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Brexit uncertainty and UK migration: Should I go?

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Brexit Uncertainty and UK Migration: Should I Go?

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Abstract

This paper examines the impact of policy uncertainty on migration. Using the Brexit referendum as a quasi-experimental setting, we study the causal impact of policy uncertainty on migration flows and migrant stocks in the UK as well as on the attractiveness of other EU countries as destinations. We employ a difference-in-difference strategy and compare EU migration to non-EU migration before and after the UK referendum of June 2016. Our results show that the policy uncertainty (i) reduced migration inflows from the EU to the UK, (ii) increased emigration of EU migrants from the UK and (iii) reduced the increase in EU migrant stock in the UK. However, there were no spillover impacts on the attractiveness of other EU countries as migration destinations. Overall, the findings show that policy uncertainty has had negative impact on migration in the UK.

JEL classification: F22, J61, J48 .
Keywords: uncertainty, UK migration, EU migration

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1 Introduction

Migration policy is one of the main drivers that influence the magnitude and type of migration flows. Many studies have focused on the impact of immigration policy, in particular, in terms of changes in restrictiveness on the selectivity of migrants. However, little focus has been given to the effects of uncertainty in migration policy on the size of migration flows. We examine the case of the Brexit referendum in June 2016 as a quasi-experimental setting to establish the causal impact of policy uncertainty on migration. The UK narrowly voted to leave the European Union, where one of the main principles is the freedom of movement of EU nationals between the member States. The outcome of the referendum triggered an immediate period of uncertainty on how future migration flows between the UK and the EU would be regulated. The uncertainty also involved EU nationals already resident in the UK, who did not know what exact rights the ultimate agreement would guarantee them post the UK exiting the EU.

This paper studies the impact of the uncertainty post the referendum on UK migration, and the potential spillover impact on intra-EU migration. More specifically, to evaluate the immediate impact of the UK referendum, we use a difference-in-difference identification strategy. The referendum neatly defines a treatment group (EU immigrants) and provides a natural control group (non-EU immigrants), which we compare pre and post-referendum. First, by using both aggregate data and micro data, we estimate the effect on inflows, outflows, and stocks of EU migrants in the UK. We distinguish migrants by their main reason for immigration to the UK and by their socioeconomic characteristics. We also investigate whether EU14 and new EU member States immigrants responded heterogeneously to the uncertainty.

Secondly, since the Brexit referendum only affected uncertainty on the freedom of movements between the UK and EU countries, while the rights of EU citizens in other member States did not change, the referendum may have created a *cliff at the border* (Pritchett, 2010) for EU nationals willing to migrate to the UK, even before an actual change in the migration policy.[1] Thus, we also examine whether the policy uncertainty in the UK have increased the relative attractiveness of other EU countries and diverted the flow of EU migrants to other destinations in the European Union, where the EU citizens' right to enter and remain have not changed. We adopt a difference-in-difference strategy and compare whether the inflows of EU migrants, relative to non-EU migrants, increased within the European Union in the post-referendum period compared to before. We use aggregate data on migration inflows from the OECD, and further validate the analysis using both aggregate Eurostat data and micro level data based on the EU Labour Force Surveys.

This paper contributes to the literature on migration drivers, in particular on the effects of migration policies.[2] There is a rather large literature on the determinants of migration focusing on the scale and selectivity of migration; see for example Grogger and Hanson (2011) and Belot and Hatton (2012). Some studies suggest a crucial effect of policies on

[1] Pritchett (2010) argues that the migration costs induced by policy restrictiveness create a "cliff at the border" which hinder the flow of people across countries.

[2] For a comprehensive review on migration drivers see Czaika and Reinprecht (2020).

migration flows, although concurring with other determinants; e.g. (Czaika and De Haas, 2013). Intuitively, less restrictive migration policies encourage migration flows, while the opposite is true for more restrictive policies, which increase migration costs (Beine et al., 2016). For example, Hatton (2005) finds that less restrictive policies increased net migration to the UK between the years 1976 and 2000. Mayda (2010), analysing migration inflows to 14 OECD countries, shows that migration policy interplay with other push and pull factors in shaping migration flows. Similarly, Ortega and Peri (2013) confirm the role of migration policies, and find evidence that the European process of integration significantly increased intra-Europe migration. Beine et al. (2019) show that the Schengen agreements significantly increased the international mobility of workers between the member countries. Also, Razin and Wahba (2015) find that migration regimes, and whether migration is free or restricted, affect the selectivity of migrants in the EU.

Unlike these previous studies which focus on the differential impact of migration policy restrictions, we contribute to this literature by investigating the impact of uncertainty in migration policy. The Brexit referendum offers an ideal setting since, between the referendum vote on 23 June 2016 and the UK finalising its agreement with the EU about its relationship post the transition period ending on 31 January 2020, there was over a four year period in which there was still freedom of movements of EU citizens to the UK (and vice versa) but there was no certainty about the future. This led to an increased instability both for the status of EU nationals already residents in the UK, and for those EU citizens planning to move to the UK. We examine whether the increased uncertainty has discouraged EU potential immigrants in choosing the UK as destination due to the difficulty in making plans for themselves and their families, and has encouraged EU immigrants resident in the UK to leave.[3]

This paper is also rooted in the recent strand of literature on how migration policy changes do not only have effects on flows to the country imposing them, but also affect migration in other destination countries. Bertoli and Fernández-Huertas Moraga (2013, 2015) and Bertoli et al. (2013) provide evidence that migration policies may have a severe impact on flows and that if Multilateral Resistance, which they define as the influence exerted by alternative destinations on bilateral migration flows, is not properly accounted for, the empirical analysis will likely underestimate the effects. Similarly, Bertoli et al. (2011) find evidence that the end of a visa waiver program in Spain decreased the inflows of Ecuadorian migrants and diverted part of that flow from Spain to the United States. Bratu et al. (2020), using a difference-in-difference identification strategy, evaluate the impact of a more restrictive policy on family reunification on migration in Denmark. They find a significant increase in the outflows of Danish citizens with immigrant background and evidence of a spillover effect of the policy as most of these emigrants moved to Sweden, a neighbouring country in

[3] A closely related paper to ours by Falkingham et al. (2021) studies the causal impact of Brexit on the post-graduation mobility decisions of EU students in the UK. They study the impact of the British government's formal withdrawal notification under Article 50 using data from a survey of graduating international students administered before and after the triggering of Article 50. They find that EU students are significantly more likely than non-EU students to plan on leaving the UK upon graduation immediately after the announcement. Results are driven by students from the new EU countries and students from the EU14 countries who do not have firm migration plans.

which reunification was less restrictive. Our analysis also estimates the impact on alternative destinations. However, this strand of the literature focuses on the effects of changes in the restrictiveness of policy and not, similar to this paper, on policy uncertainty.

Our findings show that policy uncertainty matters for migration. When analysing the impact of the referendum on UK migration, we find a negative and significant impact on the inflows of EU immigrants. The results suggest a relative decrease of around 29% of EU immigration. We also find a positive and significant impact on the outflows suggesting that a relative increase of EU emigration has doubled. This shows that, for host countries, periods of uncertainty in migration policy encourage foreign residents to leave and discourage would-be migrants to come. When analysing the stock of EU migrants, our estimates show a positive impact though at a much smaller rate relative to the previous period when the stock of EU migrants was increasing at a much higher rate. Although the uncertainty due to the referendum has led to a reduction in inflows and an increase in outflows, these impacts were not sufficiently strong to reduce the EU migrant stock in the UK, but have rather dampened the increase in the EU migrant stock.

When switching the focus of the analysis to the other members of the European Union, we do not find any significant effect of the referendum on immigration to other EU destinations. This suggests that the period of policy uncertainty in the UK, although affecting EU migration in the UK, did not have any spillover effects or change the relative attractiveness of other European Union's countries as destinations.[4] We subject our analysis to a number of robustness checks using different data sources, different specifications and different definitions of immigrants based on both country of birth and nationality. We also provide several placebo tests using previous period to test for the validity of our identification strategy; i.e. parallel trend assumption between EU and non-EU migration. All our results are robust and quantitatively similar in magnitude.

This paper underscores the importance of clear devised migration policies as a driver of migration. It also suggests that reasonable time leads in announcements and implementation of migration policy changes might be effective in reducing the instability experienced by migrants due to policies with very short lead period.[5]

The remaining of the paper is organised as follows: Section 2 describes the referendum and the context of the ensuing uncertainty; Section 3 presents the analysis on UK migration; Section 4 analyses whether the referendum had any spillover effects on the rest of European Union's countries; Section 5 discusses the main implications of the findings and concludes.

[4]Although it could be interesting to study the impact of the referendum on UK nationals emigrating, or those UK nationals resident in the EU returning, these patterns are beyond the scope of this paper as we focus on uncertainty in UK migration policy.

[5]Vono de Vihena and Bijak (2021) also argue that migration needs "concrete, rapid and targeted policy responses".

2 The Brexit referendum

Freedom of movement is one of the main principles of the European Union. It ensures to all EU nationals the right to reside, look for a job, and enjoy equal treatment with nationals in access to employment, working conditions, rights and social care, in all EU member States. With the referendum of the 23 June 2016 the UK voted in favour of leaving the European Union, and this started a long period of uncertainty on how migration movements between the EU and the UK would be regulated, and on what rights new and existing EU immigrants will have.

At the time of the referendum it was not clear whether the UK would leave the Single Market or try to retain the benefits of the membership via bilateral agreements or membership in the European Free Trade Area countries (Portes, 2021). In January 2017, the speech of the Prime Minister Theresa May, confirmed the intention of leaving the EU's single market, and with it, withdrawing from the freedom of movement.[6] In March of the same year the UK government gave formal notification of the intention to leave the EU under article 50 of the Lisbon agreement, officially starting the Brexit process.[7] As mentioned by the Migration Observatory (2017), despite Article 50 and the UK Government's promises, "One of the biggest issues affecting EU nationals living in the UK – and UK nationals living in the EU is what rights they will have to live and work in the UK after Brexit." Over the following three years and until December 2020, negotiations between the UK and the EU focused on the withdrawal agreement and what sort of relationship the UK will have with the EU. Needless to say, immigration was seen as a negotiation tactic at the early stages at least, and eventually the UK began to clarify its intentions regarding current EU residents and then for future immigrants. The UK Government rolled out the EU Settlement Scheme, which EU citizens in the UK have to apply to if they want to continue living in the UK. Although this was designed as a simple online application to enable the UK Government to establish how many EU citizens where living in the UK and provide EU citizens with a settled status, it has been seen by some as a rather "unsettling" process for many EU migrants in the UK, see Migration Observatory (2020).

The UK officially left the EU the 31 January 2020. This was followed by a transition period, formally ended on the 31 December 2020, in which the UK was still bound to the EU rules. The UK left the European single market on 31 Dec 2020, 11:00pm GMT. A points-based immigration system, that treats EU and non-EU citizens equally, was introduced. Even few months after exiting, some employers and people have not been clear about the new rules related to employing EU workers. Overall, this setting lends itself as a good example of unclear and undefined migration policy leading to great uncertainty.

We use the Brexit referendum as a quasi-experimental setting to establish the causal impacts of policy uncertainty on migration flows and stocks. The referendum represents an exogenous shock that is likely to affect the propensity of EU immigrants to choose the UK as destination and/or to remain in the UK. As the referendum only affects freedom of movement

[6] https://www.theguardian.com/politics/2017/jan/16/theresa-may-to-confirm-uk-exit-from-eu-single-market-speech

[7] The referendum's outcome was not legally binding. The official Brexit process only started when the UK government triggered Article 50.

of EU nationals within the EU, it clearly provides a treatment group (EU immigrants) and a natural control group (non-EU immigrants). The referendum only casts uncertainty on migration regulations between the EU and the UK, keeping the freedom of movement within the rest of EU unaltered. This also allows us to estimate whether there was any spillover effect on the rest of EU destinations, and its impact on the relative attractiveness of those alternative possible destinations.

We first examine the impact of uncertainty in UK policy on migration in the UK and distinguish between inflows, outflows and migrant stocks. We use both aggregate Office for National Statistics (ONS) data as well as micro level data from the UK Labour Force Survey (UK LFS). Secondly, we study whether the uncertainty pertaining to the UK immigration system and policies have made other EU countries more attractive for EU potential migrants who can still move freely to other EU countries where policies are certain. We use aggregate inflow data from the OECD and crosscheck our findings using Eurostat data and micro level data from the EU Labour Force Surveys (EU LFS).

3 The impact of the Brexit referendum on UK migration

3.1 Data and descriptive statistics

In this section of the paper we assess the impact of the Brexit referendum on the UK, analysing the change in the inflows, outflows, and stock of immigrants coming from EU countries to have a complete picture on how the referendum affected UK migration from the EU. We use two different data sources: the Long Term International Migration estimates (LTIM)[8] and the UK Labour Force Survey (UK LFS).

We analyse migrants inflows to and outflows from the UK using the LTIM, which are quarterly released by the (ONS), and the most comprehensive estimates of immigration and emigration to and from the UK. The estimates are mainly based on data from the International Passenger Survey (IPS), a survey that collects face-to-face interviews from a random sample of passengers to identify migrants as they enter or leave the UK, and adjusted on the base of administrative data.[9]

Data are available quarterly. The period of analysis is January 2013 to December 2019, a total of 28 quarters (14 before and 14 after the Brexit referendum). We define pre-referendum period as between January 2013 to June 2016, and the post-referendum as July 2016 to December 2019. We stop the analysis before the quarter January-March 2020, when the Covid-19 epidemic started. Though the LTIM data do not report the exact immigrants'

[8] A long-term international migrant, in accordance with the definition from the UN, is defined as someone who changes their country of residence for a period of at least one year, so that the country of destination effectively becomes the country of usual residence.

[9] See ONS (2020). The data are adjusted based on Census data, the UK Labour Force Survey, the data on asylum seekers and enforced removal from the Home Office, the Irish Central Statistics Office which provides estimates on migration between the UK and the Republic of Ireland, and the Northern Ireland Statistic and Research Agency which provides estimates on migration between the UK and the Northern Ireland.

country of citizenship, it is possible to distinguish 14 sub-regions, which are our unit of analysis.[10] These are: European Union EU14;[11] European Union EU 8;[12] European Union EU2;[13] Other European Union;[14] Other European countries;[15] Middle East and Central Asia; East Asia; South Asia; South East Asia; Sub-Saharan Africa; North Africa; North America (USA and Canada); Central and South America; Oceania.

The LTIM data allow us to identify migrants' main reason for migration, both for inflows and outflows. For the latter, it refers to the main reason for previously entering the UK. In our analysis we include 3 selected migration reasons: i) *Work*, that refers to migrants entering in the UK for work related reasons, including definite job and seeking for work; ii) *Family*, which includes migrants entering in the UK to join or accompany a family member; iii) *Study*, that includes migrants entering in the UK to pursue formal study. The total inflow/outflow is not only the sum of the three selected reasons, but also includes migrants entering for other or non-specified reasons.

Table 1 reports some basic statistics on the inflows of migrants broken down by main motivation for migration. The upper panel reports the statistics for EU countries, and the lower panel for non-EU countries. Column 1 reports the average for the total period of analysis, Columns 3 and 5 respectively for the pre (January 2013- June 2016) and post (July 2016- December 2019) referendum period, and Column 7 the difference between the two periods. The average number of immigrants coming from EU countries in the total period is higher for the *Total* and *Work* inflows, and lower for *Family* and *Study*. Between the pre and post-referendum period, EU immigrants *Total* and *Work* inflows experienced a sharp decrease, and the difference is statistically significant. *Family* and *Study* inflows show only a minor increase, which is non-significant. Non-EU countries experienced the opposite trend for the *Total* and *Work* inflows, showing a positive and significant difference between the pre and post period. Also in this case, *Family* and *Study* only had a minor variation.

[10] The main drawback of not having information on the exact migrants' country of citizenship, is that we are not able to exclude Irish from the sample, even though freedom of movements between the UK and Ireland has not been affected by Brexit.

[11] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden.

[12] Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Slovakia, and Slovenia.

[13] Bulgaria and Romania.

[14] Cyprus and Malta.

[15] EFTA and countries that geographically belong to Europe but are not part of the European Union.

Table 1: Descriptive statistics of UK migration inflows 2013-2019, (LTIM)

From EU countries							
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
Total	228.75	72.13	266.36	35.48	191.14	80.64	-75.21***
Work	135.39	31.69	148.21	25.38	122.57	32.98	-25.64**
Family	19.07	4.88	19.00	4.67	19.14	5.26	0.143
Study	40.11	7.97	38.36	6.34	41.86	9.22	3.500
From Non-EU countries							
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
Total	294.64	41.65	270.36	19.56	318.93	44.16	48.57***
Work	86.32	17.90	73.64	14.05	99.00	11.02	25.36***
Family	45.21	6.61	45.43	5.47	45.00	7.79	-0.429
Study	128.61	22.68	124.29	8.84	132.93	30.82	8.643

Source: Authors' calculations based on quarterly ONS LTIM estimations, January 2013 - December 2019. **Notes:** All statistics are expressed in thousands. Column 7 reports the results from a t-test of mean difference. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. The sample of the test is based on 14 sub-regions of origin classified by EU and non-EU and observed for 28 quarters.

Table 2 presents the same descriptive statistics on the outflows of migrants from the UK. As for the inflows, we notice that for the total period the average of emigrants coming from EU countries migrants who left the UK is higher for the *Total* and *Work* outflows, and lower for *Family* and *Study* compared to non-EU migrants' outflow. Comparing the pre and post-referendum period, EU *Total* and *Work* outflows show a positive and statistically significant difference. Non-EU show in general a minor variation, that is negative and significant in particular for the *Total* outflow. this suggests that EU migrants were more likely to leave the UK compared to non-EU migrants post the referendum.

Table 2: Descriptive statistics of UK migration outflows 2013-2019, (LTIM)

EU countries							
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
Total	109.46	28.03	84.07	5.31	134.86	14.66	50.79***
Work	62.79	21.12	44.07	5.58	81.50	11.89	37.43***
Family	4.36	1.37	4.43	1.60	4.29	1.14	-0.143
Study	17.82	2.20	17.21	1.93	18.43	2.34	1.214
non-EU countries							
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
Total	92.64	8.09	96.93	7.63	88.36	6.18	-8.571***
Work	23.93	2.14	24.43	1.91	23.43	2.31	-1
Family	5.11	2.39	5.00	1.80	5.21	2.94	0.214
Study	43.39	4.62	45.79	4.48	41.00	3.46	-4.786***

Source: Authors' calculations based on quarterly ONS LTIM estimations, January 2013 - December 2019. **Notes:** All statistics are expressed in thousands. Column 7 reports the results from a t-test of mean difference. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. The sample of the test is based on 14 sub-regions of origin classified by EU and non-EU and observed for 28 quarters.

Although the LTIM estimates offer a reliable picture on immigration to the UK, they do not report information on immigrants socioeconomic characteristics. We complement the inflows' analysis on the LTIM estimates with the UK LFS, a quarterly representative survey conducted by the ONS on households living in private addresses in Great Britain. Though the UK LFS is specifically targeted at offering precise information on the labour market and employment status, it reports information on the respondents' country of birth, nationality, age, gender, and highest level of qualification attained.[16] For the baseline results, we use the information on the respondents' country of birth to define immigrants. We use country of birth rather than nationality in the main analysis here as there is evidence that after the Brexit referendum the number of EU citizens granted UK citizenship increased sharply (Migration Observatory, 2019). In Table D.8 of Appendix D we present a robustness check in which we define immigrants based on their nationality. The results are consistent with the baseline analysis. Similarly to the LTIM estimations we distinguish 14 sub-regions of birth, which are our unit of analysis.

The UK LFS is a rotating panel where each household is interviewed for five successive waves before exiting the sample. To estimate the quarterly migration inflows to the UK, we build a repeated cross-sectional database from January 2013 to December 2019 including only respondents at their first wave of interview to avoid double counting.[17] We use the

[16]To rule out the possibility that our estimates are driven by demographic changes, especially when analysing stocks, we keep in the sample only respondents aged between 16 and 67.

[17]The only exception is the first quarter of the analysis, January-March 2013, in which we include all the respondents.

information on the month of arrival to assign each respondent to the quarter of arrival. However, as this information is only available for respondents who arrived in the two years preceding the quarter under consideration, and that the last available quarter is April-June 2020, there is the possibility that the number of new arrivals in the last quarters of analysis is underestimated. A related issue is that due to the Covid-19 pandemic, in March 2020 the UK LFS responses were only collected through telephone interviews. This change introduced some biases, one of these is that the 2020 quarters underestimate the number of non-UK born and nationals.[18] Another limitation of these data is that the survey only includes individuals who have been resident in their household for at least six months, meaning that the number of recent immigrants is likely to be underestimated.[19] Despite these limitations, the UK LFS is the best available source of individual data on immigrant population in the UK and has been widely used to analyse questions related to the impact of immigration on the labour market outcomes of natives , for example, Dustmann et al. (2013); Manacorda et al. (2012), and on the fiscal system Dustmann and Frattini (2014), among others.[20]

Table 3 displays basic statistics on the immigrant inflows calculated using the UK LFS, distinguishing by level of skills, age groups, and gender. In the baseline analysis we consider high-skilled to be all individuals with a university degree.[21] Consistent with the LTIM data, Column 1 shows a higher average total inflow of non-EU than EU immigrants in the total period. This confirms that, albeit the many limitations discussed above, the UK LFS data offer a reliable representation of the immigrant population in the UK. The inflows of non-EU immigrants are always higher when breaking down the data by respondents' characteristics. Column 7 shows a negative and significant difference between the pre and post period for the inflows of EU immigrants, and a non-significant difference for non-EU immigrants. As this result is consistent for all rows, it suggests that the referendum discouraged migration inflows from the EU regardless of the respondents' socioeconomic characteristics.

[18] See ONS (2021). To rule out that our results are driven by measurement biases rather than the Brexit referendum, in Table E.13 in Appendix E we run a robustness check calculating migration inflows excluding the 2020 quarters. The results are consistent with the baseline analysis.

[19] The UK LFS provides individual weights to compensate for non-response among different groups of the population. However, in our analysis on the inflows we cannot use the weights for two reasons. First, as the weights are constructed without taking nationality or country of birth into account, they are likely to be inadequate to determine the size of the immigrant population. Second, as we are only including respondents in their first wave of the survey and the weights calculation is based on all waves, they would be incorrect because they will no longer sum to the population estimate. Therefore, the statistics on the inflows should not be interpreted as an estimation of the immigrant population in the UK, but rather as an analysis on a representative sample.

[20] See Wadsworth et al. (2016) for comparison between LFS, NiNo and Annual Population Surveys as data sources on immigration. However, it is important to note that the UK LFS is not suitable for studying outflows given its nature. We use the ONS LTIM data for studying outflows.

[21] In Table D.10 of Appendix D, following Manacorda et al. (2012), we present a robustness check in which we define the level of skills based on the age when the individual left formal education.

Table 3: Descriptive statistics of UK inflows 2013-2019, (UK LFS)

	Total		Before referendum		After referendum		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
Total							
EU	55.14	22.05	69.21	14.36	41.07	19.41	-28.14***
Non-EU	72.14	23.23	77.93	21.67	66.36	24.06	-11.57
High-skilled							
EU	19.11	8.60	23.29	7.04	14.93	8.15	-8.357***
Non-EU	40.36	14.60	42.21	14.21	38.50	15.28	-3.714
Low-skilled							
EU	36.04	14.93	45.93	9.60	26.14	12.64	-19.79***
Non-EU	31.79	11.14	35.71	9.86	27.86	11.27	-7.857*
Age 16-39							
EU	44.82	18.22	56.64	11.52	33.00	15.99	-23.64***
Non-EU	55.71	19.01	59.86	18.45	51.57	19.32	-8.286
Age 40-67							
EU	10.32	5.03	12.57	4.38	8.07	4.75	-4.500**
Non-EU	16.43	6.09	18.07	5.46	14.79	6.44	-3.286
Women							
EU	28.57	12.38	34.36	9.99	22.79	12.10	-11.57**
Non-EU	40.11	13.66	42.07	12.52	38.14	14.92	-3.929
Men							
EU	26.57	11.24	34.86	6.51	18.29	8.49	-16.57**
Non-EU	32.04	10.81	35.86	9.68	28.21	10.84	-7.643*

Source: Authors' calculations based on quarterly UK LFS, January 2013 - June 2020. Column 7 reports the results of a t-test of mean difference. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. The sample of the test is based on 14 sub-region grouped by EU and non-EU and observed for 28 quarters.

We also analyse the change in migrant stocks in the UK using the UK LFS. Similar to what we did for the inflows, we build a repeated quarterly cross-sectional database from January 2013 to December 2019 and define the unit of analysis as the 14 sub-regions of birth. However, to measure the quarterly stock of foreign-born, we include in our sample all respondents, with no restrictions on their interview's wave and time of arrival, and each individual is counted in their interview's quarter. Since in this case we are using respondents in all the waves of the survey, for the baseline results on the stocks we use the individual weights provided in the survey.[22] Table 4 shows basic statistics on immigrants stocks distinguishing by the same characteristics as for the inflows. We can notice that, differently from the inflows, the stocks of immigrants from EU countries has increased between the pre and post-referendum period. The difference is statistically significant for the total, high-skilled, younger cohort, women, and men stocks. Similarly the stock of non-EU immigrants has increased, and the difference is significant for most of the migrant groups based on demographics. Below we examine whether those differences are robust to controlling for individual characteristics and macroeconomic factors.

[22] In Table E.14 and of Appendix E we present a robustness check using the unweighted stocks. The results remain substantially unchanged.

Table 4: Descriptive statistics of immigrant stocks in the UK, 2013-2019, (UK LFS, weighted)

	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
Total							
EU	2729.5	306.8	2489.4	262.3	2969.6	51.0	480.1***
Non-EU	4695.2	171.9	4543.3	85.1	4847.2	66.2	303.9***
High-skilled							
EU	969.4	152.9	846.8	119.3	1092.0	44.4	245.2***
Non-EU	1932.0	155.2	1790.8	61.9	2073.3	56.8	282.5***
Low-skilled							
EU	1760.1	162.1	1642.6	144.8	1877.5	62.6	234.9***
Non-EU	2763.2	60.5	2752.5	50.6	2773.9	69.3	21.5
Age 16-39							
EU	1746.6	185.5	1617.8	178.6	1875.3	62.2	257.5***
Non-EU	2276.0	52.3	2279.6	46.9	2272.5	58.6	-7.1
Age 40-67							
EU	982.9	134.3	871.6	87.6	1094.2	55.9	222.6***
Non-EU	2419.2	177.6	2263.7	107.3	2574.7	44.1	311.02***
Women							
EU	1436.0	148.4	1320.9	123.8	1551.2	42.9	230.3***
Non-EU	2440.2	113.6	2339.1	51.2	2541.3	46.3	202.2***
Men							
EU	1293.5	160.9	1168.5	139.5	1418.4	26.4	249.8***
Non-EU	2255.1	62.6	2204.2	38.3	2305.9	33.3	101.8***

Source: Authors' calculations based on quarterly UK LFS, January 2013 - December 2019.
Notes: All statistics are expressed in thousands. Column 4 reports a t-test of mean difference. *p < 0.10, **p < 0.05, ***p < 0.001. The sample of the test is based on 14 sub-region grouped by EU and non-EU and observed for 28 quarters.

3.2 Methodology

To estimate the impact of the Brexit referendum on the changes in the inflows, outflows, and stocks of migrants coming from EU countries we use a difference-in-difference strategy. The difference-in-difference is an econometric technique which estimates the effect of a treatment (in our case the Brexit referendum) on an outcome variable (in our case inflows, outflows, and stocks of migrants) by comparing the change in the outcome variable in a treatment group relative to the change in the outcome in a control group. The impact of the treatment is calculated as the difference in outcome between the two groups after the referendum minus the difference in outcome between the two groups before the referendum. Treatment and control groups may differ in their observable and unobservable characteristics, however the estimation of the causal impact will be unbiased only if this difference is constant over time (Angrist and Pischke, 2008). This is referred to as the parallel trends assumption.

Our identification is based on the assumption that the Brexit referendum and resulting uncertainty in immigration policies and migrant rights only affected EU migrants but have no

impact on non-EU, whose immigration policies and rights are considered separately and there were no changes or uncertainty regarding non-EU migrants. The UK was not a signatory of the Schengen agreement and as such always managed non-EU migration independently from the rest of the EU. The period between the referendum and the end of the transition period, uncertain about whether the UK would have a deal with the EU before exiting, was a prolonged period of uncertainty for the public, migrants and employers. We utilise this setting, and define immigrants coming from EU countries as the treatment group, and immigrants coming from non-EU countries as the control group. Our interest is in estimating the difference between those two groups by comparing the difference in their migration behaviour before and after the referendum.

As previously mentioned, our period of analysis goes from the January-March quarter in 2013 to the October-December quarter in 2019. We define this time span for two reasons. First, we allow the same number of time periods (14 quarters) in the pre and post-referendum period. Second, during the period of the analysis the UK government did not approve any other relevant migration policy change for EU and non-EU immigrants, meaning that sub-regions differences in propensity to migrate to the UK should be constant over time, and this should allow us to properly estimate the impact of the referendum.

We estimate the following equation:

$$Y_{it} = \alpha_i + \beta_1 EU_i + \beta_2 Post\_ref_t + \beta_3 EU_i * Post\_ref_t + \beta_4 X_t + \gamma_y + \delta_i + \epsilon_{it} \quad (1)$$

where Y_{it} is in turn the log of the number of inflows, outflows, or stocks of immigrants from sub-region i in quarter t; EU_i is a dummy that takes the value 1 if the sub-region i belongs to the European Union[23]; $Post\_ref_t$ is a dummy that takes the value 1 if the quarter t is in the post-referendum period, and $Post\_ref * EU_{it}$ is the interaction between these two dummy variables. Since the referendum took place at the end of June 2016 we do not need to exclude the quarter April-June 2016 from the analysis, but include it in the pre-referendum period. The post-referendum period starts from the quarter just after, which is July-September 2016. The coefficient β_3 quantifies the impact of the referendum on the inflows, outflows, and stocks of EU immigrants, and is our main coefficient of interest. We add a vector of controls X_t to account for the effect of economic confounding factors at destination: we include real GDP per capita (log-transformed) and unemployment rate, both lagged 4 quarters, and then use quarter γ_y and sub-region δ_i fixed effects to fully capture all confounding factors. We use GDP data based on OECD stats, and population and unemployment from the ONS. We also distinguish different types of migrants. We distinguish between EU14 and new EU member States to account for heterogeneous response to the policy change. In this specification we include in the treatment group immigrants coming from EU14 countries or new EU member States in turn, while the control group does not vary.

An important condition that our data must satisfy to give reliable estimates, is the assumption of parallel trends in the pre-referendum period. Figure 1 suggests that for the inflows calculated with the LTIM estimations the parallel trend assumption plausibly holds

[23]We refer to the sub-regions of the world, as outlined in subsection 3.1.

for the *Work*, *Family*, and *Study* inflows, even before conditioning on the fixed effects. The Figure for the *Total* inflow does not show a clear parallel trend.[24] To further confirm that the assumption can plausibly hold, in Figure 2 we estimate the quarterly difference between the inflows of EU and non-EU immigrants, also in this case without conditioning on controls and fixed effects. Figure 2 shows that the difference is never significant in the pre-referendum period for all inflows. From Figures 1 and 2 we can also detect a sharp decrease in the *Total* and *Work* inflow of immigrants coming from EU countries in the post-referendum period.

Figure 3 suggests that the parallel trend assumption holds overall also for the inflows calculated using the UK LFS. Also, in the pre referendum period the difference between EU and non-EU is never statistically significant (Figure 4). Figure 3 also shows a drop in the immigrant inflows in the post-referendum period, both from EU and non-EU countries.

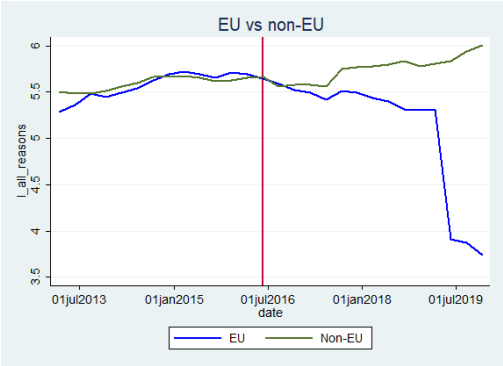
Figure 5 suggests that the assumption on the parallel trends also holds for the outflows, with the exception of when we consider the outflows of family emigrants only. On the other hand, figure 6 shows that the difference between EU and non-EU is never significant in the pre-referendum period. From Figure 5 we can also detect an increase in the outflows in the post-referendum period, especially when considering the *Work* outflow.

Figure 7 presents the trend for the stocks. We can notice that the trends are in general not clearly parallel in the pre-referendum period, with the stocks of immigrants coming from EU countries showing a gradual increase while the stocks of non-EU immigrants stay stable. In the post-referendum period the stocks for the two groups stabilise. Figure 8 shows that the difference between EU and non-EU is in general not significant in the pre-referendum period. This suggests that overall the assumption of parallel trend plausibly holds also for the stocks. We check below the parallel trend assumptions for the different groups and migration behaviour using several placebo tests.

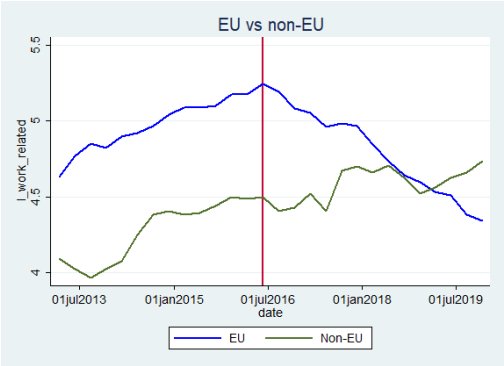
[24] In Table C.7 in Appendix C we run the estimation using the sub-region "Other Europe" as an alternative control group. The results confirm our benchmark estimation.

Figure 1: Parallel trends of inflows (log) to the UK, (LTIM)

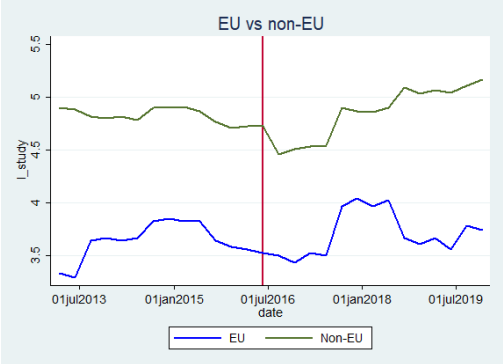
(a) Total



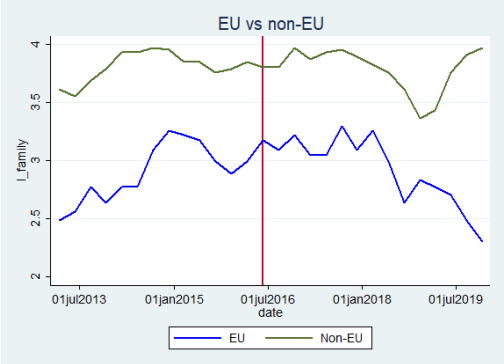
(b) Work



(c) Study



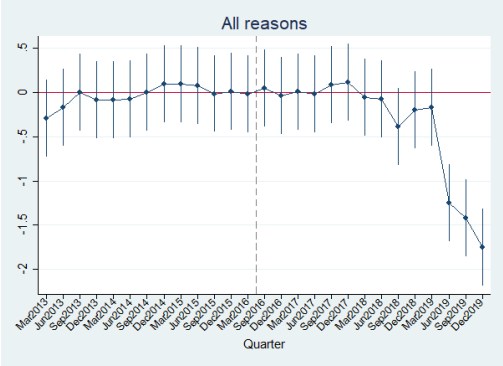
(d) Family



Source: Authors' calculations based on LTIM estimations, January 2013 - December 2019. **Notes:** All statistics are expressed in thousands. The red line indicates the quarter when the referendum took place.

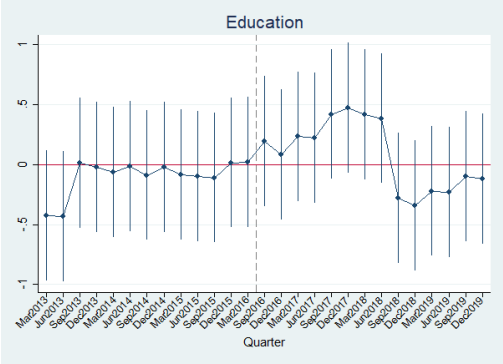
Figure 2: Difference between EU and non-EU trends of inflows (log) to the UK, (LTIM)

(a) Total

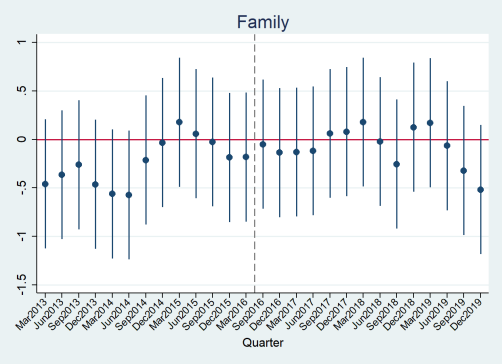


(b) Work

(c) Study



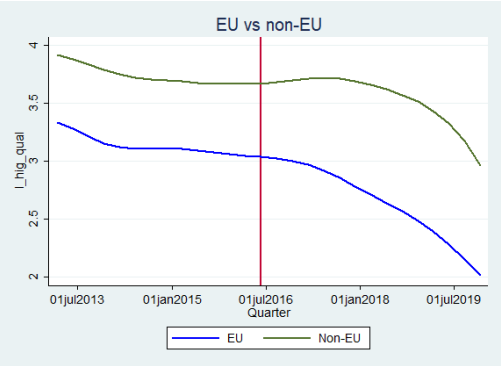
(d) Family



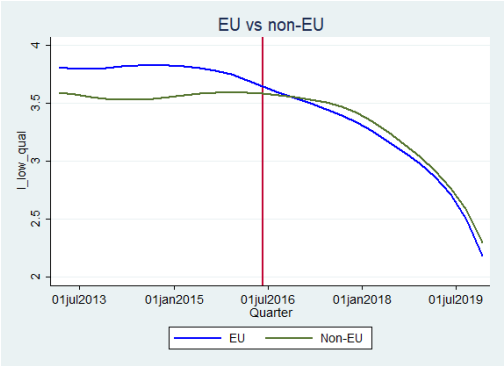
Source: Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019. **Notes:** The graphs show the estimated difference in the log of inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the quarter in which the Brexit referendum took place (June 2016, indicated with the dash line). The incertitude of each point is asserted with a 95% confidence interval.

Figure 3: Parallel trends of inflows (log) to the UK, (UK LFS)

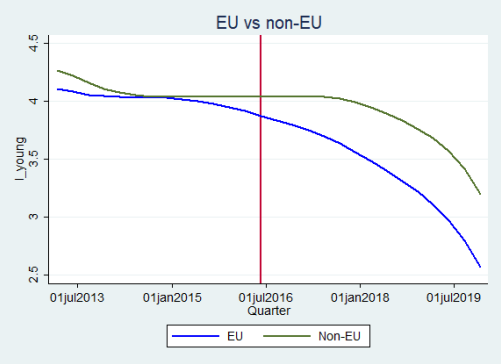
(a) High-skilled



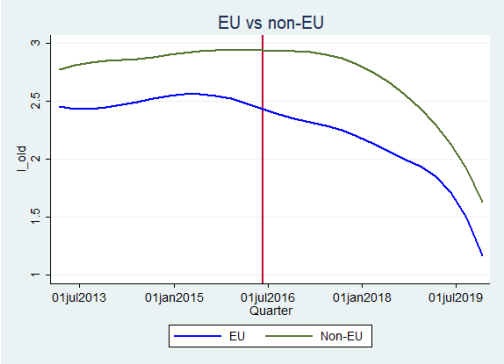
(b) low-skilled



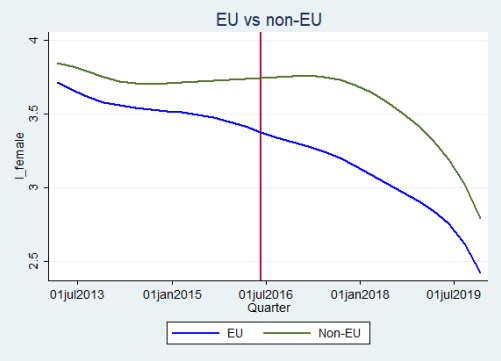
(c) Age 16-39



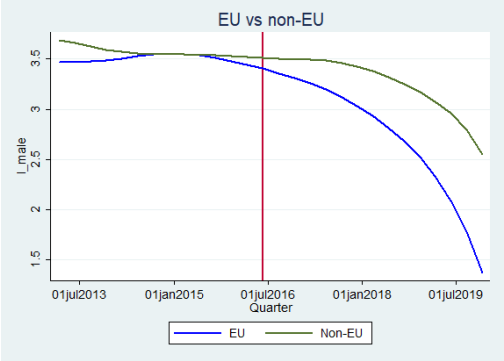
(d) Age 40-67



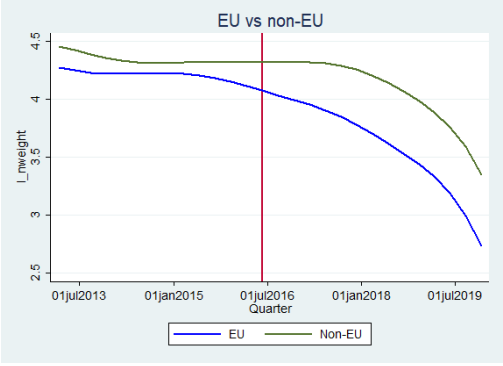
(e) Women



(f) Men

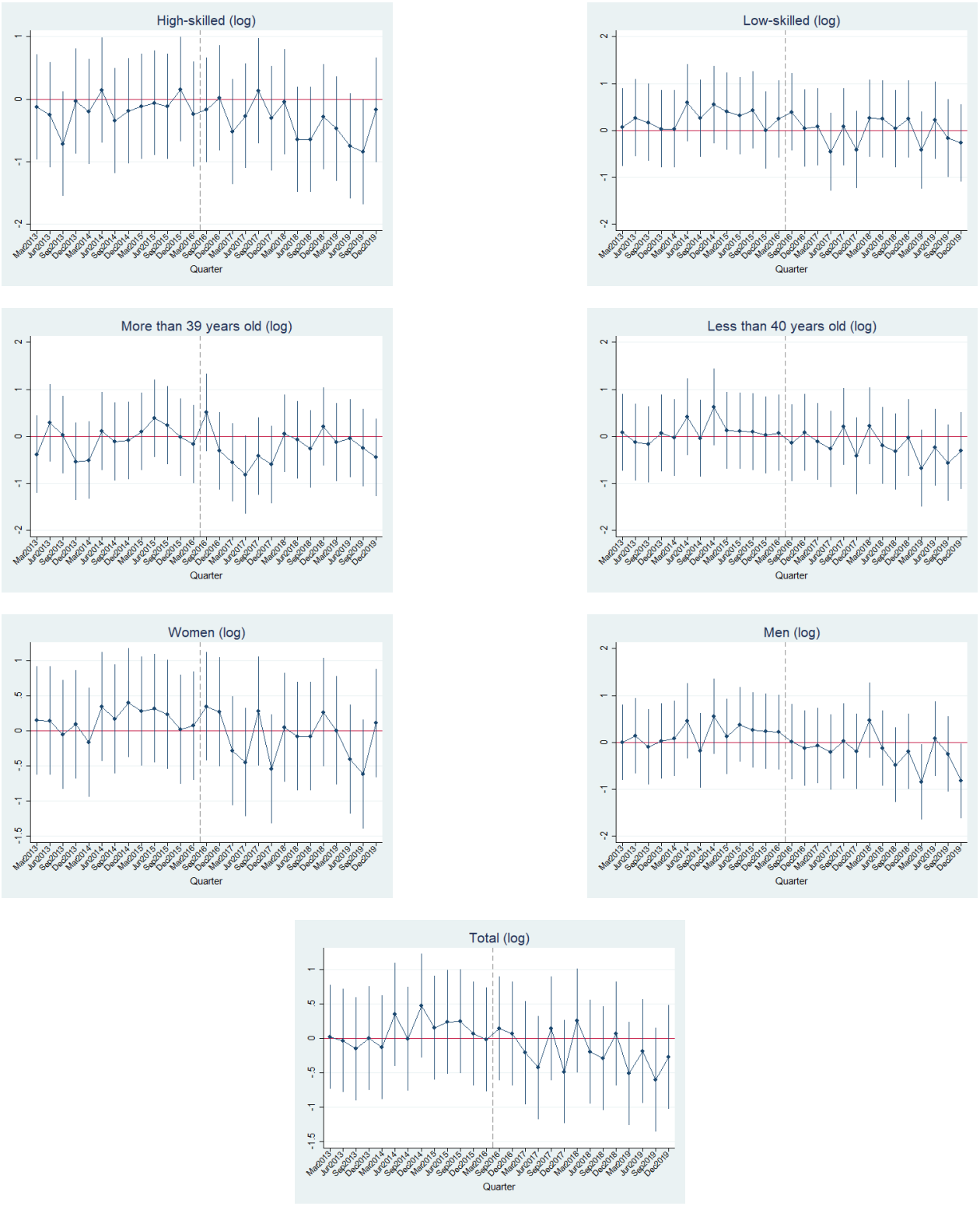


(g) Total



Source: Authors' calculations based on quarterly UK LFS, January 2013 - June 2020. The red line indicates the quarter when the referendum took place.

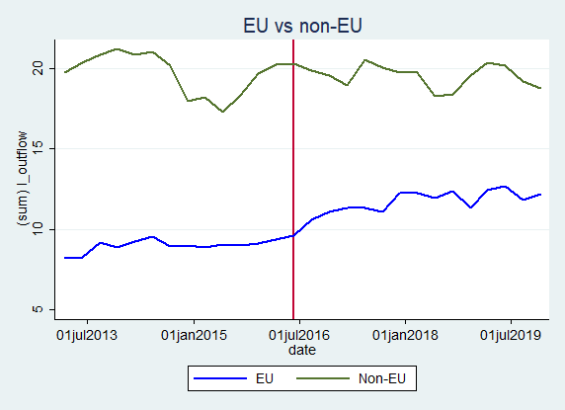
Figure 4: Difference between EU and non-EU trends of inflows (log) to the UK, (UK LFS)



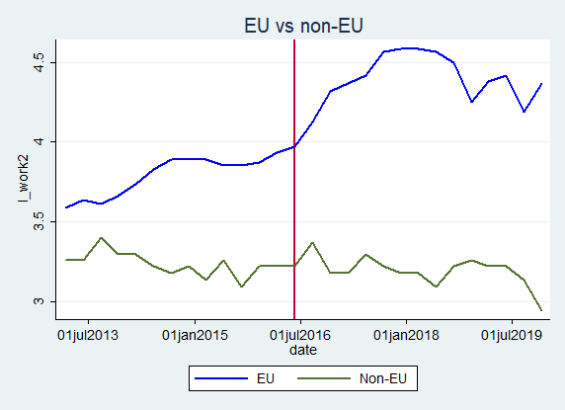
Source: Authors' calculations based on quarterly UK LFS, January 2013 - June 2020. **Notes:** The graphs show the estimated difference in the inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the quarter in which the Brexit referendum took place (June 2016, indicated with the dash line). The incertitude of each point is asserted with a 95% confidence interval.

Figure 5: Parallel trends of outflows (log) from the UK, (LTIM)

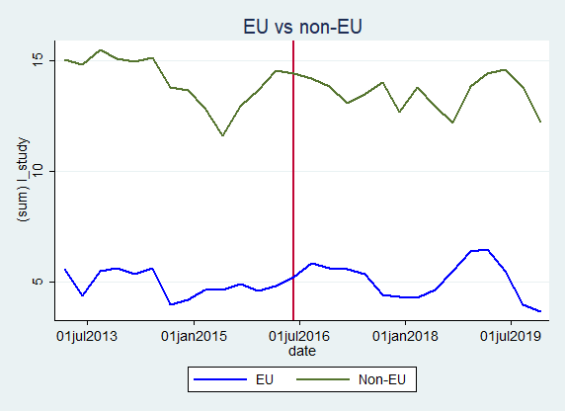
(a) Total



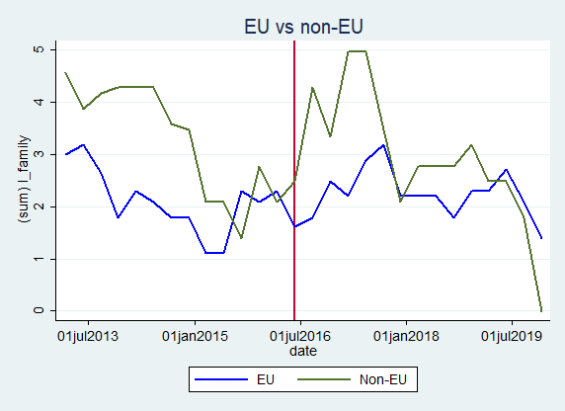
(b) Work



(c) Study



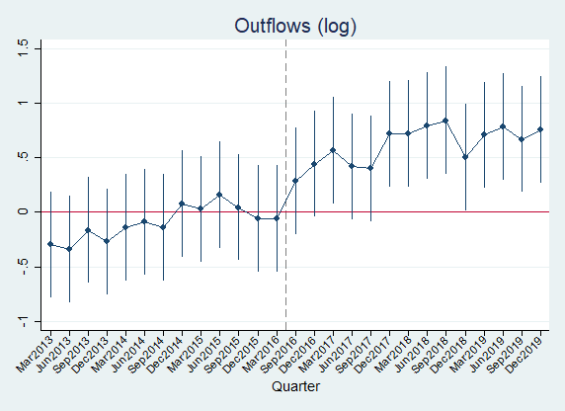
(d) Family



Source: Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019. **Notes:** All statistics are expressed in thousands. The red line indicates the quarter when the referendum took place.

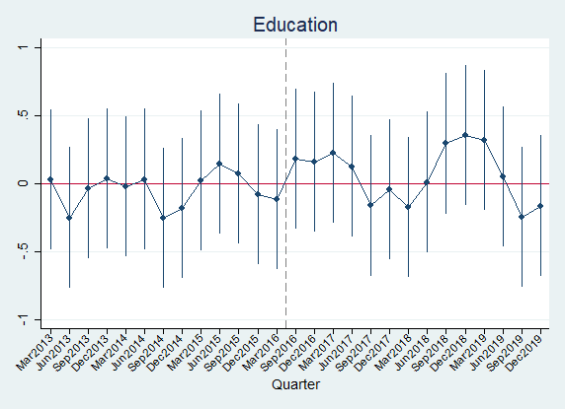
Figure 6: Difference between EU and non-EU trends of outflows (log) from the UK, (LTIM)

(a) Total



(b) Work

(c) Study

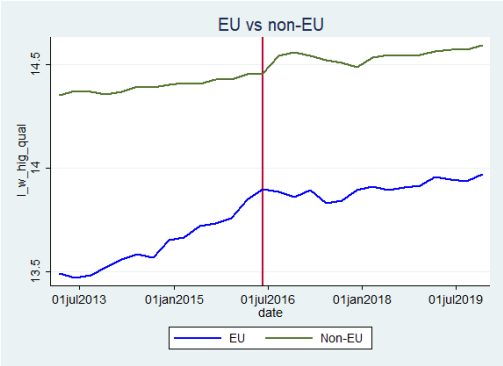


(d) Family

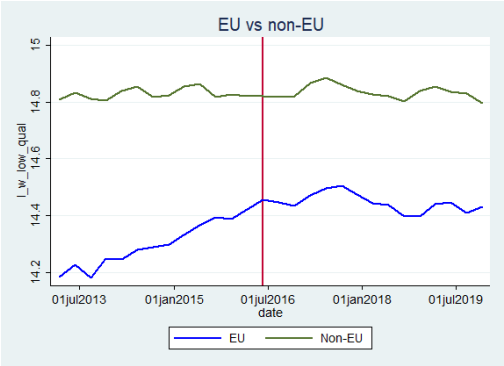
Source: Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019. **Notes:** The graphs show the estimated difference in the log of inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the quarter in which the Brexit referendum took place (June 2016, indicated with the dash line). The incertitude of each point is asserted with a 95% confidence interval.

Figure 7: Parallel trends of migrant stocks (log) in the UK, (UK LFS)

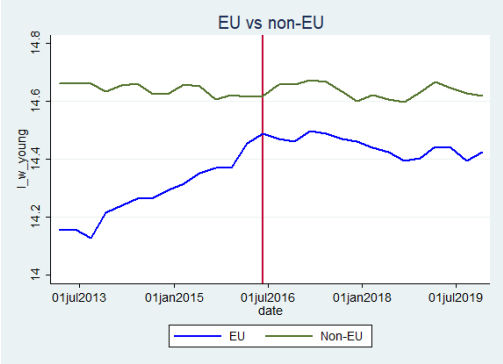
(a) High-skilled



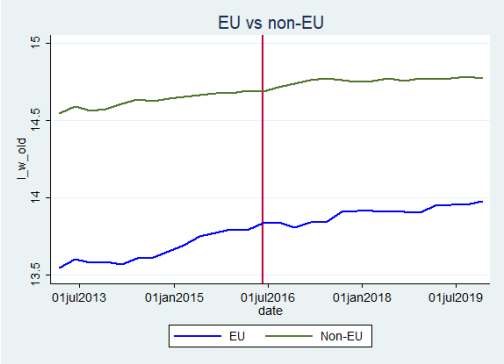
(b) Low-skilled



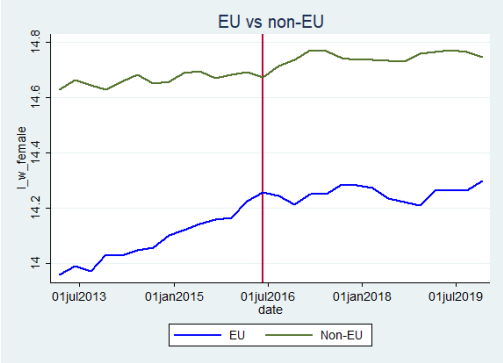
(c) Age 16-39



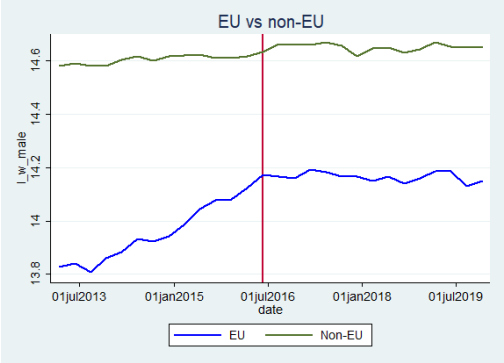
(d) Age 40-67



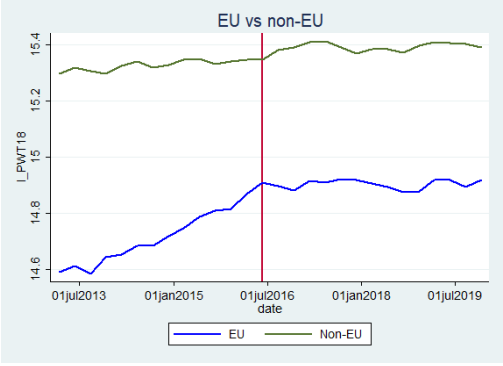
(e) Women



(f) Men

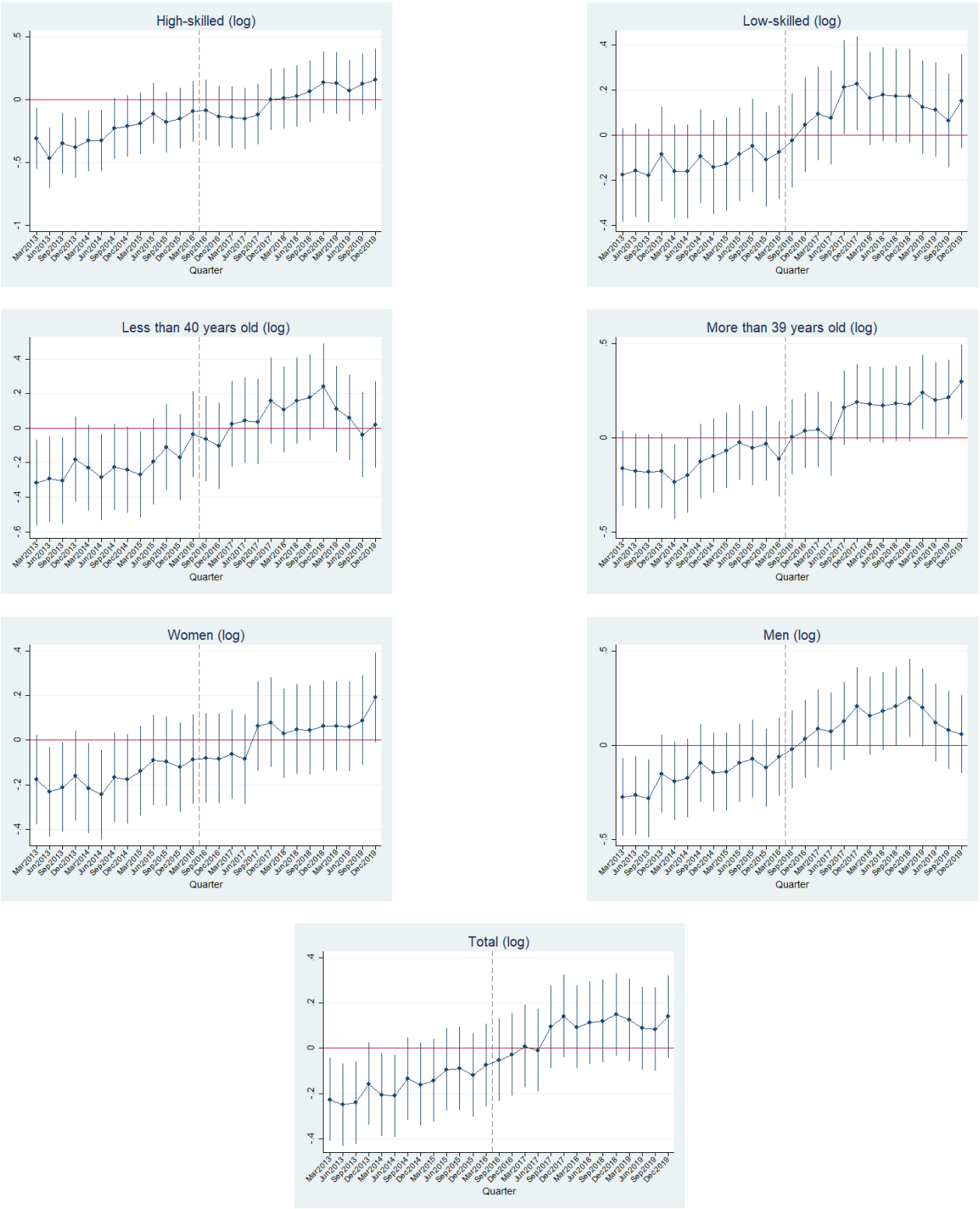


(g) Total



Source: Authors' calculations based on quarterly UK LFS, January 2013 - December 2019. The red line indicates the quarter when the referendum took place.

Figure 8: Difference between EU and non-EU trends of migrant stocks (log) in the UK, (UK LFS)



Source: Authors' calculations based on quarterly UK LFS, January 2013 - December 2019. **Notes:** The graphs show the estimated difference in the inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the quarter in which the Brexit referendum took place (June 2016, indicated with the dash line). The incertitude of each point is asserted with a 95% confidence interval.

3.3 Empirical results on effects of Brexit on UK migration

3.3.1 Immigration flows to the UK

Table 5 presents the results on the total inflows to the UK using the LTIM data. Column 1 reports the results of the equation estimated without controls and fixed effects, in column 2 we add sub-region of citizenship fixed effects, in column 3 we also control for the macroeconomic conditions using lagged real GDP per capita and lagged unemployment rates. In column 4 we control for both the sub-region of citizenship and time (quarter) fixed effects. The coefficient for the interaction between *EU* and *Post_ref* is negative, statistically significant, and robust to the inclusion of different fixed effects and the controls.

Table 5: Difference-in-difference estimates, Total Inflow to the UK, (LTIM)

	Total inflow to the UK (log)			
	(1)	(2)	(3)	(4)
EU	0.455**	-0.733***	-0.733***	-0.733***
	(0.139)	(0.0988)	(0.0984)	(0.0953)
Post_ref	0.0867	0.0867**	-0.0333	0.0877
	(0.105)	(0.0407)	(0.0700)	(0.126)
EU*post_ref	-0.333*	-0.333***	-0.333***	-0.333***
	(0.196)	(0.0762)	(0.0759)	(0.0735)
GDPpc (log)			1.970	
			(2.369)	
Unemployment			-0.0124	
			(0.0481)	
Sub-region of citizenship FE	No	Yes	Yes	Yes
Quarter FE	No	No	No	Yes
Observations	392	392	392	392
R-squared	0.0288	0.858	0.860	0.877

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. Unemployment and real GDP per capita are lagged 4 quarters. **Source:** Authors' calculations based on quarterly LTIM data, January 2013 - December 2019.

Table 6 presents the results of the specification with the regional and time fixed effects (Column 4 of Table 5), breaking down the inflow by main reason for migration. The upper panel presents the results for all EU countries inflows, the middle panel only for the EU14 countries, and the lower panel for the new EU member States. Table 6 reports the mean inflow values for the three groups of EU countries in the pre-referendum period. We also report the relative effect, which is the estimated effect of the referendum on the group of EU countries, relative to the non-EU countries, expressed in percentage.[25] The coefficients of the difference-in-difference for the *Total* and *Work* inflows are negative and strongly statistically significant for all groups of EU countries. The relative effect indicates a decrease of around 29%, suggesting that the referendum had a substantial negative impact on the inflows of immigrants coming from EU countries. The coefficient for the *Family* inflow is only marginally significant in the upper panel. The coefficient for the *Study* inflow is positive and statistically significant for the total EU and new EU member states, suggesting an increase of international students

[25]The reported relative change refers to the dependent variable expressed in levels.

in the post-referendum period. This could be explained by the fact that during the transition period students coming from EU countries could still benefit from the same rate of fees applied to British students, and this could have encouraged them to enter in the UK before the end of the transition period.

To ensure that the results are driven by the Brexit referendum, rather than any preexisting trend, we run a placebo test checking the effect of a pseudo-policy change set in the pre-referendum period. In this analysis we define the time span from April 2010 to March 2016 and set the pseudo-referendum on the 31st March 2013. The results are presented in Table A.1 in Appendix A. We find a positive and significant coefficient for the *Total*, *Work*, and *Family* inflows, which suggests that in the pre-referendum period there was an increase in the inflows of immigrants coming from EU countries. For the *Study* inflow we find a positive but not significant coefficient in the placebo test. We can therefore conclude that, in absence of the referendum, we would have expected an increasing trend of the inflows for the *Total*, *Work*, and *Family* inflows, and a stable trend for the *Study* inflow. This reinforces our conclusion that the effects we detect in the main analysis are the consequence of the uncertainty period that the Brexit referendum initiated.

We also estimate the impact of the referendum on the total inflow using the UK LFS as shown in Table 7. The coefficient of interest, the difference-in-difference, is negative, statistically significant, and robust to the inclusion of the fixed effects and the controls. Table 8 presents the results on the inflows broken down according to the individual's socioeconomic characteristics and by EU group. The coefficient of interest, when analysing the results on the total EU countries, is negative and significant with the exception of the inflows of high-skilled. The relative effect is around -27% which is similar in magnitude to the impact from the LTIM data, and also suggesting that the Brexit referendum had a considerable negative effect on migration inflows from the EU. In the middle and the lower panel we account for the heterogeneity between the group of EU14 countries and new EU member States. For most groups, the coefficients are negative and significant although the relative impact is stronger for the EU14 compared to new EU member States. For example, for EU14 the negative impact is highest amongst the low-skilled and men inflows, and the relative effect ranges between 39% and 35%. For the new EU member States the relative impacts on the low-skilled and men are 37% and 28% respectively.

We repeat the placebo test also for the inflows calculated with the UK LFS data. The results are presented in Table A.2 in Appendix A. The coefficient of the difference-in-difference is only slightly significant when considering all EU countries, while is non-significant when we account for the heterogeneity between EU14 and new EU member States. Also in this case the results of the placebo test confirm our conclusion that the Brexit referendum had negative impact on inflows of immigrants coming from EU countries.

Table 6: Difference-in-difference estimates, Inflows to the UK, (LTIM)

	(1)	(2)	(3)	(4)
Total inflows from EU and non EU (log)	all_reasons	work	family	study
EU	-0.733***	-0.382***	-0.916***	-0.724***
	(0.0953)	(0.0896)	(0.117)	(0.0971)
Post_ref	0.0877	0.523***	0.0703	-0.105
	(0.126)	(0.118)	(0.155)	(0.128)
EU*post_ref	-0.333***	-0.415***	0.149*	0.175**
	(0.0735)	(0.0691)	(0.0902)	(0.0750)
Sub-region of citizenship and quarter FE	Yes	Yes	Yes	Yes
Mean EU pre referendum	266.36	148.21	19	38.36
Relative effect	- 29%	- 34%	16%	19%
Observations	392	392	392	392
R-squared	0.877	0.935	0.768	0.889
	(1)	(2)	(3)	(4)
Inflows from EU14 and non EU (log)	all_reasons	work	family	study
EU14	2.357***	3.322***	1.120***	1.453***
	(0.0791)	(0.0870)	(0.119)	(0.101)
Post_ref	0.283**	0.592***	0.0466	-0.114
	(0.102)	(0.112)	(0.153)	(0.130)
EU14*post_ref	-0.435***	-0.422***	0.194	0.150
	(0.0942)	(0.104)	(0.142)	(0.120)
Sub-region of citizenship and quarter FE	Yes	Yes	Yes	Yes
Mean EU14 pre referendum	119	69.14	8.57	26.14
Relative effect	- 35%	- 35%	21%	16%
Observations	308	308	308	308
R-squared	0.913	0.942	0.805	0.917
	(1)	(2)	(3)	(4)
Inflows from EU_new and non EU (log)	all_reasons	work	family	study
EU_new	-0.750***	-0.383***	-0.909***	-0.728***
	(0.0936)	(0.0937)	(0.122)	(0.102)
Post_ref	0.172	0.538***	0.136	-0.125
	(0.126)	(0.126)	(0.164)	(0.137)
EU_new*post_ref	-0.299***	-0.412***	0.135	0.183**
	(0.0790)	(0.0791)	(0.103)	(0.0860)
Sub-region of citizenship and quarter FE	Yes	Yes	Yes	Yes
Mean EU_new pre referendum	49.12	26.36	3.48	4.07
Relative effect	- 26%	- 34%	14%	20%
Observations	364	364	364	364
R-squared	0.868	0.917	0.750	0.876

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. All statistics are expressed in thousands. **Source:** Authors' calculations based on quarterly LTIM estimations.

Table 7: Difference-in-difference estimates, Total Inflow to the UK, (UK LFS)

	Total inflows to the UK (Log)			
	(1)	(2)	(3)	(4)
EU	0.682***	1.893***	1.893***	1.893***
	(0.145)	(0.170)	(0.166)	(0.147)
Post_ref	-0.182*	-0.182**	-0.111	-1.194***
	(0.110)	(0.0701)	(0.118)	(0.195)
EU*post_ref	-0.311	-0.311**	-0.311**	-0.311**
	(0.206)	(0.131)	(0.128)	(0.114)
GDPpc (log)			16.56***	
			(4.005)	
Unemployment			-0.337***	
			(0.0812)	
Sub-region of birth FE	No	Yes	Yes	Yes
Quarter FE	No	No	No	Yes
Observations	392	392	392	392
R-squared	0.0869	0.641	0.657	0.749

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. Unemployment and real GDP per capita are lagged of 4 quarters. **Source:** Authors' calculations based on quarterly LTIM estimations, January 2013 - June 2020.

Table 8: Difference-in-difference estimates, Inflows to the UK by group, (UK LFS)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total Inflow from EU and non EU (log)	Total	High_skilled	Low_skilled	Women	Men	Young	Older
EU	1.893***	1.671***	1.775***	1.650***	1.838***	1.853***	1.345***
	(0.147)	(0.159)	(0.143)	(0.144)	(0.148)	(0.153)	(0.143)
Post_ref	48.31***	36.42***	28.59**	41.43***	31.51**	36.75***	27.26**
	(9.722)	(10.50)	(9.474)	(9.547)	(9.767)	(10.13)	(9.448)
EU*post_ref	-0.311**	-0.186	-0.469***	-0.312**	-0.353**	-0.329**	-0.257**
	(0.114)	(0.123)	(0.111)	(0.111)	(0.114)	(0.118)	(0.110)
Sub-region of birth and quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU pre referendum	69.21	23.29	45.93	34.36	34.86	56.64	12.57
Relative effect	- 27%	- 17%	- 37%	- 27%	- 30%	- 28%	- 23%
Observations	392	392	392	392	392	392	392
R-squared	0.749	0.652	0.717	0.692	0.678	0.715	0.516
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Inflow from EU14 and non EU (log)	Total	High_skilled	Low_skilled	Women	Men	Young	Older
EU14	1.917***	1.728***	1.789***	1.659***	1.874***	1.862***	1.425***
	(0.170)	(0.185)	(0.166)	(0.168)	(0.171)	(0.178)	(0.167)
Post_ref	46.96***	42.37***	22.30**	44.07***	29.03**	32.93**	31.20**
	(11.01)	(12.04)	(10.78)	(10.89)	(11.10)	(11.53)	(10.86)
EU14*post_ref	-0.359*	-0.300	-0.496**	-0.330*	-0.426**	-0.347	-0.417**
	(0.202)	(0.221)	(0.198)	(0.200)	(0.204)	(0.212)	(0.199)
Sub-region of birth and quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU14 pre-ref.	30.07	19.71	10.35	15.42	14.64	23.78	6.28
Relative effect	- 30%	- 26%	- 39%	- 28%	- 35%	- 29%	- 34%
Observations	308	308	308	308	308	308	308
R-squared	0.686	0.640	0.585	0.638	0.630	0.654	0.473
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Inflow from EU_new and non EU (log)	Total	High_skilled	Low_skilled	Women	Men	Young	Older
EU_new	1.388***	0.498**	1.987***	1.232***	1.341***	1.350***	1.005***
	(0.154)	(0.166)	(0.149)	(0.150)	(0.154)	(0.161)	(0.144)
Post_ref	-1.136***	-0.810***	-0.833***	-0.937***	-0.815***	-1.004***	-0.544**
	(0.208)	(0.223)	(0.201)	(0.202)	(0.206)	(0.216)	(0.194)
EU_new*post_ref	-0.295**	-0.148	-0.460***	-0.306**	-0.329**	-0.323**	-0.204*
	(0.130)	(0.140)	(0.126)	(0.127)	(0.130)	(0.136)	(0.122)
Sub-region of birth and quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU_new pre-ref.	13.47	4.31	9.17	6.74	6.74	11.19	2.28
Relative effect	- 26%	- 14%	- 37%	- 26%	- 28%	- 28%	- 19%
Observations	364	364	364	364	364	364	364
R-squared	0.701	0.568	0.684	0.642	0.612	0.662	0.443

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - June 2020.

3.3.2 Emigration from the UK

Examining the outflow of migrants from the UK using aggregate data based on the ONS LTIM data, the coefficient of the difference-in-difference for the total outflow is positive, strongly significant, and robust to the inclusion of different fixed effects and controls (Table 9). In Table 10 we break down the outflow by main reason for the initial migration to the UK, finding a positive and significant coefficient for the *Work* outflow. The relative effect ranges between 102% and 104%, suggesting a strong positive change in the outflows for immigrants coming from EU countries relative to immigrants coming from non-EU countries in the post-referendum period. The results on EU14 countries only show a positive and significant coefficient for the *Work* outflow only. Conversely, the results for new EU member States immigrants show a positive and significant coefficient for all reasons of previous migration, with a relative effect ranging between 22% and 139%. The results suggest that the Brexit referendum increased the outflows of EU immigrants from the UK, especially for those who came to the UK for work reasons. Moreover, our results suggest that the effect on leaving the UK is higher for migrant coming from new EU member States.

As for the inflows, we run a placebo test to check the robustness of the estimated effects. For the outflows, the first available quarter is October - December 2012. Therefore we define the time span until March 2016, with a pseudo-shock the set on the 30th of June 2014. The results are presented in Table A.3 in Appendix A. The coefficient of the difference-in-difference is never statistically significant. Hence, it is only post the referendum where we observe an increase in emigration.

Table 9: Difference-in-difference estimates, Total Outflows from the UK, (LTIM)

	Total outflow from the UK (log)			
	(1)	(2)	(3)	(4)
EU	0.285*	1.897***	1.897***	1.897***
	(0.158)	(0.0858)	(0.0860)	(0.0855)
Post_ref	0.00540	-0.0167	-0.00105	0.0415
	(0.120)	(0.0355)	(0.0611)	(0.115)
EU*post_ref	0.680**	0.702***	0.702***	0.702***
	(0.224)	(0.0663)	(0.0664)	(0.0661)
GDPpc (log)			0.876	-2.795
			(2.071)	
Unemployment			0.0227	
			(0.0420)	
Sub-region FE	No	Yes	Yes	Yes
Quarter FE	No	No	No	Yes
Observations	392	392	392	392
R-squared	0.103	0.924	0.924	0.929

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. Unemployment and real GDP per capita are lagged of 4 quarters. **Source:** Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019.

Table 10: Difference-in-difference estimates, Outflows from the UK by group, (LTIM)

	(1)	(2)	(3)	(4)
Total outflows (log+1)	all_reasons	work	family	study
EU	1.897***	2.174***	0.505***	0.170*
	(0.0855)	(0.0951)	(0.0977)	(0.0904)
Post_ref	0.0415	-0.125	-0.463***	-0.366**
	(0.115)	(0.126)	(0.129)	(0.120)
EU*post_ref	0.702***	0.714***	0.0758	0.110
	(0.0661)	(0.0734)	(0.0754)	(0.0698)
Sub-region and quarter FE	Yes	Yes	Yes	Yes
Mean EU pre-ref.	84.04	44.07	4.43	17.21
Relative effect	102%	104%	8%	12%
Observations	390	392	392	392
R-squared	0.929	0.913	0.579	0.870
	(1)	(2)	(3)	(4)
EU14 (log+1)	all_reasons	work_related	family	study
EU14	2.638***	2.604***	1.438***	1.577***
	(0.112)	(0.122)	(0.111)	(0.104)
Post_ref	0.239*	0.0566	-0.423***	-0.336**
	(0.131)	(0.139)	(0.127)	(0.119)
EU14*post_ref	0.159	0.312**	-0.252*	0.0151
	(0.133)	(0.144)	(0.132)	(0.123)
Sub-region and quarter FE	Yes	Yes	Yes	Yes
Mean EU14 pre-ref.	48.64	23.36	3.57	13.28
Relative effect	17%	36%	- 27%	2%
Observations	308	308	308	308
R-squared	0.907	0.891	0.582	0.869
	(1)	(2)	(3)	(4)
EU_new	all_reasons	work_related	family	study
EU_new	1.843***	2.095***	0.413***	0.123
	(0.0925)	(0.101)	(0.102)	(0.0944)
Post_ref	0.130	-0.0455	-0.478***	-0.364**
	(0.118)	(0.127)	(0.127)	(0.118)
EU_new*post_ref	0.810***	0.871***	0.259**	0.203**
	(0.0880)	(0.0961)	(0.0965)	(0.0897)
Sub-region and quarter FE	Yes	Yes	Yes	Yes
Mean EU_new pre-ref.	34.14	20.43	0.86	3
Relative effect	125%	139%	29%	22%
Observations	364	364	364	364
R-squared	0.864	0.915	0.587	0.871

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$.
Source: Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019.

3.3.3 Migrant stocks in the UK

Lastly, we analyse the impact of the referendum on immigrants stocks in the UK. In Table 11 we notice that the coefficient of the difference-in-difference is positive and non-significant in Column 1, where we do not add any control or fixed effect. When, from Column 2, we start to add the fixed effects the coefficient becomes significant and is robust to the inclusion of the controls. In Table 12 we break down the stock by respondents' characteristics. The coefficient of the difference-in-difference in the upper panel is positive and statistically significant in all the columns, suggesting that the Brexit referendum had a positive effect on the stocks of immigrants from EU countries. The relative average effect is 25%. New EU member States stock shows a positive and significant coefficient in all columns, with a relative effect ranging between 27% and 44%. On the other hand, the effects are not strong for the stock

of immigrants from EU14. In other words, this suggest that there has been no significant increase in the stock of EU14, but a significant one for the stock of immigrant from new EU member States in the UK.

To check if the estimated results could be interpreted as a positive impact of the referendum on the stock of EU immigrants, we run a placebo test in the pre-referendum period. We define the same time span as for the inflows, and set the pseudo-shock between the 31st of March 2013. The results are presented in Table A.4 in Appendix A. We find a positive and statistically significant coefficient in all columns, suggesting an ongoing increasing trend not directly correlated with the referendum. The possible explanation is that the positive impact of the referendum on the outflows was not sufficiently strong to inverse the trend and decrease the overall stock, and that the inflows remain larger than the outflows. This is confirmed by Table 1 and 2 where, if comparing the average EU total inflow and outflow in the post-referendum period, we can notice that the former shows a higher value than the latter. Thus, overall EU migrant stock increased post the referendum but that increase was much smaller to the increase witnessed until the referendum.

Table 11: Difference-in-difference estimates, Total migrant stock in the UK, (UK LFS, weighted)

	Total stock (log)			
	(1)	(2)	(3)	(4)
EU	0.0245	-1.924***	-1.924***	-1.924***
	(0.145)	(0.0333)	(0.0319)	(0.0325)
Post_ref	0.0924	0.0924***	-0.0194	0.174***
	(0.110)	(0.0138)	(0.0227)	(0.0429)
EU*post_ref	0.227	0.227***	0.227***	0.227***
	(0.206)	(0.0257)	(0.0246)	(0.0251)
GDPpc (log)			1.200	
			(0.767)	
Unemployment			-0.0234	
			(0.0156)	
Sub-region FE	No	Yes	Yes	Yes
Quarter FE	No	No	No	Yes
Observations	392	392	392	392
R-squared	0.0149	0.985	0.986	0.987

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. Unemployment and real GDP per capita are lagged of 4 quarters. **Source:** Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019.

Table 12: Difference-in-difference estimates, Migrant stock by groups, (UK LFS, weighted)

Total Migrant stocks (log)	(1) Total	(2) High_skilled	(3) Low_skilled	(4) Women	(5) Men	(6) Young	(7) Older
EU	-1.924***	-2.017***	-1.906***	-1.994***	-1.845***	-2.386***	-1.733***
	(0.0325)	(0.0444)	(0.0363)	(0.0356)	(0.0368)	(0.0441)	(0.0355)
Post_ref	0.174***	0.355***	0.0429	0.208***	0.131**	0.0665	0.295***
	(0.0429)	(0.0588)	(0.0481)	(0.0471)	(0.0487)	(0.0584)	(0.0470)
EU*post_ref	0.227***	0.245***	0.241***	0.181***	0.274***	0.271***	0.266***
	(0.0251)	(0.0343)	(0.0280)	(0.0275)	(0.0284)	(0.0340)	(0.0274)
Sub-region and quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU pre-ref.(thous)	2489.4	846.8	1642.6	1617.8	871.6	1320.9	1168.5
Relative effect	25%	28%	27%	20%	31%	31%	30%
Observations	392	392	392	392	392	392	392
R-squared	0.987	0.976	0.985	0.985	0.983	0.982	0.982
EU14 and non EU Migrant Stock	(1) Total	(2) High_skilled	(3) Low_skilled	(4) Women	(5) Men	(6) Young	(7) Older
EU14	1.222***	1.545***	1.010***	1.147***	1.318***	1.414***	1.064***
	(0.0244)	(0.0362)	(0.0310)	(0.0301)	(0.0290)	(0.0376)	(0.0288)
Post_ref	0.0450*	0.0810**	0.00997	0.0340	0.0538*	0.0424	0.0348
	(0.0237)	(0.0351)	(0.0301)	(0.0292)	(0.0281)	(0.0365)	(0.0280)
EU14*post_ref	0.0402	0.0343	0.0371	0.00673	0.0783**	0.120**	-0.0381
	(0.0291)	(0.0432)	(0.0369)	(0.0359)	(0.0345)	(0.0448)	(0.0343)
Sub-region and quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU14 pre-ref.(thous)	1146.3	518.9	627.5	610.3	536.0	579.2	567.2
Relative effect	4%	3%	4%	1%	8%	13%	- 4%
Observations	308	308	308	308	308	308	308
R-squared	0.992	0.981	0.990	0.989	0.989	0.983	0.989
EU_new and non EU Migrant Stock	(1) Total	(2) High_skilled	(3) Low_skilled	(4) Women	(5) Men	(6) Young	(7) Older
EU_new	-1.955***	-2.052***	-1.940***	-2.024***	-1.878***	-2.411***	-1.784***
	(0.0329)	(0.0457)	(0.0369)	(0.0364)	(0.0374)	(0.0458)	(0.0341)
Post_ref	0.175***	0.357***	0.0447	0.210***	0.131**	0.0619	0.303***
	(0.0442)	(0.0614)	(0.0496)	(0.0490)	(0.0503)	(0.0616)	(0.0459)
EU_new*post_ref	0.289***	0.315***	0.309***	0.239***	0.339***	0.321***	0.367***
	(0.0278)	(0.0385)	(0.0311)	(0.0308)	(0.0316)	(0.0386)	(0.0288)
Sub-region and quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU new pre-ref. (thous)	1343.1	328.0	1015.2	710.6	632.6	1038.6	304.5
Relative effect	33%	37%	36%	27%	40%	38%	44%
Observations	364	364	364	364	364	364	364
R-squared	0.986	0.972	0.985	0.984	0.982	0.981	0.982

Notes: * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK LFS, January 2013 - December 2019.

3.4 Robustness tests: Impact on UK migration

To check the robustness of our results so far, we run a number of alternative estimations. All tests are presented in the Appendix and largely confirm the results of the baseline analysis.

(i) Data on National Insurance Registration: First, we validate our results on the inflows by replicating the same analysis using data on National Insurance number (NINo). Appendix B describes the NINo data and displays the inflows based on that source of data as a further robustness check. Interestingly, we find results of similar magnitude suggesting a fall of about 28% in the immigration flows based on the NINo data post the referendum.

(ii) Alternative control group: In Appendix C we replicate the estimation on the total inflows and outflows using LTIM data by defining an alternative control group. We choose the sub-region "Other Europe", which includes the EFTA countries and all countries which geographically belongs to Europe but are not part of the EU. The results confirm our benchmark

estimations.

(iii) Different Definitions: In Appendix D we replicate the analysis by defining and classifying immigrants based on the information on the nationality, rather than country of birth. We first examine the impact of policy uncertainty on inflows using UK LFS data (Table D.8), followed by on migrant stocks using UK LFS data (Table D.9). Again these checks confirm the robustness of our previous results.

We also check the robustness of our definition of skill and employ an alternative definition of high and low-skilled immigrants, based on the age when the individual left formal education rather than on the qualification level in Table D.10. Similar to before we find negative impact of the referendum for both high and low-skilled immigration to the UK, but both groups are significant when using this alternative definition of skill. Also, using this alternative definition of skills to estimate the impact on the stock of migrants in the UK, produces robust results as shown in Table D.11.

(iv) Different Sample: We use an unbalanced panel for the UK LFS inflows in Table E.12 and find similar results to before. We re-calculate the inflows excluding the 2020 quarters of the UK LFS in Table E.13 and, also in this case, the results are consistent. Concerning the stocks, we replicate the analysis using unweighted sample (Table E.14.), and are able to confirm that the findings are not driven by using weights.

(v) Alternative Specification: We re-estimate all our regressions using robust standard errors corrected for heteroscedasticity. We show the main results as follow. In Table F.16 we estimate the regressions for the impact of referendum on inflows using LTIM data. In the upper panel we re-estimate the inflows regression, while in the lower panel the outflows regression. In Table F.17 we show the effects using UK LFS data. In the upper panel we check the robustness of the results on the inflows and in the lower panel we re-estimate the stocks regression. All the results using robust standard errors are consistent with our earlier results.

4 Was the inflow diverted to other EU countries?

4.1 Data and descriptive statistics

The results presented so far highlighted that the Brexit referendum has reduced immigration flows of EU immigrants to the UK and increased emigration of EU immigrants from the UK. In this section we investigate whether the uncertainty in UK policy increased the attractiveness of other EU countries as alternative destination where freedom of movement was unaffected.

To analyse the impact on the referendum on the EU countries we use the OECD International Migration Database, which provides information on the yearly migration inflows to OECD countries by immigrants' nationality from 2000 to 2018.[26] As possible destination

[26]The time span varies depending on the country. As the data are only available until 2018, the time period of the analysis on EU migration (2014-2018) is different from the analysis on UK migration (2013-2019). Also, data are only available yearly and not quarterly.

countries, we select the EU 28 countries. Data are not available for Bulgaria, Cyprus, Croatia, Ireland, Lithuania, Malta, and Romania. We integrate the data with information on immigration to Ireland from the national Population and Migration Estimates made available by the Irish Central Statistical Office. The Irish migration estimates do not report the exact nationality of immigrants, but allow us to distinguish between EU14 countries, new EU member states, and the rest of the world. Therefore, we organise the OECD data, which have information on 199 nationalities, as the Irish estimates. The final sample has three possible sub-regions of nationality and 21 possible destination countries. The unit of analysis is the migration inflow by sub-region of nationality and destination country. Immigrants with British nationality are excluded from the sample.[27] To allow the same number of time period before and after the referendum, the time span of our analysis goes from 2014 to 2018, and we exclude the year 2016.

In Table 13 we provide some basic descriptive statistics. In the upper panel we consider only the UK as possible destination, while in the lower panel we only consider the rest of EU countries. Consistently with the analysis on the UK data, the difference for the EU inflows to the UK between the pre and post-referendum period is negative, although non-statistically significant. We also find a negative sign for the inflow of non-EU immigrants. Concerning the rest of the EU countries, we find a negative, albeit small, difference for the inflows of EU immigrants, and a positive difference for non-EU immigrants. In both cases the difference is non-statistically significant. From this first descriptive evidence we do not find any significant change in the post-referendum period on the attractiveness of EU countries as destination for EU migrants.

[27]This is possible also with the Irish estimates, which report immigrants with British nationality as a separate category.

Table 13: Descriptive statistics, Immigration to EU versus the UK, (OECD data)

Destination: UK							
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
EU	170.6	98.9	156.3	135.5	191.9	29.8	-42.6
Non-EU	179.4	101.7	159.0	138.3	209.9	4.4	-28.6
Destination: EU countries							
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
EU	1416.2	19.02	1418.1	26.01	1414.3	19.9	-3.7
Non-EU	1817.7	322.8	1718.8	516.2	1916.5	83.6	197.7

Source: Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016. **Notes:** All statistics are expressed in thousands. The sample is based on 199 nationalities (this number varies depending on the destination) grouped in 3 sub-regions, in turn grouped by EU/non-EU. UK is excluded as possible nationality. In the second panel we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Lithuania, Malta, and Romania. Data for Ireland come from the Irish Central Statistics Office on Population and Migration Estimates, years 2014 - 2018 excluding 2016. The last column reports a t-test of mean difference. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. The sample is based on 3 sub-regions grouped by EU and non-EU and observed for 4 years.

4.2 Methodology: Impact on EU immigration

In this section we investigate whether the Brexit referendum increased the relative attractiveness of the rest of EU countries, where freedom of movement did not suffer any threat, for EU potential immigrants, by comparing EU to non-EU migration inflows before and after 2016.

First, we adopt a difference-in-difference strategy, similar to what we did to estimate the impact on the UK. We include EU immigrants in the treatment group and non-EU immigrants in the control group. As we are interested in estimating the effect of the referendum on the attractiveness of the rest of EU countries as possible destinations, we exclude the UK both as a possible destination and as possible nationality. We estimate the following equation:

$$Y_{idy} = \alpha_{id} + \beta_1 EU_i + \beta_2 Post\_ref_y + \beta_3 EU_i * Post\_ref_y + \beta_4 X_{dy} + \gamma_y + \theta_d + \delta_i + \epsilon_{iy} \quad (2)$$

where Y_{idy} is the log of the inflows of immigrants from sub-region i to destination d in year y; EU_i is a dummy that takes the value 1 if the sub-region i is in the European Union; $Post\_ref_y$ is a dummy that takes the value 1 if the year y is in the post-referendum period, and $Post\_ref_y * EU_{iy}$ is the interaction between these two dummies. β_3 is our main coefficient of interest and measures the impact of the referendum on the rest of EU destinations. We include GDP per capita in PPP (in log) and unemployment rate, both lagged one year to account for the effect of economic confounding factors at destination. We use data on GDP and unemployment rate from the World Bank. We also include year (γ_y), destination θ_d and

sub-region (δ_i) fixed effects. The period of analysis goes from 2014 to 2018, and we exclude the year 2016 of the referendum.[28]

Second, we adopt a triple difference approach to estimate the relative difference between the UK and other EU destinations. The main difference between difference-in-difference and triple difference is that the latter allows us to account for another dimension, in our case the destination (EU destinations or the UK). To be more specific, in the difference in difference above, we compare the difference between the outcome variable (immigration to EU destinations) for the treated group (EU migrants) relative to the control group (non-EU migrants) before and after the referendum. In addition, in order to examine the effect of the referendum on the EU relative to the UK as destination, we estimate the difference in immigration between the EU and the UK, between the treated and control groups before and after. Therefore, for this analysis we include the UK as an additional destination. We estimate the following equation:

$$\begin{aligned} Y_{idy} =& \alpha_{id} + \beta_1 EU_i + \beta_2 UK_d + \beta_3 Post\_ref_y + \beta_4 EU_i * Post\_ref_y + \\ & \beta_5 EU_i * UK_d * Post\_ref_y + \theta_d + \gamma_y + \delta_i + \epsilon_{cy} \end{aligned} \tag{3}$$

where Y_{idy} is the log of the inflow of immigrants from sub-region i to destination d in year y, EU_i is a dummy that takes the value 1 if the sub-region is in the European Union, UK_d a dummy that takes the value 1 if the destination country is the UK, $Post\_ref_y$ is a dummy that takes the value 1 if the year y is in the post-referendum period. γ_y, θ_d, and δ_i are respectively sub-region, destination, and year fixed effects. The main coefficients of interest are β_4, that gives us the impact of the Brexit referendum on European countries, and β_5 that gives us the impact of the referendum on the UK relative to other EU countries. The period of analysis is the same as above.

For both identification strategies, we check the sensitivity of our results to the inclusion/exclusion of Ireland as possible destination country. Ireland could plausibly be a substitute destination country to the UK for the EU immigrants once the referendum took place because of the geographical proximity to the UK and of the language.

In Figure 9 we display the inflows trend for EU and non-EU immigrants over time. In Figure 9*a* we represent only UK as destination country, in Figure 9*b* the rest of EU countries excluding the UK, and in Figure 9*c* we exclude Ireland and the UK. In none of the three sub-figures the pre-referendum trends look parallel. In Figure 9*b* and 9*c* we can detect a sharp increase in non-EU inflow in the year 2015, which coincide with the refugee crisis. On the other hand, the inflow of EU immigrants looks fairly stable over time, with no considerable differences between the pre and post-referendum period. Figure 9*a* confirms what we observed on the UK data, showing a sharp decrease of EU immigrants in the post-referendum period.[29] In Figure 10 we present the estimates of the yearly difference between EU and non-EU inflows. The difference is non-statistically significant in the sub-pictures focused on EU countries as possible destinations (*b* and *c*), while is slightly statistically

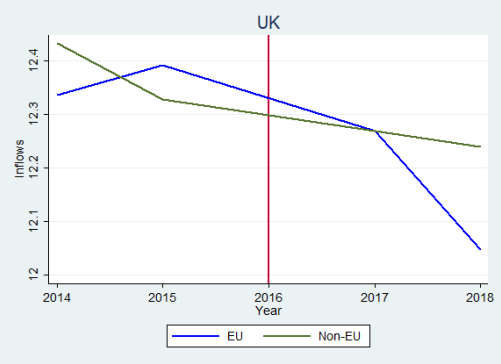
[28] Unlike previous analysis, we use annual data rather than quarter data.

[29] It important to note that the inflow data for the UK compiled by the OECD are annual and we only have data for 2014-2018 so is not exactly comparable to the ONS LTIM data on inflows to the UK

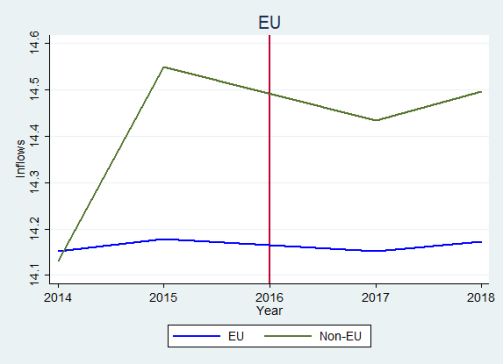
significant in 2014 for 10*a*, when we focus on the UK. If on the one hand, Figure 10 reassures us that the assumption of parallel trends can plausibly hold when considering the rest of EU as destination countries, on the other hand Figure 9 suggest caution in interpreting the results of our estimations, as choosing non-EU immigrants as the control group may not be the most appropriate choice as the refugees crisis might have changed the pattern of non-EU migration to Europe and data are not available by migration motive to exclude refugees from the control group.

Figure 9: Parallel trends of migration inflows (log) to the UK and the EU 2014-2018, (OECD data)

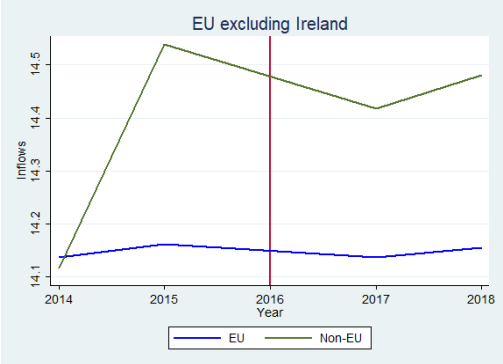
(a) UK



(b) EU countries



(c) EU countries (excluding Ireland)



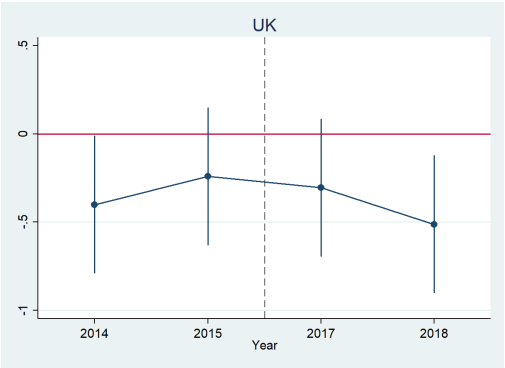
Source: Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016. Data for Ireland come from the Irish Central Statistics Office on Population and Migration Estimates, years 2014 - 2018 excluding 2016. **Notes:** The sample is based on 199 nationalities (this number varies depending on the destination) grouped in 3 sub-regions, in turn grouped by EU/non-EU. UK is excluded as possible nationality. In Figure *b* we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Lithuania, Malta, and Romania. The red line indicates the year when the referendum took place.

4.3 Empirical results: Impact on EU immigration

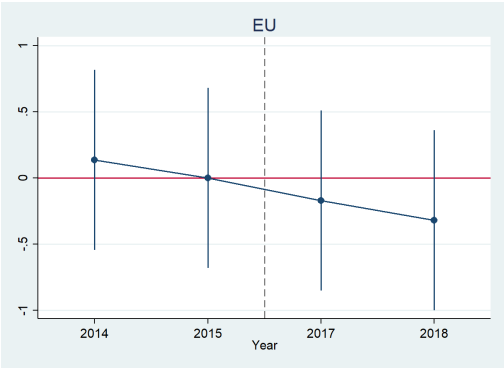
Table 14 presents the results of the difference-in-difference estimation. In Column 1 we do not include any control or fixed effect, in Column 2, 3, and 4 we add respectively year, nationality, ad destination fixed effects, in Column 5 and 6 we add the controls one by one. The magnitude of the coefficient of the double difference is robust to the inclusion of the different fixed effect and controls, and is never statistically significant. Also in Column 7,

Figure 10: Difference between EU vs non-EU trends of migration inflows (log) to the UK and the EU 2014-2018, (OECD data)

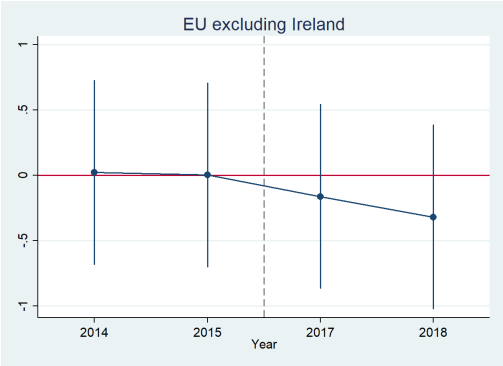
(a) UK



(b) EU countries



(c) EU countries (excluding Ireland)



Source: Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016.
Notes: The sample is based on 199 nationalities (this number varies depending on the destination) grouped in 3 sub-regions, in turn grouped by EU/non-EU. UK is excluded as possible nationality. In Figure *b* we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Lithuania, Malta, and Romania. Data for Ireland come from the Irish Central Statistics Office on Population and Migration Estimates, years 2014 - 2018. In Figure *c* Ireland is excluded as possible destination country.The graphs show the estimated difference in the inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the year 2016, indicated with the dash line. The incertitude of each point is asserted with a 95% confidence interval.

when we exclude Ireland as possible destination country, the coefficient is non-significant, though it slightly decrease in magnitude. This suggests that there was no significant change in the inflows of EU immigrants in the rest of EU countries and that the results are not particularly sensitive to the inclusion/exclusion of Ireland.

Table 15 summarises the results of the triple difference estimation. The Columns are organised as in Table 14. The coefficient of the difference-in-difference is not significant in all Columns, confirming the results of Table 14. Also the coefficient of the triple difference is never significant, suggesting that the referendum did not have a significant impact on the relative attractiveness of other EU countries as possible destinations for EU immigrants.

Table 14: Difference-in-difference estimates, Inflows to EU countries, (OECD data)

	Total inflows to EU countries (log)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EU	-1.055**	-1.055**	-1.000**	-1.000***	-1.000***	-1.000***	-1.081***
	(0.385)	(0.386)	(0.418)	(0.202)	(0.202)	(0.202)	(0.208)
Post_ref	0.571	0.543	0.543	0.543**	0.164	0.101	-0.798
	(0.444)	(0.515)	(0.516)	(0.249)	(0.401)	(0.407)	(0.732)
EU*post_ref	-0.315	-0.315	-0.315	-0.315	-0.315	-0.315	-0.253
	(0.544)	(0.546)	(0.547)	(0.265)	(0.264)	(0.264)	(0.273)
GDPpc (log)					2.091	1.429	7.054
					(1.729)	(1.894)	(4.411)
Unemployment						-0.0575	-0.0330
						(0.0669)	(0.0691)
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Nationality's sub-region FE	No	No	Yes	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes	Yes
Ireland included as destination	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	240	240	240	240	240	240	228
R-squared	0.0859	0.0862	0.0867	0.804	0.805	0.806	0.814

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. The sample is based on 3 sub-regions grouped by EU and non-EU and observed for 4 years. UK is excluded as possible nationality. In this table we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Lithuania, Malta, and Romania. Unemployment and real GDP per capita are lagged on one year. **Source:** Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016. Data for Ireland come from the Irish Central Statistics Office on Population and Migration Estimates, years 2014 - 2018 excluding 2016.

Table 15: Triple difference-in-difference, Inflows to EU countries versus the UK, (OECD data)

	Total inflows (Log)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EU	-1.039**	-1.039**	-0.988**	-0.988***	-0.988**	-0.988**	-1.065**
	(0.368)	(0.370)	(0.400)	(0.194)	(0.353)	(0.348)	(0.361)
UK	2.484***	2.484***	2.484***	1.104**	3.474***	3.811***	3.751***
	(0.706)	(0.708)	(0.710)	(0.435)	(0.663)	(0.664)	(0.673)
Post_ref	0.538	0.507	0.507	0.507**	0.191	0.408	0.339
	(0.425)	(0.493)	(0.494)	(0.239)	(0.440)	(0.441)	(0.456)
EU*post_ref	-0.298	-0.298	-0.298	-0.298	-0.300	-0.300	-0.241
	(0.524)	(0.526)	(0.527)	(0.255)	(0.465)	(0.459)	(0.476)
UK*EU*post_ref	-0.123	-0.123	-0.123	-0.123	-0.0877	-0.0798	-0.0725
	(1.222)	(1.227)	(1.229)	(0.595)	(1.086)	(1.071)	(1.085)
GDPpc (log)					1.762***	2.013***	2.257***
					(0.339)	(0.346)	(0.372)
Unemployment						0.0826**	0.0934**
						(0.0293)	(0.0302)
Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Nationality's sub-region FE	No	No	Yes	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes	Yes
Ireland included as destination	Yes	Yes	Yes	Yes	Yes	Yes	No
Observations	252	252	252	252	252	252	240
R-squared	0.143	0.143	0.144	0.815	0.337	0.358	0.372

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. The sample is based on 3 sub-regions grouped by EU and non-EU and observed for 4 years. UK is excluded both as possible nationality. In this table we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Lithuania, Malta, and Romania. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016. Data for Ireland come from the Irish Central Statistics Office on Population and Migration Estimates, years 2014 - 2018 excluding 2016.

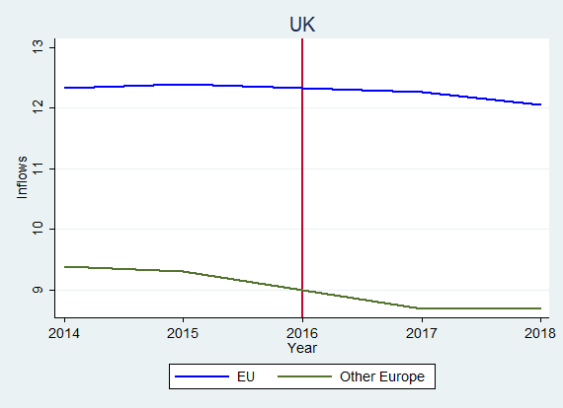
4.3.1 Alternative control group

So far, we did not find evidence that the Brexit referendum increased the inflow of EU immigrants from the UK to the rest of EU countries, nor an impact on the relative attractiveness of other EU countries. However, Figure 9 casts doubts on whether the parallel trend assumption can plausibly hold when defining the control group as non-EU immigrants.

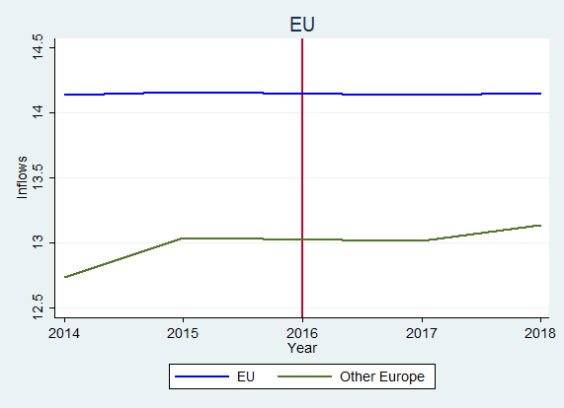
In this section we replicate the analysis by estimating the regressions including in the control group the sub-region "Other Europe". In this case we cannot include Ireland in the analysis, as the statistics on non-EU immigrants in Ireland only include "Rest of the World" as possible nationality sub-group. Notwithstanding this limitation, Figure 11 and 12 suggest that the crucial assumption of parallel trends is more likely to be satisfied with this alternative control group. Also in this case, we can notice that the inflow of EU immigrants to the rest of EU countries did not show any change in the post-referendum period. The results of the difference-in-difference (Table 16) and triple difference (17) estimations confirm the results of the previous analysis, when using all non-EU countries as control group. This confirms the baseline results we found using non-EU immigrants as control group.

Figure 11: Parallel trends of migration inflows (log) to the UK and the EU 2014-2018, (OECD data, alternative control group)

(a) UK



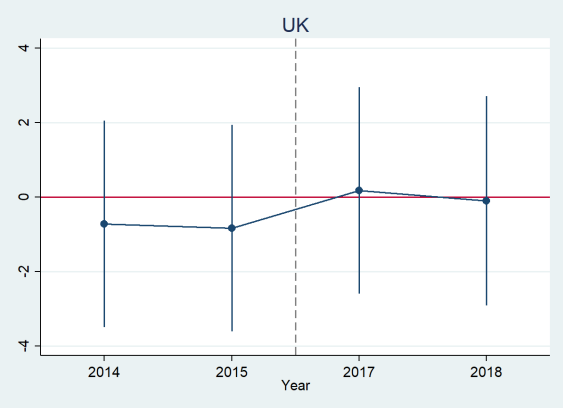
(b) Europe



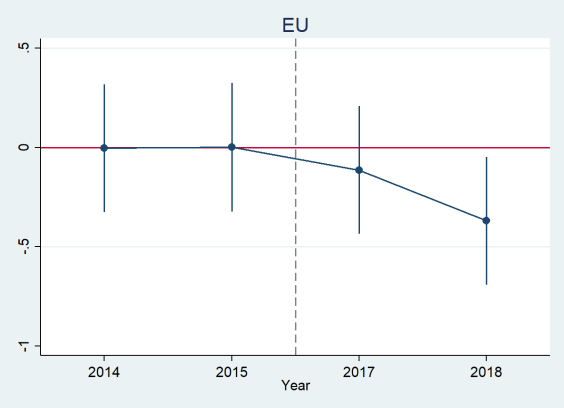
Source: Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016.
Notes: The sample is based on 199 nationalities (this number varies depending on the destination) grouped in 4 sub-regions, in turn grouped by EU/non-EU. UK is excluded as possible nationality. In Figure *b* we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Ireland, Lithuania, Malta, and Romania. The red line indicates the year when the referendum took place.

Figure 12: Difference between EU and Other Europe trends of migration inflows (log) to the UK and the EU, (OECD data)

(a) UK



(b) Europe



Source: Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016.
Notes: The sample is based on 199 nationalities (this number varies depending on the destination) grouped in 4 sub-regions, in turn grouped by EU/non-EU. UK is excluded as possible nationality. In Figure *b* we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Ireland, Lithuania, Malta, and Romania. The graphs show the estimated difference in the inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the year 2016, indicated with the dash line. The incertitude of each point is asserted with a 95% confidence interval.

Table 16: Difference-in-difference estimates: Alternative Control Group, (OECD data)

	Inflow from EU and other European countries (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
EU	-1.023**	-1.023**	0.139	0.138	0.221	0.223
	(0.393)	(0.393)	(0.386)	(0.204)	(0.282)	(0.282)
Post_ref	0.287	0.438	0.438	0.436*	0.213	0.282
	(0.492)	(0.540)	(0.466)	(0.247)	(0.670)	(0.672)
EU*post_ref	-0.303	-0.304	-0.303	-0.300	-0.310	-0.315
	(0.552)	(0.553)	(0.477)	(0.253)	(0.315)	(0.315)
GDP (log)					0.393	1.515
					(4.555)	(4.644)
Unemployment						0.0918
						(0.0760)
Year FE	No	Yes	Yes	Yes	Yes	Yes
Nationality's sub-region FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Observations	367	367	367	367	367	367
R-squared	0.0486	0.0519	0.299	0.813	0.801	0.802

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. The sample is based on 4 sub-regions grouped by EU and non-EU and observed for 4 years. UK is excluded as possible nationality. In this table we only consider EU countries as possible destinations. No data are available for Bulgaria, Cyprus, Croatia, Ireland, Lithuania, Malta, and Romania. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016.

Table 17: Triple difference-in-difference Inflows: Alternative Control Group, (OECD data)

	Inflow from EU and other European countries (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
EU	-0.925**	-0.925**	0.239	0.238	0.295	0.296
	(0.311)	(0.312)	(0.311)	(0.165)	(0.331)	(0.331)
UK	1.691**	1.689**	1.704***	-0.0716	2.468***	2.554***
	(0.527)	(0.528)	(0.453)	(0.305)	(0.503)	(0.509)
Post_ref	0.268	0.310	0.298	0.457**	0.0671	0.123
	(0.435)	(0.495)	(0.425)	(0.226)	(0.402)	(0.405)
EU*post_ref	-0.294	-0.294	-0.293	-0.285	-0.308	-0.310
	(0.490)	(0.491)	(0.421)	(0.224)	(0.411)	(0.411)
UK*EU*post_ref	1.138	1.138	0.846	0.747*	0.906	0.912
	(0.973)	(0.975)	(0.837)	(0.445)	(0.782)	(0.782)
GDP (log)					1.242***	1.325***
					(0.268)	(0.279)
Unemployment						0.0234
						(0.0219)
Year FE	No	Yes	Yes	Yes	Yes	Yes
Nationality's sub-region FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Observations	386	386	386	386	386	386
R-squared	0.0797	0.0821	0.329	0.418	0.451	0.453

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. The sample is based on 4 sub-regions grouped by EU and non-EU and observed for 4 years. UK is excluded as possible nationality. No data are available for Bulgaria, Cyprus, Croatia, Ireland, Lithuania, Malta, and Romania. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on OECD data on migration inflows by nationality, years 2014-2018 excluding 2016.

4.4 Robustness tests: Impact on EU migration

Similarly to what we did for the analysis on the UK, we run a number of alternative estimations to check the robustness of our results. All tests largely confirm the results of the baseline analysis and are organised as follows:

(i) Alternative Definition of Immigration: To ensure that our results are not driven by the choice to focus on nationality rather than country of birth, we replicate the analysis using data on immigration flows by country of destination and country of birth available from Eurostat. The main shortcoming of that data is that we have information on fewer countries if compared with the OECD data used in the main analysis. In particular there are no data on Germany and Poland and is not possible to integrate information for these two countries using the national statistics offices, as the latter only provide information based on immigrants' nationality. We present the analysis and results in Appendix G. Also in this case, we do not find evidence that the EU inflow was diverted to other EU countries, nor of a change in the relative attractiveness of other EU destinations. We also run the estimation with "Other Europe" as alternative control group in Table G.21, which confirm the results of the main estimations.

(ii) Analysis of Impact on EU migrant stocks: We complement the analysis on the in-

flows by investigating whether the referendum had an impact on the stocks of EU immigrants in EU countries for 2014-2018. We use data from the European Labour Force Survey (EU LFS), which is is the largest harmonised household survey in Europe and has detailed information on the main respondents' socioeconomic characteristics, including country of birth and nationality. However, the EU LFS survey does not record precise information on the individual's year of arrival, making it impossible to correctly estimate the yearly inflows. For this reason, we only use the EU LFS to analyse stocks at the time of the survey. Results, based on country of birth, are presented in Appendix H and do not find any impact of the referendum on the stocks of EU immigrants in EU countries as destinations, regardless of the individuals' socioeconomic characteristics. We also find a positive and statistically significant coefficient of the difference-in-difference when focus on UK only as possible destination (Table H.23), confirming the findings of section 3. In Table H.23 we also investigate the impact of the referendum on Ireland. Even in this case we do not find a significant impact. Using nationality as opposed to country of birth does not change the results, see Table H.25. The results are also robust to the definition of "Other Europe" as the alternative control group (Table H.28).

5 Conclusions

The outcome of the Brexit referendum resulted in huge uncertainty, for the following four years, in particular regarding immigration policies with respect to potential and current EU migrants in the UK. This paper examines the case of the Brexit referendum as a quasi-experimental setting to evaluate the causal impact of policy uncertainty on migration flows and stocks. More specifically, we study the direct impact on the UK migration as well as the potential indirect impact on the attractiveness of other EU destinations.

We use a difference-in-difference strategy as the referendum represents an exogenous shock that only affects migration between the EU and the UK, allowing us to compare EU migrants to non-EU migrants before and after the UK referendum of June 2016. First, we estimate the impact on UK migration. The results show that the uncertainty resulting from the referendum vote had reduced migration inflows from the EU, especially for work purpose. When examining the inflow by socioeconomic characteristics, we find that the effect is always negative and significant for all groups. Both inflows from EU14 and new EU member States have fallen by around 29 percent of the average size of the inflow pre-referendum. This suggests that, contrary to some expectations that the Brexit referendum could have lead to a surge in migration, as immigrants could have tried to establish legal residence in the UK before the freedom of movement was officially suspended (Portes, 2016), the uncertainty related to their future rights discouraged EU immigrants to move to the UK. Moreover, our findings show that the impact has been positive on the outflows, suggesting that the referendum encouraged outflows of EU immigrants from the UK. Also, the results particularly hold for those migrants whose main motive for moving initially to the UK was for work and the effect on the outflow was much higher for immigrants from new EU member States in the UK compared to those from EU14. Those results are robust to using different data sources.

When analysing the impact on the migrant stock in the UK, we find that the effect of the referendum was not sufficiently strong to reverse the ongoing increasing trend, and that the stocks of EU immigrants grew at around 25% compared to pre-referendum compared to more than 100% comparing 2013-2016 to 2010-13. Overall, despite the effects of the referendum on the inflows and outflows, inflows of EU immigrants continued to be greater than outflows resulting in a positive albeit smaller than previously increase in UK net migration.

Looking at the indirect effects of the referendum on migration to other European Union's states, and its impact on diverting the flow from the UK to alternative EU destinations, we do not find evidence of such an effect. We also do not find a significant impact of the referendum on the relative attractiveness of other EU destinations. The results are not particularly sensitive to the inclusion/exclusion of Ireland, a country that we believe could be a valid substitute destination, due to its close geographic proximity and English language.

An important implication of our results is that they highlight that policy uncertainty has negative impact on migration as uncertainty increases the difficulty in planning to move and/or to stay. However, it has to be seen whether post the UK exiting the EU, and the change in rules pertaining to EU migrant's freedom of movement and having the same immigration rules as non-EU, those trends of reduction in inflows and increase in outflows of EU migrants in the UK would persist.

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1 Appendix

A Placebo tests

Table A.1: Placebo test, inflows to the UK, (LTIM)

Total inflows from EU and non EU (log)	(1) all_reasons	(2) work_related	(3) family	(4) study
EU	-1.253***	-0.510***	-1.217***	-0.789***
	(0.0819)	(0.0883)	(0.104)	(0.108)
Post_shock	0.105	0.358**	-0.0169	-0.230*
	(0.101)	(0.108)	(0.128)	(0.132)
EU*post_shock	0.399***	0.432***	0.579***	0.0501
	(0.0632)	(0.0681)	(0.0802)	(0.0831)
Controls	Yes	Yes	Yes	Yes
Sub-region and quarter FE	Yes	Yes	Yes	Yes
Mean EU pre referendum	48.62	22.83	2.18	9.83
Relative effect	49%	54%	78%	5%
Observations	336	336	336	336
R-squared	0.936	0.953	0.844	0.889
	(1)	(2)	(3)	(4)
Inflows from EU14 and non EU (log)	all_reasons	work_related	family	study
EU14	2.125***	3.307***	0.652***	1.393***
	(0.0802)	(0.0846)	(0.117)	(0.129)
Post_ref	0.132	0.361***	-0.0844	-0.218
	(0.0955)	(0.101)	(0.140)	(0.154)
EU14*post_shock	0.292**	0.341***	0.523***	0.122
	(0.0955)	(0.101)	(0.140)	(0.154)
Controls	Yes	Yes	Yes	Yes
Sub-region and quarter FE	Yes	Yes	Yes	Yes
Mean EU14 pre referendum	81.75	39.83	4.66	25.5
Relative effect	33%	41%	69%	13%
Observations	264	264	264	264
R-squared	0.931	0.959	0.815	0.888
	(1)	(2)	(3)	(4)
Inflows from EU_new and non EU (log)	all_reasons	work_related	family	study
EU_new	-1.271***	-0.525***	-1.226***	-0.777***
	(0.0863)	(0.0925)	(0.105)	(0.113)
Post_shock	0.105	0.358**	-0.0210	-0.216
	(0.108)	(0.115)	(0.131)	(0.141)
EU_new*post_shock	0.434***	0.463***	0.597***	0.0262
	(0.0728)	(0.0780)	(0.0886)	(0.0953)
Controls	Yes	Yes	Yes	Yes
Sub-region and quarter FE	Yes	Yes	Yes	Yes
Mean EU_new pre referendum	37.58	17.16	1.36	4.61
Relative effect	54%	59%	82%	3%
Observations	312	312	312	312
R-squared	0.924	0.941	0.849	0.878

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are expressed in thousands. **Source:** Authors' calculations based on quarterly LTIM estimations, April 2010 - March 2016.

Table A.2: Placebo test, inflows to the UK, (UK LFS)

Total inflow from EU and non EU (log)	EU	EU14	EU new
EU	-1.251***	1.298***	-1.230***
	(0.181)	(0.220)	(0.187)
Post_shock	0.360*	0.356	0.291
	(0.208)	(0.234)	(0.217)
EU*post_shock	0.283*	0.420	0.237
	(0.146)	(0.272)	(0.163)
Controls	Yes	Yes	Yes
Sub-region and year FE	Yes	Yes	Yes
Mean EU pre referendum	16.13	18.66	15.04
Relative effect	33%	52%	27%
Observations	368	299	345
R-squared	0.709	0.633	0.692

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK LFS estimations, April 2010 - March 2016.

Table A.3: Placebo test, outflows from the UK, (LTIM)

	(1)	(2)	(3)	(4)
Total outflow from EU and non EU (log)	all_reasons	work_related	family	study
EU	1.962***	2.242***	0.0842	0.532***
	(0.155)	(0.184)	(0.157)	(0.131)
Post_shock	0.426	-0.0153	2.127***	0.00332
	(0.384)	(0.455)	(0.389)	(0.324)
EU*post_shock	0.0779	0.237*	-0.0370	0.00159
	(0.118)	(0.140)	(0.120)	(0.0995)
Controls	Yes	Yes	Yes	Yes
Sub-region and year FE	Yes	Yes	Yes	Yes
Mean EU pre referendum	15.58	7.42	0.96	3.71
Relative effect	8%	27%	-4%	1%
Observations	186	186	186	186
R-squared	0.863	0.821	0.838	0.608
	(1)	(2)	(3)	(4)
Outflows from EU14 and non EU (log)	all_reasons	work_related	family	study
EU14	1.479***	1.475***	0.839***	0.901***
	(0.189)	(0.226)	(0.168)	(0.165)
Post_shock	0.316	-0.0953	1.976***	0.0226
	(0.403)	(0.482)	(0.357)	(0.351)
EU14*post_shock	0.233	0.284	0.256	-0.0840
	(0.210)	(0.251)	(0.186)	(0.183)
Controls	Yes	Yes	Yes	Yes
Sub-region and year FE	Yes	Yes	Yes	Yes
Mean EU14 pre referendum	20.14	9	1.86	5.42
Relative effect	26%	33%	29%	-8%
Observations	145	145	145	145
R-squared	0.829	0.761	0.877	0.614
	(1)	(2)	(3)	(4)
Outflows from EU_new and non EU (log)	all_reasons	work_related	family	study
EU_new	1.994***	2.252***	0.144	0.515***
	(0.110)	(0.136)	(0.143)	(0.111)
Post_shock	-0.120	-0.123	-0.0845	0.00565
	(0.0930)	(0.115)	(0.121)	(0.0940)
EU_new*post_shock	0.0263	0.221**	-0.135	0.0301
	(0.0906)	(0.112)	(0.118)	(0.0915)
Controls	Yes	Yes	Yes	Yes
Sub-region and year FE	Yes	Yes	Yes	Yes
Mean EU_new pre referendum	13.71	6.76	0.58	3
Relative effect	3%	25%	- 13%	3%
Observations	169	169	169	169
R-squared	0.923	0.885	0.857	0.639

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are expressed in thousands. **Source:** Authors' calculations based on quarterly LTIM estimations, October 2012 - March 2016.

Table A.4: Placebo test, migrant stocks in the UK, (UK LFS, weighted)

Migrant stock (log)	EU + non EU	EU14 + non EU	EU new + non EU
EU	-2.494***	0.859***	-2.550***
	(0.238)	(0.128)	(0.240)
Post_shock	0.657**	0.782***	0.697**
	(0.292)	(0.152)	(0.300)
EU*post_shock	0.721***	0.385**	0.833***
	(0.184)	(0.152)	(0.203)
Controls	Yes	Yes	Yes
Sub-region and quarter FE	Yes	Yes	Yes
Mean EU pre referendum (thous)	276.4	506.1	199.9
Relative effect	105%	47%	130%
Observations	336	264	312
R-squared	0.681	0.875	0.675

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK LFS estimations, April 2010 - March 2016.

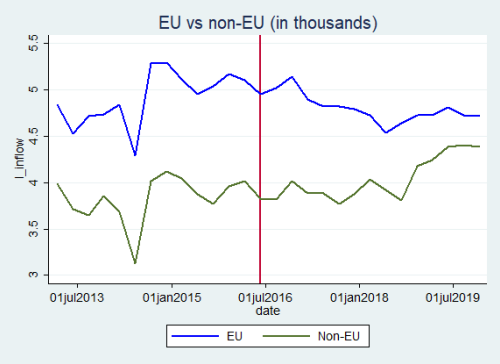
B Data on National Insurance Registrations

In this section we compare the results obtained from the LTIM estimations with the National Insurance number (NINo) data for adult overseas nationals, available from the ONS data collection. The two data sources are not directly comparable, as the NINo data only register foreigners who apply for a National Insurance Number and the date of application may differ from the arrival date. Also, NINo registrations are likely to include short-term migrants, while the LTIM statistics are especially targeted to estimate long-term migration inflows. Nonetheless, NINo registrations may highlight emerging changes in patterns of migration and be a useful source of comparison for our estimations.

Similarly to the LTIM, data are available quarterly and we can define the same time span going from March 2013 to December 2019, for a total of 28 points in time (14 before and 14 after the referendum). The quarterly version of the data does not report the country of citizenship, but it is possible to distinguish 14 macro-regions, as for the LTIM estimations.

Figure B.1 and B.2 provide evidence that the assumption of parallel trends can plausibly hold. We can also detect a decrease in the number of EU immigrants in the post-referendum period and an increase of non-EU immigrants.Table B.5 reports basic descriptive statistics on the inflow, distinguishing between EU and non-EU sub-region of citizenship, and between the period before and after the referendum. The difference is negative and slightly significant for EU countries, and positive and significant for non-EU countries, suggesting an inverse trend for the two groups. Table B.6 presents the results from the difference-in-difference estimation, which confirm the findings on the LTIM data.

Figure B.1: Parallel trends of inflows (log) to the UK, (NINo registrations data)



Source: Authors' calculations based on quarterly NINo registration data, January 2013 - December 2019 **Notes:** all statistics are expressed in thousands. The red line indicates the quarter when the referendum took place.

Figure B.2: Difference between EU vs non-EU trends of the inflows (log) to the UK, (NINo registrations data)

Source: Authors' calculations based on quarterly NINo registrations data, January 2013 - December 2019. **Notes:** All statistics are expressed in thousands. The graphs show the estimated difference in the inflows from EU countries relative to non-EU countries, without conditioning on controls and fixed effects. The baseline level is the quarter in which the Brexit referendum took place (June 2016, indicated with the dash line). The incertitude of each point is asserted with a 95% confidence interval.

Table B.5: Descriptive statistics of UK migration inflows, 2013-2019, (NINo registrations data).

	Total		Before		After		Difference
	mean	sd	mean	sd	mean	sd	
Inflow (EU)	130.66	30.80	140.38	37.15	120.95	19.66	-19.43*
Inflow (non-EU)	51.91	13.32	46.36	10.01	57.47	14.21	11.11**

Source: Authors' calculations based on quarterly NINo registrations data, January 2013 - December 2019 **Notes:** all statistics are expressed in thousands. The last column reports the results from a t-test of mean difference.* p < 0.10, ** p < 0.05, *** p < 0.001. The sample is based on 14 sub-region grouped by EU and non-EU and observed for 28 quarters.

Table B.6: Difference-in-difference estimates, Total Inflow to the UK, (NINo registrations data)

	(1)	(2)	(3)
	EU total	EU14	EU_new
EU	-0.518***	2.779***	-0.534***
	(0.0693)	(0.0392)	(0.0725)
Post_ref	0.288**	0.252***	0.304**
	(0.0917)	(0.0504)	(0.0975)
EU*post_ref	-0.196***	-0.290***	-0.165**
	(0.0535)	(0.0466)	(0.0612)
Sub-region FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Mean EU pre referendum	140.38	55.05	85.33
Relative effect	- 28%	- 25%	- 15%
Observations	392	308	364
R-squared	0.952	0.982	0.936

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are expressed in thousands. **Source:** Authors' calculations based on quarterly NINo registrations data, January 2013 - December 2019.

C Alternative control group

Table C.7: Difference-in-difference estimates, Total inflows and outflows, (LTIM, alternative control group)

	(1) Inflows	(2) Outflows
EU	1.945***	-1.496***
	(0.1428)	(0.1081)
Post_ref	-0.530	0.409*
	(0.3006)	(0.2277)
Treat_post	-0.321*	0.582***
	(0.1771)	(0.1341)
Sub-region FE	Yes	Yes
Quarter FE	Yes	Yes
Mean EU pre-referendum	266.36	84.04
Relative effect	-28%	79%
Observations	140	140
R-squared	0.903	0.957

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are expressed in thousands.
Source: Authors' calculations based on quarterly LTIM, January 2013 - December 2019.

D Different definitions

Table D.8: Difference-in-difference estimates, Inflows to the UK, (UK LFS, immigrants defined by nationality)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total inflow (log+1)	Total	High_skilled	Low_skilled	Women	Men	Young	Older	EU14	EU_new
EU	-1.360***	-1.002***	-0.827***	-1.030***	-0.775***	-1.138***	-0.562***	1.508***	-1.365***
	(0.132)	(0.147)	(0.144)	(0.136)	(0.141)	(0.142)	(0.146)	(0.151)	(0.138)
Post_ref	-1.334***	-0.844***	-1.273***	-1.129***	-1.098***	-1.175***	-0.839***	-1.359***	-1.308***
	(0.174)	(0.194)	(0.191)	(0.180)	(0.187)	(0.188)	(0.194)	(0.194)	(0.186)
EU*post_ref	-0.265**	-0.205*	-0.249**	-0.224**	-0.352**	-0.286**	-0.176	-0.293	-0.255**
	(0.102)	(0.113)	(0.111)	(0.105)	(0.109)	(0.110)	(0.113)	(0.179)	(0.117)
Sub-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of EU pre-ref.	76	24.43	51.57	38.14	37.86	60.50	15.50	33.78	42.21
Relative effect	- 23%	- 19%	- 22%	- 20%	- 30%	- 25%	- 26%	- 25%	- 23%
Observations	392	392	392	392	392	392	392	308	364
R-squared	0.785	0.660	0.730	0.707	0.696	0.739	0.517	0.717	0.756

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - June 2020.

Table D.9: Difference-in-difference estimates, Stock by group, (UK LFS, weighted, immigrants defined by nationality)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total stocks (log)	Total	High_skilled	Low_skilled	Women	Men	Young	Older	EU14	EU_new
EU	-2.059***	-2.042***	-2.113***	-2.245***	-1.892***	-2.094***	-2.111***	2.047***	-2.073***
	(0.0394)	(0.0558)	(0.0468)	(0.0419)	(0.0510)	(0.0510)	(0.0533)	(0.0351)	(0.0410)
Post_ref	0.105**	0.145*	0.0695	0.143**	0.0569	0.0458	0.217**	0.0499	0.0906
	(0.0521)	(0.0739)	(0.0620)	(0.0555)	(0.0675)	(0.0675)	(0.0705)	(0.0452)	(0.0551)
EU*post_ref	0.284***	0.286***	0.294***	0.292***	0.281***	0.270***	0.343***	0.198***	0.313***
	(0.0304)	(0.0431)	(0.0361)	(0.0324)	(0.0394)	(0.0394)	(0.0411)	(0.0419)	(0.0346)
Sub-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU pre-ref. (thous)	307.8	118.6	189.1	160.4	147.4	205.1	102.7	1058.0	426.5
Relative effect	33%	33%	34%	34%	32%	31%	41%	22%	37%
Observations	392	392	392	392	392	392	392	308	364
R-squared	0.986	0.972	0.982	0.985	0.976	0.979	0.972	0.987	0.983

Notes: * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - December 2019.

Table D.10: Difference-in-difference estimates, Inflows to the UK by skills, (UK LFS, alternative definition)

	Inflows to the UK (log)	
	(1)	(2)
	High_skilled	Low_skilled
EU	-0.756***	-0.708***
	(0.206)	(0.208)
Post_ref	-0.799***	-1.330***
	(0.219)	(0.222)
EU*post_ref	-0.477***	-0.256**
	(0.119)	(0.121)
Sub-region FE	Yes	Yes
Quarter FE	Yes	Yes
Observations	392	392
R-squared	0.610	0.677

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - June 2020.

Table D.11: Difference-in-difference estimates, Stocks of immigrants in the UK by skills, (UK LFS, alternative definition)

	Stocks the UK (log)	
	(1)	(2)
	High_skilled	Low_skilled
EU	-2.320***	-1.798***
	(0.0460)	(0.0366)
Post_ref	0.358***	0.0308
	(0.0609)	(0.0484)
EU*post_ref	0.239***	0.259***
	(0.0355)	(0.0282)
Sub-region FE	Yes	Yes
Quarter FE	Yes	Yes
Observations	392	392
R-squared	0.610	0.677

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - December 2019.

E Different samples

Table E.12: Difference-in-difference estimates, Inflow to the UK by group, unbalanced panel, (UK LFS)

	Inflows to the UK (log)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	High_skilled	Low_skilled	Women	Men	Young	Older
EU	1.936***	1.689***	1.409***	1.537***	1.676***	1.872***	0.857***
	(0.124)	(0.131)	(0.121)	(0.132)	(0.106)	(0.121)	(0.169)
Post_ref	0.0361	0.0997	0.0594	0.195	0.0186	0.0951	-0.136
	(0.129)	(0.134)	(0.138)	(0.136)	(0.125)	(0.128)	(0.127)
EU*post_ref	-0.474***	-0.385**	-0.573***	-0.362**	-0.474***	-0.532***	-0.233*
	(0.116)	(0.124)	(0.118)	(0.114)	(0.105)	(0.117)	(0.126)
Sub-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	357	330	273	328	306	345	217
R-squared	0.654	0.566	0.679	0.607	0.652	0.632	0.408

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on UK-LFS, January 2013 - June 2020.

Table E.13: Difference-in-difference estimates, Total inflows, (UK LFS, no 2020)

	(1)	(2)	(3)
	Total	EU14	EU_new
EU	-1.337***	1.492***	-1.351***
	(0.132)	(0.151)	(0.138)
Post_ref	-1.742***	-1.802***	-1.679***
	(0.174)	(0.195)	(0.185)
EU*post_ref	-0.236**	-0.319*	-0.208*
	(0.102)	(0.180)	(0.116)
Sub-region FE	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes
Mean EU pre-referendum	58.83	21.16	32.66
Relative effect	-21%	-27%	-19%
Observations	392	308	364
R-squared	0.798	0.743	0.773

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. All statistics are expressed in thousands. **Source:** Authors' calculations based on quarterly UK LFS, January 2013 - December 2019.

Table E.14: Descriptive statistics stocks of immigrants 2013-2019, (UK LFS, unweighted)

	Total		Before		After		Difference
	(1)		(2)		(3)		(4)
	mean	**sd**	**mean**	**sd**	**mean**	**sd**	**(3-2)**
Total							
EU	3521.04	215.55	3404.14	231.93	3637.93	115.23	233.8***
Non-EU	6015.86	328.91	6244.29	190.79	5787.43	275.48	-456.9***
High-skilled							
EU	1202.25	121.17	1114.50	112.58	1290.00	35.1	175.5***
Non-EU	2416.07	58.83	2417.71	39.45	2414.43	75.01	-3.286
Low-skilled							
EU	2318.79	121.32	2289.64	123.59	2347.93	116.03	58.29
Non-EU	3599.79	295.98	3826.57	158.92	3373.00	214.29	-453.6***
Age 16-39							
EU	2105.93	150.59	2065.00	161.55	2146.86	131.87	81.86
Non-EU	2693.71	252.49	2892.07	158.52	2495.36	150.13	-396.7***
Age 40-67							
EU	1415.11	103.83	1339.14	84.56	1491.07	53.02	151.9***
Non-EU	3322.14	115.72	3352.21	79.37	3292.07	139.87	-60.14
Women							
EU	1951.25	103.75	1901.14	111.76	2001.36	66.76	100.2***
Non-EU	3261.61	160.90	3361.50	111.84	3161.71	140.61	-199.8***
Men							
EU	1569.79	117.37	1503.00	122.49	1636.57	63.27	133.6***
Non-EU	2754.25	173.29	2882.79	82.84	2625.71	141.15	-257.1***

Source: Authors' calculations based on quarterly UK LFS, January 2013 - December 2019.
Notes: The last column reports the results of a t-test of mean difference. * p < 0:10, ** p < 0:05, *** p < 0:001. The sample is based on 14 sub-region grouped by EU and non-EU and observed for 28 quarters.

Table E.15: Difference-in-difference estimates, Stock by group, (UK LFS, unweighted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total stocks (log)	Total	High_skilled	Low_skilled	Women	Men	Young	Older	EU14	EU_new
EU	-1.817***	-1.888***	-1.788***	-1.873***	-1.718***	-2.255***	-1.644***	1.261***	-1.853***
	(0.0325)	(0.0412)	(0.0363)	(0.0341)	(0.0363)	(0.0420)	(0.0364)	(0.0241)	(0.0325)
Post_ref	-0.0846*	0.0880	-0.200***	-0.0499	-0.127**	-0.175**	-0.00343	-0.117***	-0.0854*
	(0.0430)	(0.0545)	(0.0480)	(0.0451)	(0.0480)	(0.0556)	(0.0481)	(0.0310)	(0.0436)
EU*post_ref	0.259***	0.278***	0.263***	0.205***	0.317***	0.289***	0.296***	0.0392	0.333***
	(0.0251)	(0.0318)	(0.0280)	(0.0263)	(0.0280)	(0.0324)	(0.0281)	(0.0288)	(0.0274)
Sub-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean EU pre-ref.	3404.14	1114.5	2289.64	1901.14	1503	2065	1139.14	1597.21	1806.93
Relative effect	29%	32%	30%	23%	37%	33%	34%	4%	39%
Observations	392	392	392	392	392	392	392	308	364
R-squared	0.987	0.978	0.985	0.986	0.983	0.984	0.981	0.993	0.986

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - December 2019.

F Alternative specifications

Table F.16: Difference-in-difference estimates, robust standard errors, (LTIM)

	Total Inflows to the UK			
	(1)	(2)	(3)	(4)
	all_reasons	work_related	family	study
EU	-0.733***	-0.382***	-0.916***	-0.724***
	(0.106)	(0.106)	(0.107)	(0.126)
Post_ref	0.0877	0.523**	0.0703	-0.105
	(0.206)	(0.166)	(0.162)	(0.165)
EU*post_ref	-0.333***	-0.415***	0.149	0.175**
	(0.0994)	(0.0805)	(0.102)	(0.0810)
Sub-region FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Observations	392	392	392	392
R-squared	0.877	0.935	0.768	0.889
	Total Outflows from the UK			
	(1)	(2)	(3)	(4)
	all_reasons	work_related	family	study
EU	1.897***	2.174***	0.505***	0.170
	(0.116)	(0.101)	(0.0856)	(0.112)
Post_ref	0.0415	-0.125	-0.463***	-0.366**
	(0.139)	(0.133)	(0.105)	(0.131)
EU*post_ref	0.702***	0.714***	0.0758	0.110
	(0.0698)	(0.0751)	(0.0715)	(0.0748)
Sub-region FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Observations	392	392	392	392
R-squared	0.929	0.913	0.579	0.870

Notes: Standard errors corrected for heteroscedasticity in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly LTIM estimations, January 2013 - December 2019.

Table F.17: Difference-in-difference estimates, robust standard errors, (UK LFS)

				Inflows			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	High_skilled	Low_skilled	Women	Men	Young	Older
EU	1.893***	1.671***	1.775***	1.650***	1.838***	1.853***	1.345***
	(0.111)	(0.122)	(0.130)	(0.130)	(0.124)	(0.113)	(0.157)
Post_ref	-1.194***	-0.902***	-0.837***	-0.983***	-0.915***	-1.062***	-0.603**
	(0.251)	(0.241)	(0.208)	(0.228)	(0.241)	(0.240)	(0.199)
EU*post_ref	-0.311**	-0.186	-0.469***	-0.312**	-0.353**	-0.329**	-0.257**
	(0.107)	(0.113)	(0.105)	(0.106)	(0.108)	(0.110)	(0.109)
Sub-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	392	392	392	392	392	392	392
R-squared	0.749	0.652	0.717	0.692	0.678	0.715	0.516
				Stocks			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	High_skilled	Low_skilled	Women	Men	Young	Older
EU	-1.817***	-1.888***	-1.788***	-1.873***	-1.718***	-2.255***	-1.644***
	(0.0342)	(0.0591)	(0.0369)	(0.0361)	(0.0410)	(0.0480)	(0.0378)
Post_ref	-0.0846*	0.0880	-0.200***	-0.0499	-0.127**	-0.175**	-0.00343
	(0.0472)	(0.0623)	(0.0571)	(0.0527)	(0.0534)	(0.0616)	(0.0557)
EU*post_ref	0.259***	0.278***	0.263***	0.205***	0.317***	0.289***	0.296***
	(0.0336)	(0.0405)	(0.0362)	(0.0336)	(0.0368)	(0.0408)	(0.0362)
Sub-region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	392	392	392	392	392	392	392
R-squared	0.987	0.978	0.985	0.986	0.983	0.984	0.981

Notes: Standard errors corrected for heteroscedasticity in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. **Source:** Authors' calculations based on quarterly UK-LFS, January 2013 - June 2020 for the inflows, January 2013 - December 2019 for the stocks.

G Eurostat data

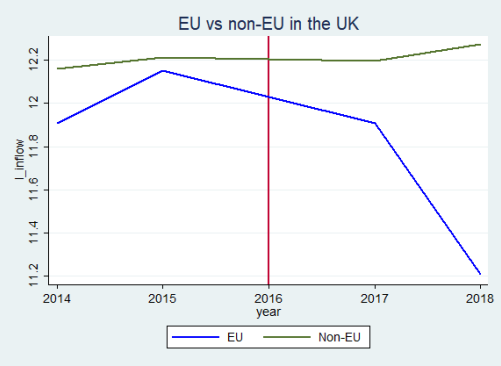
In this section we use data on immigration flows by country of destination and country of birth available from Eurostat. As we are only interested in migration from EU countries other than the UK, we exclude UK as country of birth. Data on immigrants' country of birth are missing for Cyprus, Germany, Greece, Ireland, Malta, Portugal and Poland. Data are available yearly from 2008 to 2018. To allow an equal number of years before and after the referendum, we restrict the period of analysis between 2014 and 2018, and exclude the year 2016. The results are consistent with the analysis on the OECD data, suggesting that there was no spillover effect on other EU countries.

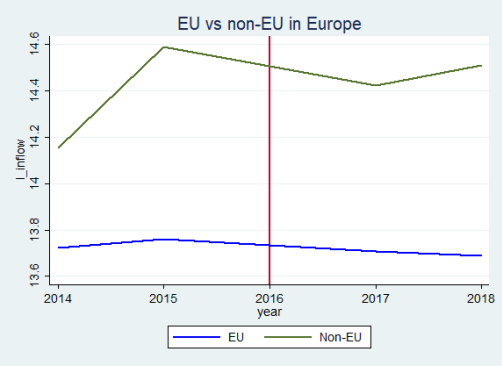
Table G.18: Descriptive statistics, Immigration to EU vs the UK 2014-2018, (Eurostat data)

	Destination: UK						
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
EU	140.0	48.2	168.9	29.1	111.1	52.8	-57.8
Non-EU	204.2	11.4	202.1	15.8	206.2	1.1	4.2
	Destination: Europe						
	Total		Before		After		Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mean	sd	mean	sd	mean	sd	(5-3)
EU	491.3	6.0	486.7	2.1	495.8	4.7	9.1
Non-EU	997.7	231.7	809.7	92.3	1185.6	105.9	375.9*

Source: Authors' calculations based on Eurostat immigration inflows data, years 2014-2018 excluding 2016. **Notes:** All statistics are expressed in thousands. In this table we use the country of birth to determine migrants' origin. UK is included as country of birth when we consider European destinations. As not all countries report the exact migrants' country of birth, in the second panel Cyprus, Germany, Greece, Poland, and Portugal are not included as destinations. The last column reports the results from a t-test of mean difference. *p $<$ 0.10, **p $<$ 0.05, ***p $<$ 0.001.The sample is based on 255 countries of birth grouped by EU and non-EU and observed for 4 years.

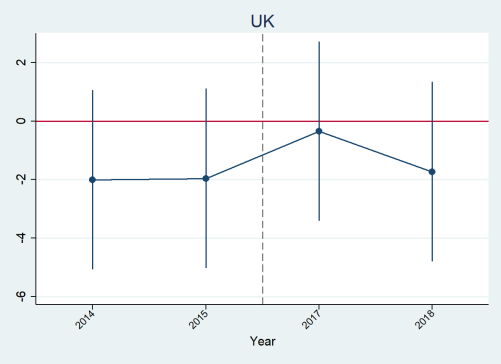
Figure G.3: Parallel trends of (log) migration inflows to the UK and the EU, (Eurostat data)

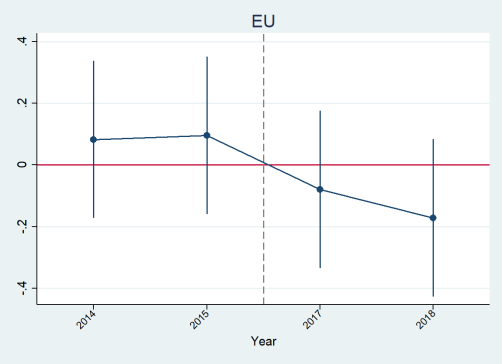




Source: Authors' calculations based on Eurostat immigration inflows data, years 2014-2018 excluding 2016. **Notes:** In this figure we use the country of birth to determine migrants' origin. UK is excluded as country of birth when we consider Europe as destination. As not all countries report the exact migrants' country of birth, in sub-figure *b* Cyprus, Germany, Greece, Ireland, Poland, and Portugal are not included as destinations. The red line indicates the year when the referendum took place.

Figure G.4: Differences in trends of migration inflows to the UK and the EU, (Eurostat data)





Source: Authors' calculations based on Eurostat immigration inflows data, years 2014-2018 excluding 2016. **Notes:** In this figure we use the country of birth to determine migrants' origin. UK is excluded as country of birth when we consider Europe as destination. As not all countries report the exact migrants' country of birth, in sub-figure *b* Cyprus, Germany, Greece, Ireland, Poland, and Portugal are not included as destinations. The red line indicates the year when the referendum took place. The baseline level is the year 2016, indicated with the dash line. The incertitude of each point is asserted with a 95% confidence interval.

Table G.19: Difference-in-difference estimates, Inflows to EU countries, (Eurostat data)

	Inflow to EU countries (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
EU	-0.425	-0.425	-0.425***	-0.425***	-0.425***	-0.453***
	(0.317)	(0.318)	(0.114)	(0.114)	(0.113)	(0.116)
Post_ref	0.377	0.547	0.547***	0.381	0.274	-0.0628
	(0.317)	(0.389)	(0.139)	(0.260)	(0.268)	(0.377)
EU*post_ref	-0.247	-0.247	-0.247	-0.247	-0.247	-0.250
	(0.448)	(0.450)	(0.161)	(0.161)	(0.160)	(0.164)
GDPpc (log)				0.870	0.217	2.285
				(1.150)	(1.224)	(2.020)
Unemployment					-0.0642	-0.0594
					(0.0423)	(0.0430)
Sub-region of origin and year FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Ireland included as destination	Yes	Yes	Yes	Yes	Yes	No
Observations	208	208	208	208	208	200
R-squared	0.0358	0.0390	0.893	0.893	0.894	0.897

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. The sample is based on 215 countries of birth grouped by EU/non-EU countries and 23 possible destination countries.UK is excluded as country of birth when we consider other EU countries as destinations. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on Eurostat data on immigration by country of citizenship, years 2014-2018 excluding 2016.

Table G.20: Triple difference-in-difference, Inflows to EU countries vs the UK, (Eurostat data)

	Inflow to EU countries (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
EU (origin)	-0.412	-0.412	-0.412***	-0.412	-0.412	-0.438
	(0.307)	(0.308)	(0.110)	(0.269)	(0.268)	(0.277)
UK (destination)	2.786***	2.786***	1.605***	3.126***	3.245***	3.197***
	(0.663)	(0.665)	(0.310)	(0.610)	(0.611)	(0.621)
Post_ref	0.368	0.530	0.530***	0.185	0.287	0.299
	(0.307)	(0.377)	(0.135)	(0.333)	(0.336)	(0.347)
EU*post_ref	-0.250	-0.250	-0.250	-0.251	-0.251	-0.254
	(0.436)	(0.438)	(0.157)	(0.383)	(0.381)	(0.394)
UK*EU*post_ref	0.00943	0.00943	0.00943	0.0469	0.0443	0.0513
	(1.326)	(1.330)	(0.476)	(1.163)	(1.157)	(1.174)
GDPpc (log)				1.825***	1.985***	2.101***
				(0.265)	(0.279)	(0.299)
Unemployment					0.0368*	0.0395*
					(0.0206)	(0.0211)
Sub-region of origin and year FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Ireland included as destination	Yes	Yes	Yes	Yes	Yes	No
Observations	216	216	216	216	216	208
R-squared	0.130	0.132	0.902	0.343	0.353	0.359

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. The sample is based on 215 countries of birth grouped by EU/non-EU countries and 23 possible destination countries.UK is excluded as country of birth when we consider other EU countries as destinations. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on Eurostat data on immigration by country of citizenship, years 2014-2018 excluding 2016.

Table G.21: Difference-in-difference estimates, Inflows to EU countries, Alternative control group (Eurostat data)

	Inflow to EU countries (log)
	(1)
EU	0.268
	(0.322)
Post_ref	0.539
	(0.391)
EU*post_ref	-0.318
	(0.400)
Sub-region of origin and year FE	Yes
Destination country FE	Yes
Observations	400
R-squared	0.623

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. The sample is based on 215 countries of birth grouped by EU/Other Europe countries and 23 possible destination countries.UK is excluded as country of birth when we consider other EU countries as destinations. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on Eurostat data on immigration by country of citizenship, years 2014-2018 excluding 2016.

H EU LFS data on migrant stocks

In this Annex we are using the yearly European Labour Force Survey (EU LFS) as data source. The EU LFS, with about 1.8 millions interviews by quarter, is the largest harmonized household survey in Europe and includes all people that are, or intend to be, resident in the country of reference for at least one year. The EU LFS covers 33 countries, including the EU 28 countries, the 3 EFTA countries (Iceland, Norway, Switzerland), North Macedonia, and Turkey. Total coverage for EU 28 has been achieved since 2002. For our analysis we only consider the sample of the EU 28 countries and use yearly data from 2013 to 2019.

Even though the main focus of the survey is on the labour market, it contains detailed information on the main respondents' demographic characteristics and records the respondents' country of birth and nationality. Similarly to the UK LFS, it does not report the exact country but the sub-region of birth. Although the classification is not perfectly harmonized, we can distinguish between EU and non-EU immigrants for all countries. For the majority of countries, the sub-regions overlap with the one in the UK LFS. The only differences is that in the EU LFS we find 3 EU sub-regions (EU14, EU 8, and EU 4[30]) rather than 4 (in the UK LFS we have EU14, EU 8, EU 2, and other European Union). A drawback is that we can't exclude British from the sample of immigrants, thus our EU inflows estimations to other European countries will be overestimated.

The survey is conducted by the national statistical offices of each country. The majority of countries has a rotating panel system where respondents are surveyed up to 8 times before exiting the sample. Similarly to the UK LFS, the EU LFS provides individual yearly weights which indicate of how many persons the individual is representative. Also in this case we use the weights to analyse the stocks.[31]

We replicate the analysis on the stocks by estimating a difference-in-difference and a triple difference regression. We account for the heterogeneity of the respondents' by defining different socioeconomic groups, in line with what we did on UK data. In the presented analysis we consider high-skilled all individuals with a university degree.

[30] Bulgaria, Romania, Cyprus, and Malta.

[31] To get weights that are consistent across datasets, we multiply the variable $COEFF$ by 1000. We use the resulting weights as probability weights.

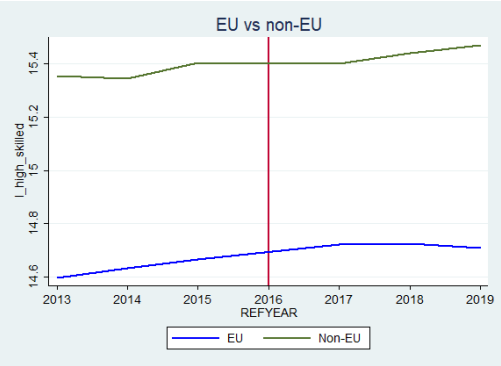
Table H.22: Difference-in-difference estimates, Migrant stocks in the EU countries, (EU LFS data)

	Migrant Stocks (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
EU	1.819***	1.819***	1.316*	3.144***	3.144***	3.144***
	(0.260)	(0.261)	(0.753)	(0.489)	(0.489)	(0.489)
Post_ref	0.234	0.384	0.384	0.384**	0.216	0.213
	(0.176)	(0.280)	(0.259)	(0.158)	(0.307)	(0.308)
EU*post_ref	-0.0401	-0.0401	-0.0401	-0.0401	-0.0392	-0.0396
	(0.368)	(0.369)	(0.341)	(0.207)	(0.207)	(0.207)
GDPpc (log)					0.617	0.553
					(0.969)	(1.066)
Unemployment						-0.00492
						(0.0342)
Year FE	No	Yes	Yes	Yes	Yes	Yes
Sub-region of origin FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Observations	1662	1662	1662	1662	1662	1662
R-squared	0.0556	0.0563	0.202	0.710	0.710	0.710

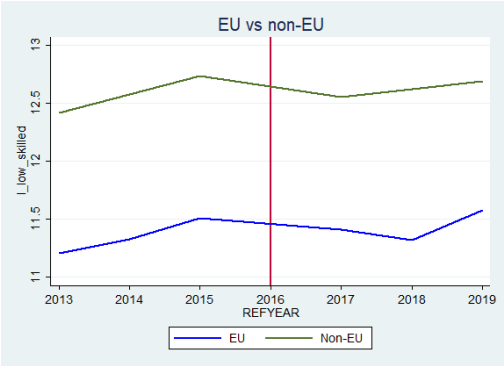
Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.

Figure H.5: Parallel trends of migrant stocks (log) to the EU 2014-2018, (EU LFS)

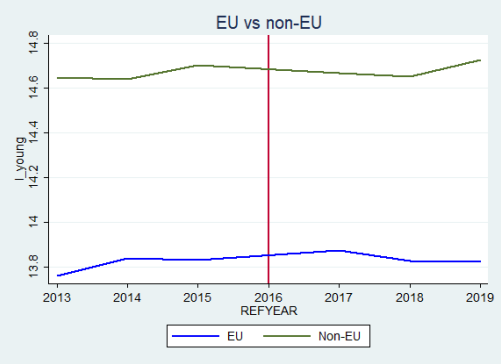
(a) High-skilled



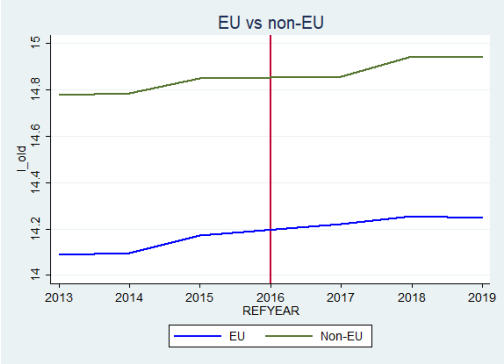
(b) Low-skilled



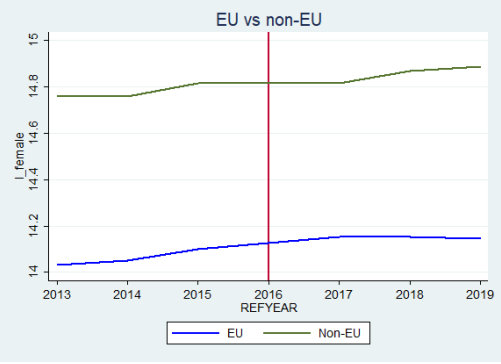
(c) Age 16-39



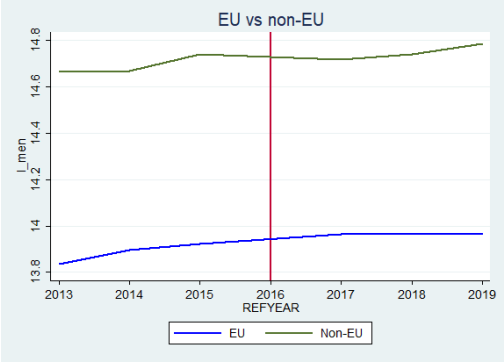
(d) Age 40-67



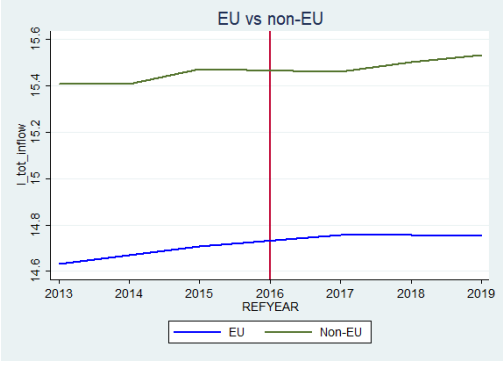
(e) Women



(f) Men



(g) Total



Source: Authors' calculations based on EU LFS yearly data, years 2013-2019. **Notes:** All statistics are weighted using the weights provided in the survey. The red line indicates the year when the referendum took place.

Table H.23: Difference-in-difference estimations, Migrant stocks by group in the EU countries, (EU LFS data)

	Migrant Stocks (log)					
	High-skilled	Low-skilled	Women	Men	Younger	Older
EU	3.123***	3.794***	3.498***	3.194***	2.935***	3.357***
	(0.488)	(0.537)	(0.493)	(0.498)	(0.498)	(0.497)
Post_ref	0.213	0.190	0.102	0.319	0.155	0.296
	(0.308)	(0.338)	(0.311)	(0.314)	(0.314)	(0.313)
EU*post_ref	-0.0479	0.157	0.0418	-0.0998	0.153	-0.0884
	(0.207)	(0.228)	(0.209)	(0.211)	(0.211)	(0.211)
GDPpc (log)	0.590	1.404	0.600	0.125	0.0557	0.861
	(1.064)	(1.171)	(1.075)	(1.086)	(1.087)	(1.084)
Unemployment	-0.00153	0.0513	-0.00538	-0.0284	-0.0164	0.0279
	(0.0341)	(0.0376)	(0.0345)	(0.0348)	(0.0349)	(0.0348)
Sub-region of origin and year FE	Yes	Yes	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1662	1662	1662	1662	1662	1662
R-squared	0.710	0.684	0.733	0.692	0.708	0.727

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.

Table H.24: Difference-in-difference estimates, Migrant stocks in the EU, the UK, and Ireland, (EU LFS)

	Stocks (log)		
	All destinations	Only UK	Only Ireland
EU	3.144***	1.924***	3.591***
	(0.489)	(0.131)	(0.129)
Post_ref	0.213	0.890	-0.302
	(0.308)	(1.432)	(0.356)
EU*post_ref	-0.0396	0.324**	-0.0635
	(0.207)	(0.110)	(0.108)
GDPpc (log)	0.553	6.556	2.653
	(1.066)	(15.01)	(2.255)
Unemployment	-0.00492	0.543	0.0829
	(0.0342)	(1.159)	(0.105)
Sub-region of origin and year FE	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes
Observations	1662	84	94
R-squared	0.710	0.973	0.985

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.

Table H.25: Difference-in-difference estimates, Migrant stocks in the EU, the UK, and Ireland, (EU LFS, immigrants defined by nationality)

	Stocks (log)		
	All destinations	Only UK	Only Ireland
EU	3.545***	2.345***	3.823***
	(0.744)	(0.146)	(0.180)
Post_ref	0.0237	0.0183	3.467
	(0.247)	(0.100)	(2.720)
EU*post_ref	-0.0351	0.292**	-0.0418
	(0.377)	(0.122)	(0.150)
GDPpc (log)	4.549***	-2.346	-14.32
	(0.237)	(1.518)	(11.95)
Unemployment	0.202***	-0.107	-0.544
	(0.0159)	(0.0748)	(0.449)
Sub-region of origin and year FE	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes
Observations	1662	56	56
R-squared	0.710	0.973	0.985

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.

Table H.26: Triple difference-in-difference, Migrant stocks in the EU countries vs those in the UK, (EU LFS)

	Migrant Stocks (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
EU (origin)	1.782***	1.782***	1.264*	3.099***	3.098***	3.099***
	(0.249)	(0.249)	(0.736)	(0.481)	(0.481)	(0.481)
UK (destination)	3.823***	3.823***	4.035***	2.327***	2.441***	2.430***
	(0.365)	(0.365)	(0.339)	(0.278)	(0.324)	(0.329)
Post_ref	0.225	0.371	0.371	0.371**	0.196	0.191
	(0.168)	(0.268)	(0.248)	(0.152)	(0.297)	(0.298)
EU*post_ref	-0.00222	-0.00222	0.00929	0.00152	0.00166	0.00123
	(0.356)	(0.356)	(0.330)	(0.202)	(0.202)	(0.202)
UK*EU*post_ref	-0.454	-0.454	-0.707	-0.536	-0.521	-0.521
	(1.112)	(1.113)	(1.032)	(0.632)	(0.633)	(0.633)
GDPpc (log)					0.653	0.572
					(0.948)	(1.045)
Unemployment						-0.00620
						(0.0336)
Year FE	No	Yes	Yes	Yes	Yes	Yes
Sub-region of origin FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Observations	1746	1746	1746	1746	1746	1746
R-squared	0.113	0.114	0.249	0.722	0.722	0.722

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.

Table H.27: Triple difference-in-difference, Migrant stocks by group in EU countries vs the UK, (EU LFS)

	Migrant Stocks (log)					
	High-skilled	Low-skilled	Women	Men	Younger	Older
EU (origin)	3.078***	3.748***	3.453***	3.145***	2.899***	3.304***
	(0.481)	(0.536)	(0.486)	(0.490)	(0.490)	(0.491)
UK (destination)	2.426***	2.542***	2.473***	2.343***	2.477***	2.370***
	(0.329)	(0.367)	(0.333)	(0.335)	(0.335)	(0.336)
Post_ref	0.194	0.0711	0.0965	0.283	0.135	0.292
	(0.297)	(0.332)	(0.301)	(0.303)	(0.303)	(0.304)
EU*post_ref	-0.00776	0.207	0.0879	-0.0610	0.176	-0.0208
	(0.202)	(0.225)	(0.204)	(0.206)	(0.206)	(0.206)
UK*EU*post_ref	-0.538	0.305	-0.765	-0.370	-0.263	-1.051
	(0.632)	(0.705)	(0.639)	(0.645)	(0.644)	(0.646)
GDPpc (log)	0.601	1.688	0.580	0.176	0.0815	0.822
	(1.043)	(1.164)	(1.055)	(1.064)	(1.063)	(1.066)
Unemployment	-0.00305	0.0540	-0.00704	-0.0290	-0.0175	0.0257
	(0.0336)	(0.0375)	(0.0340)	(0.0342)	(0.0342)	(0.0343)
Sub-region of origin and year FE	No	No	Yes	Yes	Yes	Yes
Destination country FE	No	No	No	Yes	Yes	Yes
Observations	1746	1746	1746	1746	1746	1746
R-squared	0.722	0.695	0.743	0.706	0.723	0.736

Notes: Standard errors in parentheses. * $p < 0.10$, **$p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.

Table H.28: Difference-in-difference estimates, Migrant stocks in the EU, the UK, and Ireland, alternative control group (EU LFS)

	Stocks (log)			
	All destinations	Only UK	Only Ireland	Triple difference
EU (origin)	-0.197	1.541***	2.606***	-0.104
	(0.247)	(0.127)	(0.170)	(0.237)
Post_ref	0.145	0.180	0.431*	0.147
	(0.333)	(0.170)	(0.228)	(0.319)
EU*post_ref	0.130	0.343*	-0.0234	0.0881
	(0.314)	(0.160)	(0.215)	(0.302)
UK (destination)				0.584
				(0.458)
UK*EU*post_ref				0.976
				(0.600)
Sub-region of origin and year FE	Yes	Yes	Yes	Yes
Destination country FE	Yes	Yes	Yes	Yes
Observations	420	24	24	444
R-squared	0.634	0.973	0.977	0.658

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$. All statistics are weighted using the yearly weights provided in the survey. GDP and unemployment are lagged of one year. Although the EU LFS provides information on all 28 EU countries, in the regressions we exclude Germany, Malta, and the UK as destinations. UK is excluded for estimation reasons. We do not include Germany because information on the respondents' country of birth are not recorded before 2016, and Malta because there is no information on non-EU migrants. Unemployment and real GDP per capita are lagged of one year. **Source:** Authors' calculations based on EULFS data, years 2013-2019 excluding 2016.