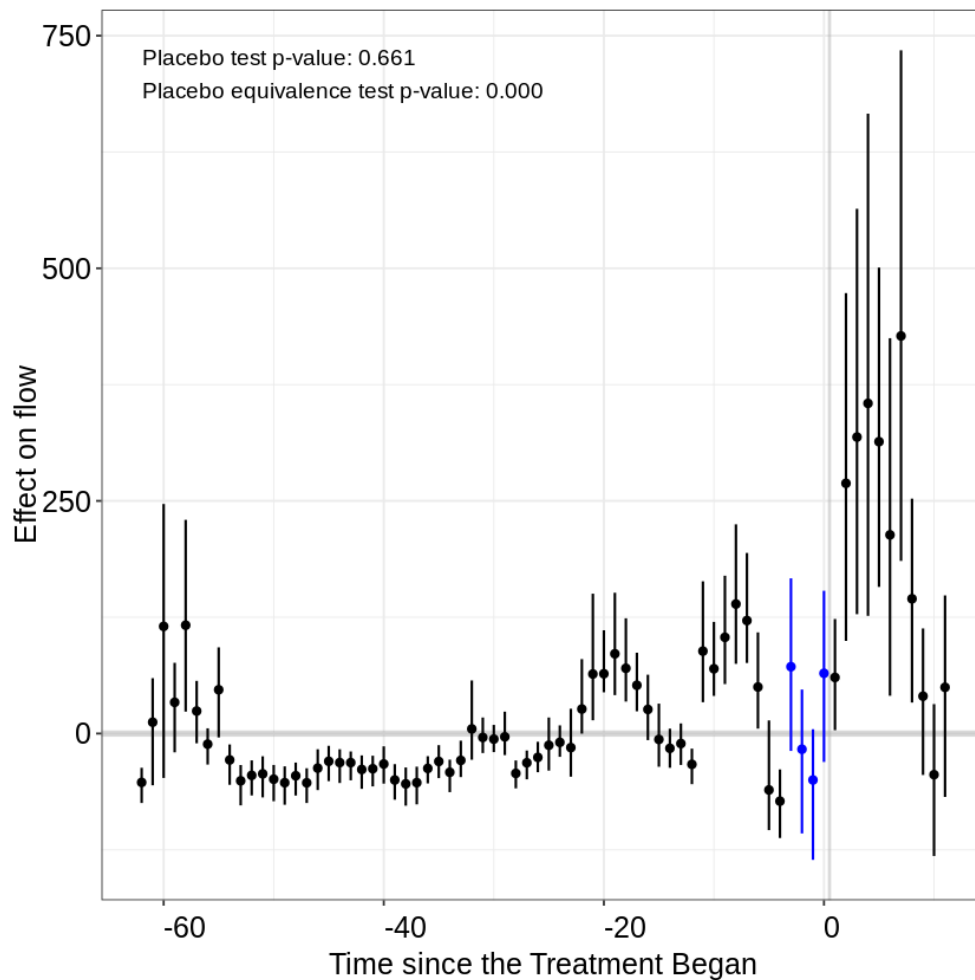


Figure S3: Placebo in time 4 months ahead

Placebo in-time 6 months ahead - Matrix Completion with Covariates - Central route

We test whether the estimated ATT in this range (the blue dots) differs significantly from zero.

For the first test, if the p-value is not significant, then the placebo test is passed.

For the second test (Placebo equivalence test) if the p-values are significant then the test is passed. The model passes all the tests.

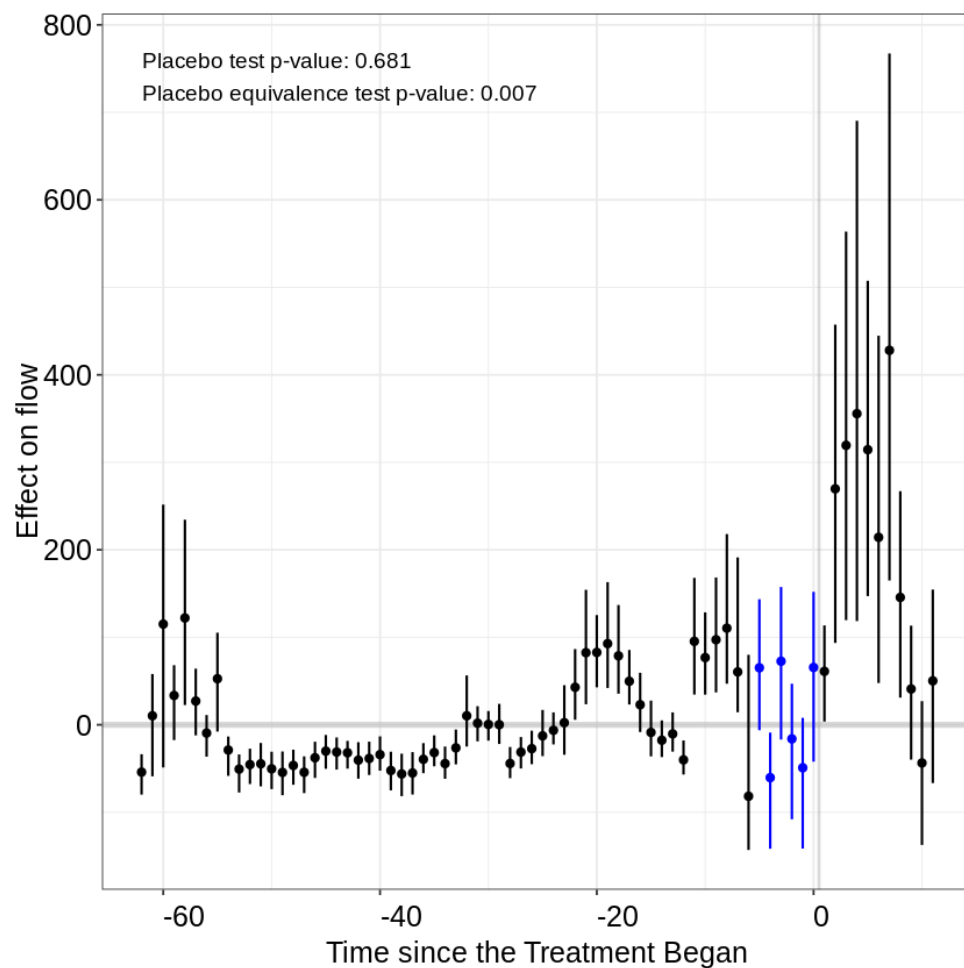


Figure S4: Placebo in time 6 months ahead

Test for no pre-trend #2

The results for the 6 months ahead are coherent with the 4 months ahead, Therefore one case is presented.

Placebo in-time 4 months ahead - Matrix Completion without Covariates

We test whether each of the previous 4 estimated ATT are statistically different from 0.

For the first F-test, if the p-value is not significant, then the placebo test is passed.

For the second test (Equivalence test) if the p-values are significant then the test is passed.

The model passes the second test. However the first test is less robust to outliers.

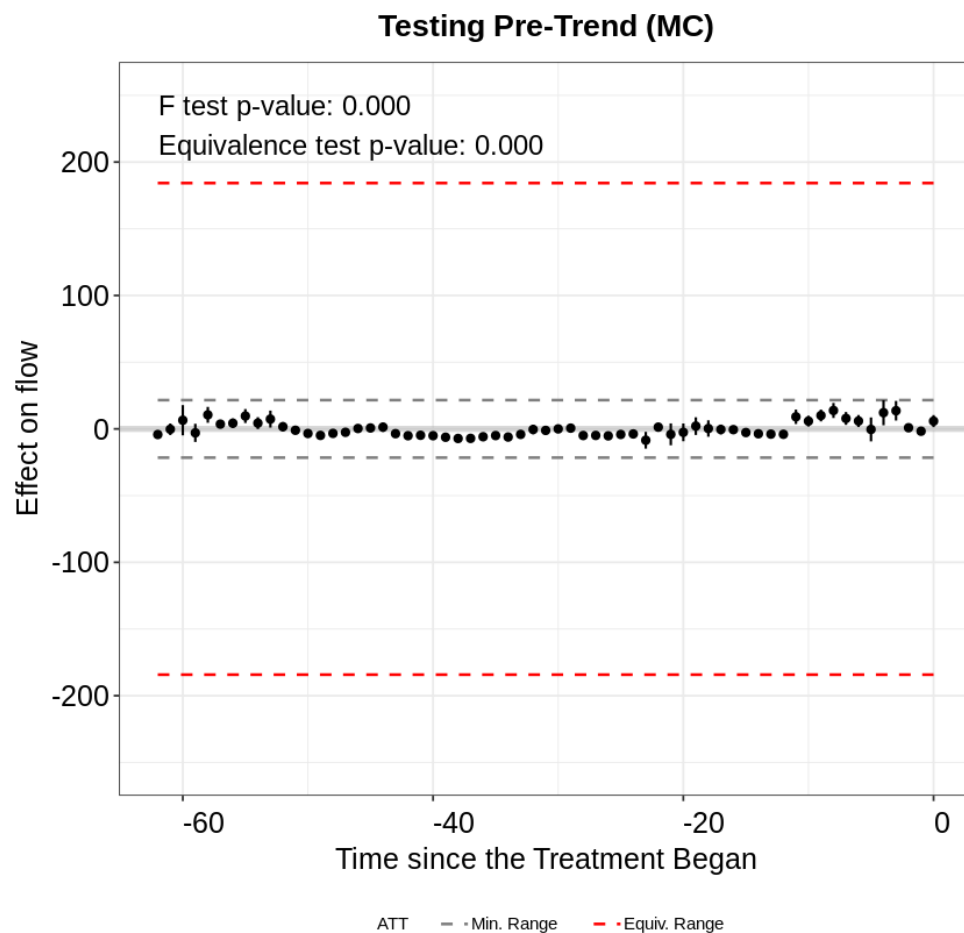


Figure S5: Pre-trend test in time 4 months ahead without covarites

Placebo in-time 4 months ahead - Matrix Completion with Covariates

We test whether each of the previous 4 estimated ATT are statistically different from 0.

For the first F-test, if the p-value is not significant, then the placebo test is passed.

For the second test (Equivalence test) if the p-values are significant then the test is passed.

The model passes the second test. However the first test is less robust to outliers.

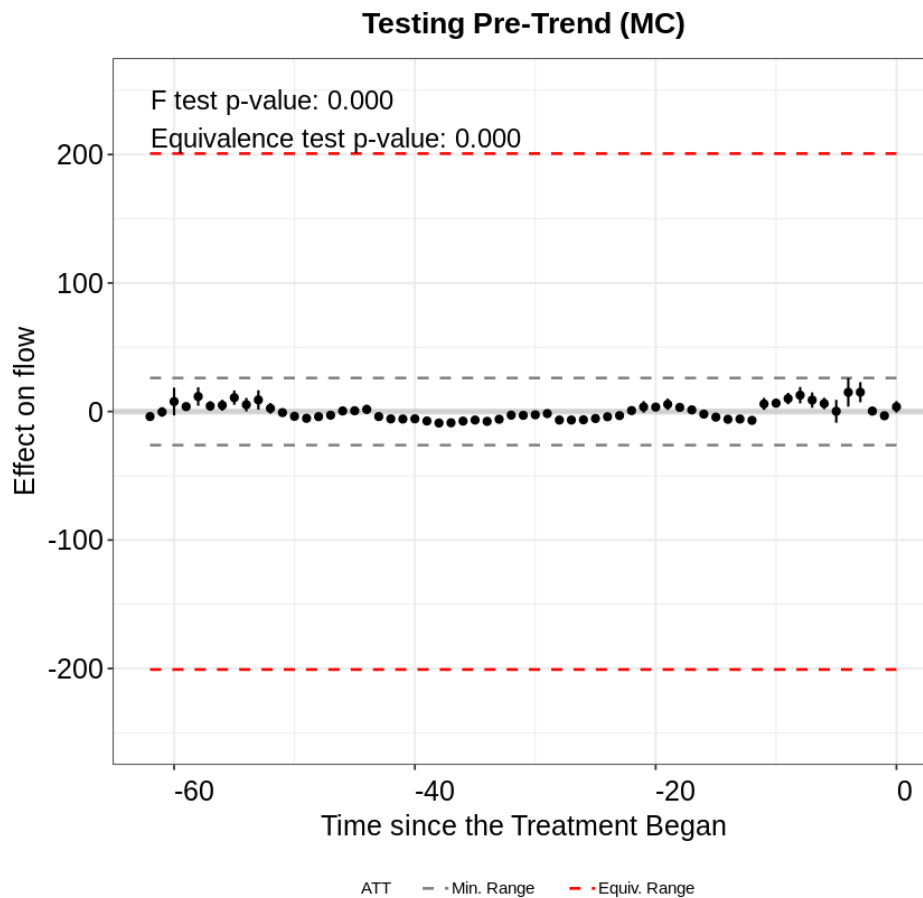


Figure S6: Pre-trend test in time 4 months ahead with covariate

Iterative Computation of the ATT with varying treated/untreated group.

This plot illustrates the Average Treatment Effects on the Treated (ATTs) for various treated and untreated groups. The ATT at the 0th run corresponds to the treated nationalities based on the third quartile threshold, while the final ATT (at the 55th run) corresponds to the first quartile threshold.

Notably, the Central Mediterranean route consistently shows statistical significance (indicated by dots), whereas the Eastern and Western Mediterranean routes exhibit only weak significance.

The third quartile threshold is the most selective, including only nationalities at the top of the distribution as treated. As additional nationalities are added to the treated group, the ATT for the Central Mediterranean route begins to decrease, while the ATT for the Eastern Mediterranean route increases. Conversely, the ATT for the Western Mediterranean routes remains stable, suggesting that these routes are unaffected by the changes in the treated group and the deal itself, likely due to their more distant geographical context.

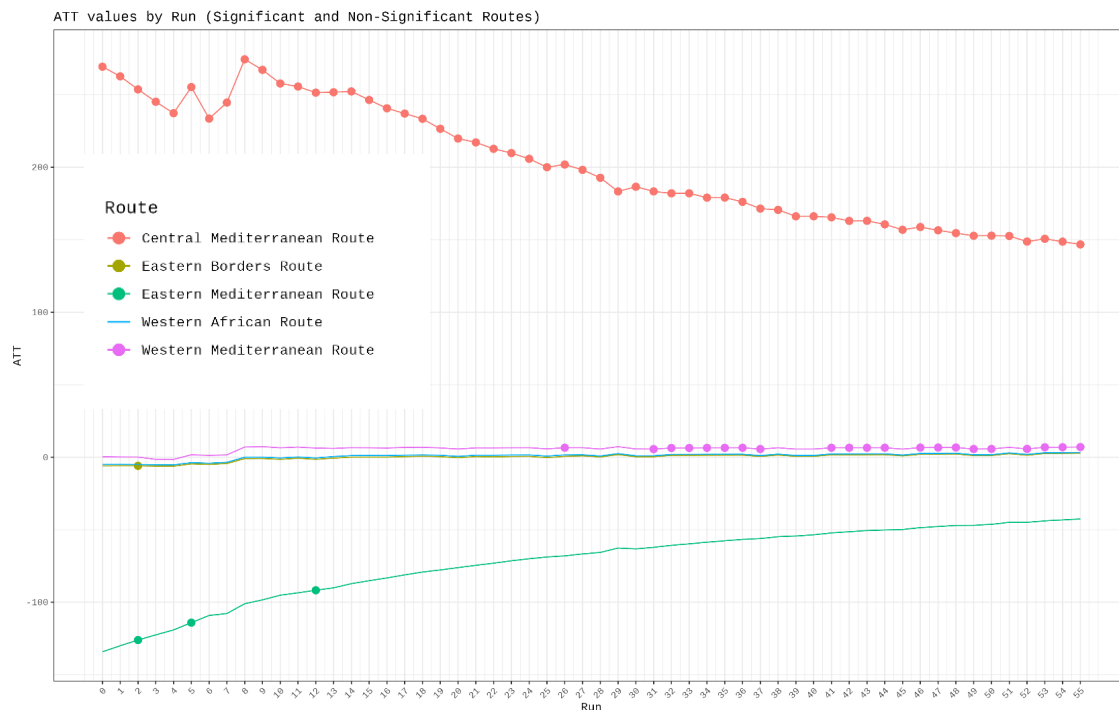


Figure S7: ATTs for each route computed with the Matrix Completion estimator with varying treated/untreated group. The points stand for statistically significant ATTs

Iraqi Crossing trends over the Central and Eastern route

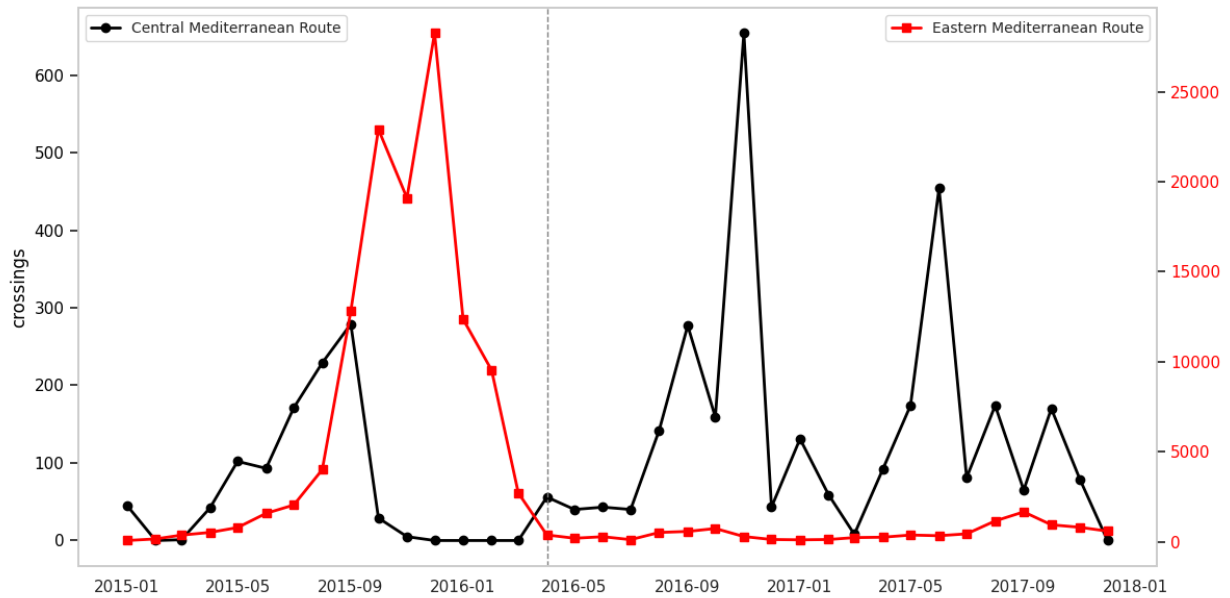


Figure S8: This plot shows the number of crossing attempts on the Eastern Mediterranean and Central route for the iraqi from January 2015 to January 2018.

Total number of Dead and Missing migrants

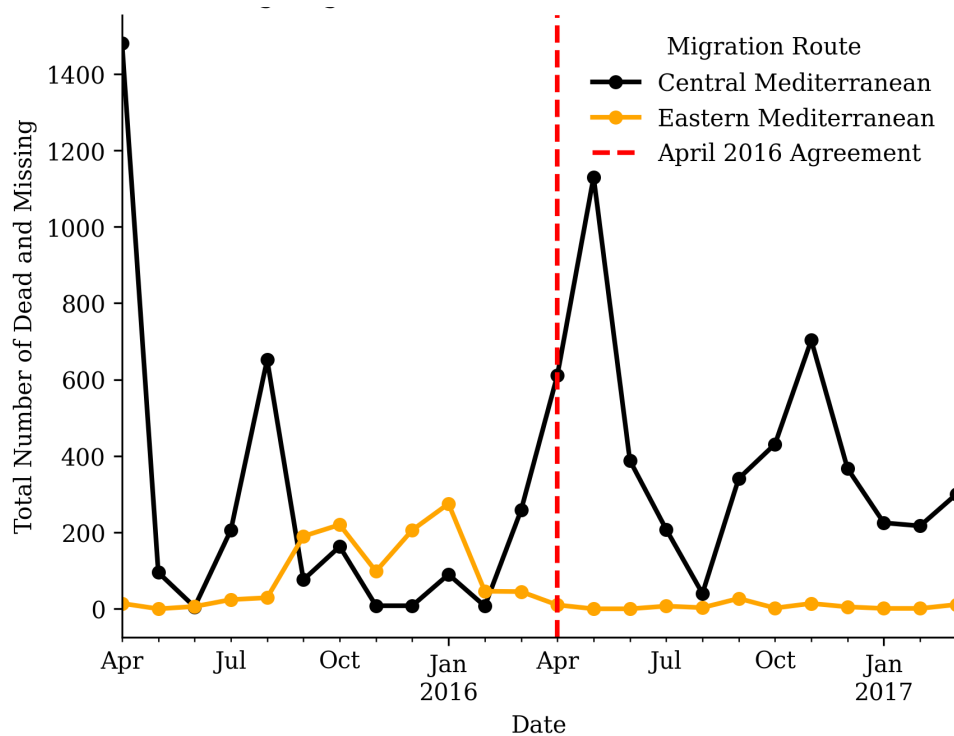


Figure S9: This plot shows the absolute number of dead and missing migrants on the Central and Eastern Mediterranean route.

Generalized Synthetic Control Method

The Tables present the Estimated ATTs in a standardized form. The non standardized model did not give plausible results.

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: median

Estimator: Interactive Synthetic Control

Covariates : Yes

Table S15: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p.value
Central Mediterranean Route	0.993325205	2.10432342	-3.1310729	5.1177233	0.6368981
Eastern Borders Route	-0.006132658	0.15047713	-0.3010624	0.2887971	0.9674914
Eastern Mediterranean Route	-0.145507059	0.98183692	-2.0698721	1.7788579	0.8821859
Western African Route	0.001235156	0.06768865	-0.1314322	0.1339025	0.9854413
Western Mediterranean Route	0.033562298	0.30961242	-0.5732669	0.6403915	0.9136776

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: median

Estimator: Interactive Synthetic Control

Covariates : No

Table S16: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p.value
Central Mediterranean Route	1.000722901	1.22049202	-1.3913975	3.3928433	0.4122537

Eastern Borders Route	-0.00854461 8	0.0788091 2	-0.163007 7	0.145918 4	0.913661 2
Eastern Mediterranean Route	-0.15881809 6	0.7627244 1	-1.653730 5	1.336094 3	0.835053 5
Western African Route	0.00221333 0	0.0818123 0	-0.158135 8	0.162562 5	0.978416 9
Western Mediterranean Route	0.02572529 5	0.3808144 3	-0.720657 3	0.772107 9	0.946141 2

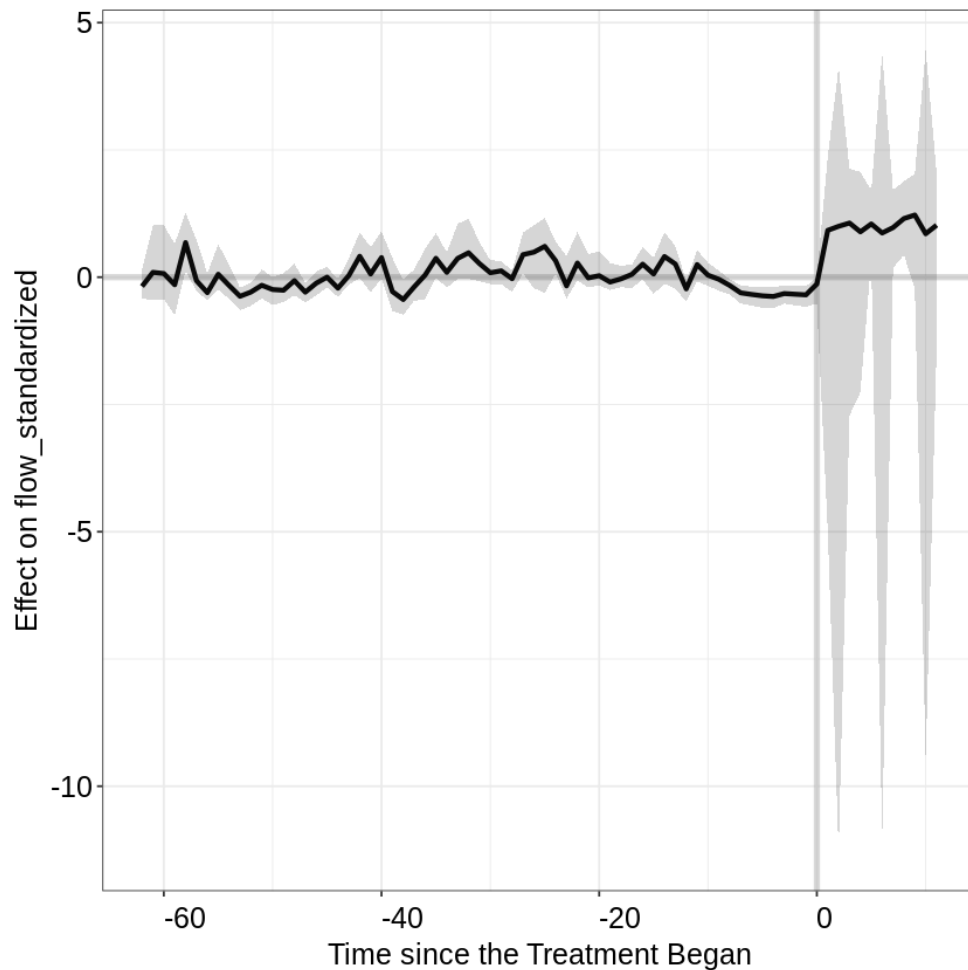


Figure S10: Estimated Average Treatment Effect on the Treated (ATT) for the Central Mediterranean without Controls (the version with Controls is almost identical)

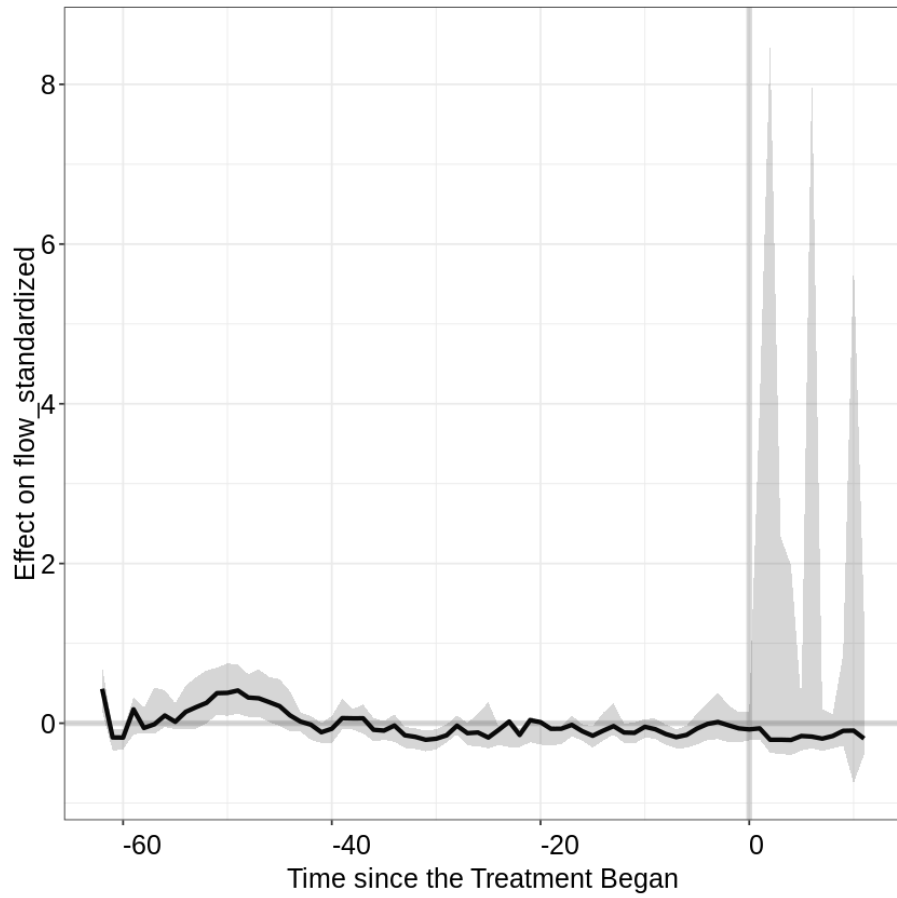


Figure S11: Estimated Average Treatment Effect on the Treated (ATT) for the Eastern Mediterranean without Controls (the version with Controls is almost identical)

Placebo test - Central route

The SC fails both Placebo tests, And both for the 4 and 6 months ahead.

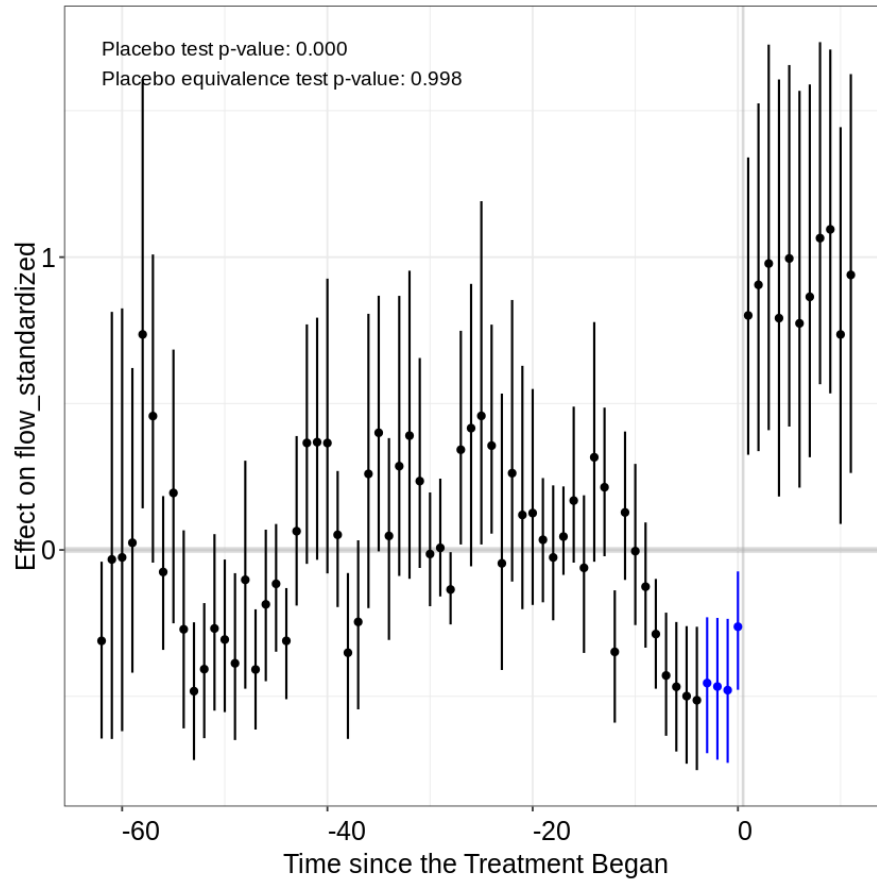


Figure S12: Placebo tests with SC.

Interactive Fixed Effects

We have also performed a Two-way fixed effects model and it conceived similar results.

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: median

Estimator: Interactive Fixed Effects

Covariates : No

Table S17: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p.value
Central Mediterranean Route	188.1734 71	66.6040 69	57.6318955	318.7150 47	0.0047243 02
Eastern Borders Route	1.676145	2.54123 5	-3.3045845	6.656875	0.5095240 85
Eastern Mediterranean Route	-64.82998 8	43.0382 13	-149.18333 62	19.52336 0	0.1319810 71
Western African Route	2.384835	2.44125 5	-2.3999371	7.169608	0.3286241 22
Western Mediterranean Route	7.345279	3.93558 5	-0.3683254	15.05888 3	0.0619888 50

Time period: 2011.01.01 - 2017.02.01

Treatment threshold: median

Estimator: Interactive Fixed Effects

Covariates : Yes

Table S18: Summary of Average Treatment Effects (ATT) on Migration Routes

Route	ATT	S.E.	CI.lower	CI.upper	p.value
Central Mediterranean Route	193.7713 48	59.7693 67	76.625542	310.9171 54	0.0011870 06

Eastern Borders Route	-3.065218	2.822290	-8.596805	2.466369	0.277445891
Eastern Mediterranean Route	-80.549721	46.267621	-171.232592	10.133150	0.081691940
Western African Route	-4.269968	3.904232	-11.922122	3.382185	0.274096673
Western Mediterranean Route	1.027524	4.807159	-8.394335	10.449382	0.830743052

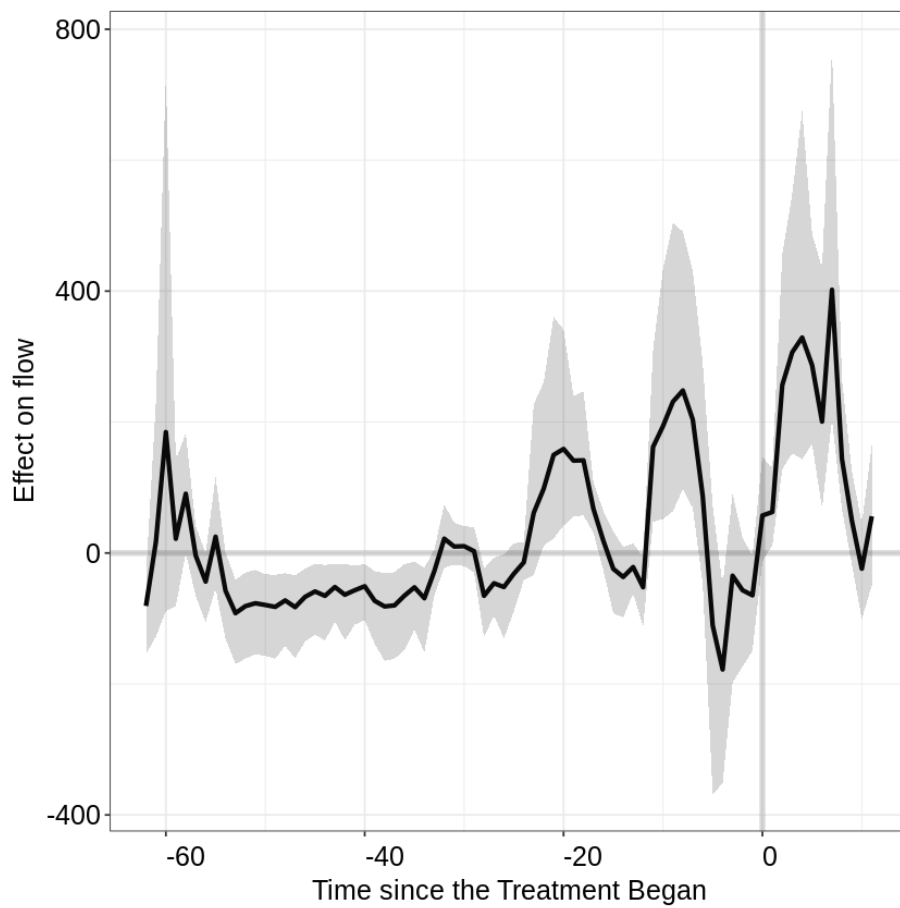


Figure S13: Estimated Average Treatment Effect on the Treated (ATT) for the Central Mediterranean without Controls (the version with Controls is almost identical)

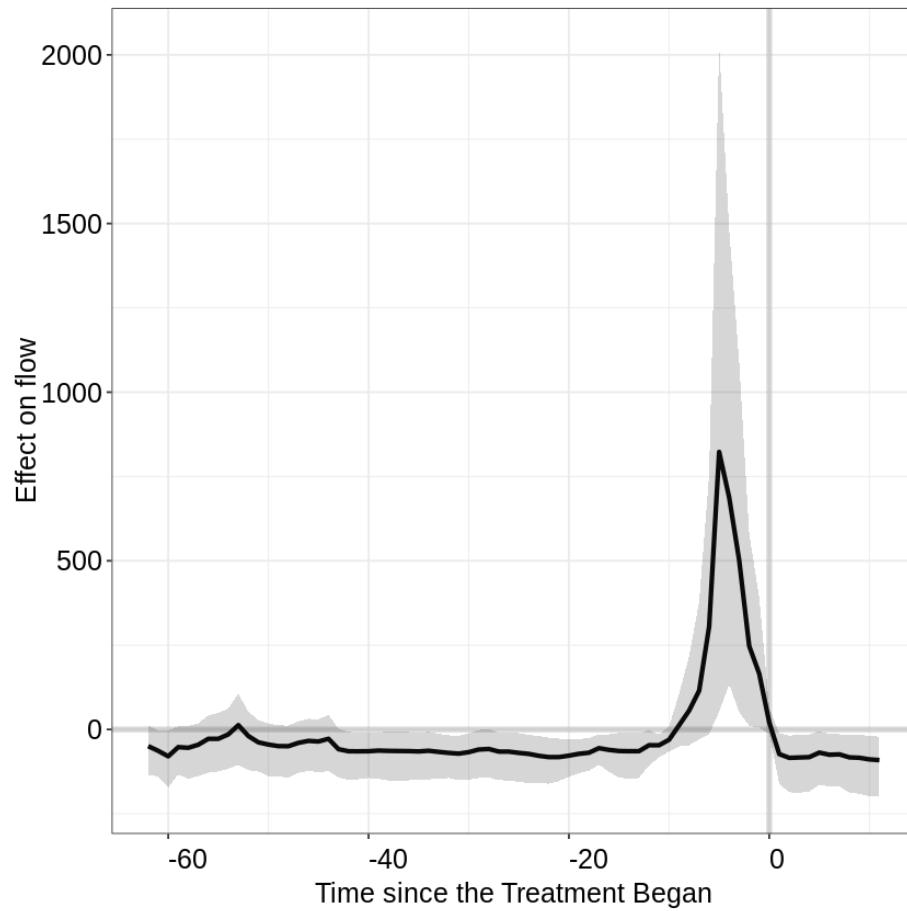


Figure S14: Estimated Average Treatment Effect on the Treated (ATT) for the Eastern Mediterranean without Controls (the version with Controls is almost identical)

Placebo test - Central route

The IFE passes both Placebo tests, and both for 4 and 6 months ahead.

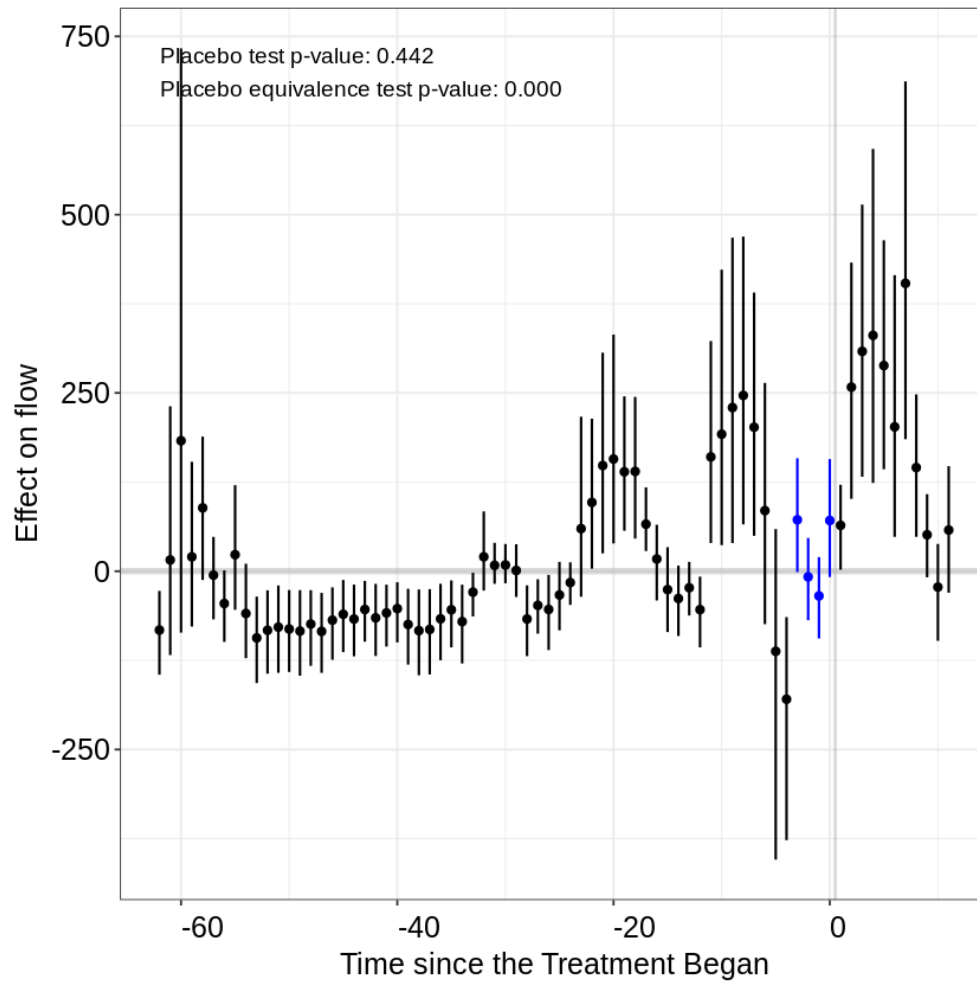


Figure S15: Placebo test on the Central Mediterranean route.