Vilde Antonsen & Ferdinand F J Hansen

Brexit, Migration and Political Uncertainty

An empirical study of how the Brexit referendum affected bilateral migration flows to the UK

Master's thesis

NTNU
Norwegian University of
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Thesis advisor: Costanza Biavaschi

Master's thesis in Economics

Faculty of Economics and Management

Department of Economics

NTNU

Abstract

In this thesis we have investigated the effects of the result of the Brexit referendum on bilateral migration flows to the UK. We found that net migration and individuals looking for work were more affected by the Brexit referendum in EU regions than non- EU regions and that individuals arriving with a job were unaffected. We obtained inaccurate results with respect to student migration which added to previous criticisms of the IPS data as a reliable source. We observed that the referendum activated other drivers of migration than what a general analysis of the determinants of migration found to be significant. We also found that sovereign bonds yielded significant additional effects on net migration and individuals looking for work after the referendum in the EU. This suggests that the political uncertainty after the referendum has affected bilateral migration flows.

Sammendrag

I denne oppgaven har vi undersøkt hvilke effekter folkeavstemningen om Brexit har hatt på bilaterale migrasjonsstrømninger til Storbritannia. Våre funn viser at folkeavstemningen har påvirket netto migrasjon og strømningen av individer som kommer for å lete etter arbeid mer i EU enn utenfor EU, samt at individer som kommer med et allerede klart jobbtilbud ikke har blitt påvirket av folkeavstemningen. Når det kommer til strømningen av studenter har vi oppnådd upresise estimater, noe som underbygger tidligere kritikk av IPS som en pålitelig datakilde. Vi observer videre at folkeavstemningen har aktivert andre migrasjonsdrivere som signifikante enn hva en generell analyse viser. Vi finner at statsobligasjoner har gitt signifikante tilleggseffekter på netto migrasjon og individer som leter etter arbeid etter folkeavstemningen i EU. Dette impliserer at politisk usikker som følge av folkeavstemningen har påvirket bilaterale migrasjonsstrømninger.

Preface

This master thesis marks the end of a 5-year integrated master program in Economics at the department of Economics, NTNU. First, we would like to extend a special thanks and an enormous amount of gratitude to our knowledgeable, educational and patient thesis advisor Costanza Biavachi. Without her invaluable insight and ability to easily communicate complex ideas, this work would have turned out quite differently.

We would also like to thank fellow students, whose humor and liveliness can be a most needed diversion from the reading room. Last, but not least we would like to thank each other for fruitful discussions and for, without compromise, pointing out each others blind spots.

All views and statements in this thesis are our own, and cannot be assigned to NTNU. The authors of this paper take full responsibility for any errors that may follow.

Norwegian University of Science and Technology

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Contents

Figures

Tables

1 Introduction

The UK became a member of the EU in 1972. The EU is a union of 28 countries, each with access to the European single market. Broadly speaking, access to the single market grants its members the right to live and work, without restrictions in all member countries. Access also permits free flow of capital and goods. Having been a wealthy country for a long time, the UK has always been an attractive migration destination. Net migration peaked in 2016, and has remained stable with around 283.000 more individuals coming, than leaving in the year ending in September 2018 (Office for National Statistics, 2019b). Access to the single market has brought about economic prosperity for the UK since the beginning, but one can argue that not all UK citizens have reaped the fruits from this arrangement. In most EU member states the migration debate has focused on the challenges posed by immigrants and asylum seekers from outside the EU, whereas the debate in the UK has focused on intra- European migration (Thielemann and Schade, 2016). Migration was one of the scale- tipping issues in the election when voting for- or against the Brexit referendum bill[1][2], and is constantly listed as the most important issue facing the nation. Theresa May said that the referendum result sent "a very clear message" that "people wanted us to take control of our borders and control of immigration from the EU" (The European Union Committee, 2017).

After the referendum in June 2016, different patterns for EU and non- EU migration emerged. From outside the EU, increasing numbers are entering the country for work and study, causing migration from this region to be at its highest level since 2004. In contrast, the number of EU citizens coming to the UK for work has dropped. EU net migration is still adding to the population, but is at its lowest level since 2009 (Office for National Statistics, 2019b). Many fear that a "no deal" will put an end to the free movement to the UK for European citizens. A report from The European Union Committee (2017) examines what the Government's pledge to deliver control over EU immigration might mean in practice. The free movement of individuals between the UK and other countries

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[1]The name given to the phenomena of Great Britain leaving the European Union: Britain- Exit = Brexit.

[2]The Brexit referendum bill (European Union Referendum Act 2015, chapter 36) is an Act to make provision for the holding of a referendum in the United Kingdom and Gibraltar on whether the United Kingdom should remain a member of the European Union.

in the EU, is set to end automatically if the UK leaves the EU without any deal.

Our thesis has two aims: (i) To examine the overall impact of Brexit on migration flows to the UK; (ii) To study potential changes in the responsiveness to migration drivers[3]. With Brexit dominating the political zeitgeist in- and around the UK, and the uncertain outcome of the negotiations being discussed on a daily basis, we want to see if the political uncertainty after the referendum has affected migration.

To answer our research questions, we have assembled a panel data set that stretches from the fourth quarter of 2008 to the second quarter of 2018. As key variables of interest we look at overall migration flows and flows by "reason". To measure changes in uncertainty we further control for sovereign bond yields. Political uncertainty has been proven to be a significant determinant of sovereign bond yields, making this variable particularly interesting and our main independent variable.

We find no significant change in flows in net migration or individuals with a definite job in non- EU regions after the referendum, whereas inflows of individuals looking for work from non- EU regions had a slight increase. In terms of student inflows we obtain inaccurate results, which will be discussed in section 6.2. When distinguishing between flows in EU and non- EU regions, we observe that net migration and inflows of individuals looking for work from the EU were negatively impacted compared to non- EU. Inflows of individuals with a definite job and students from the EU did not react differently than those from non- EU. In terms of migration drivers, we observe that net migration and individuals looking for work from the EU are more sensitive to changes in sovereign bond yields after the referendum. This indicates that individuals from EU regions are more sensitive to the political uncertainty crated by the referendum than individuals from non- EU regions, in terms of their decision to move.

The thesis will be structured in 7 chapters. The next chapter will give a short background on how recent studies have measured determinants of migration, and a summary of previous results. Chapter 3 describes which method specification we have used in our analysis. Chapter 4 provides information on how we constructed our data set, and a presentation of descriptive statistics. Chapter 5 goes through our findings. In chapter 6

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[3]A migrant is defined as someone who changes his or her country of usual residence for a period of at least a year, so that the country of destination effectively becomes the country of usual residence (Office for National Statistics, 2019a).

we extensively discuss our results and data limitations before concluding in chapter 7.

2 Background

Recent developments in the literature on the determinants of migration have highlighted the challenge of how to consistently measure it. These models are powered by a comprehensive micro- econometric foundation that explains which components that are instrumental when deciding to migrate. Understanding this process is key to accurately specify the regression models that will be used in the analysis. In this chapter we derive a simple micro- econometric backdrop that will inform our model specification, and much of the discussion surrounding it. Then we give a brief summary of the most relevant and popular models for estimating migration flows and go through previous results.

2.1 Micro Econometric Foundation

Beine et al. (2016) derive the micro- econometric foundation that powers gravity models. They begin with a simple random utility model of migration (RUM) that assumes dyadic decisions[4].

We begin by introducing bilateral migration flows given by the following expression:

$$f_{jkt} = p_{jkt} s_{jt} \tag{2.1}$$

where f_{jkt} is the flow of migrants from unit j to unit k at time t. That is, the share of migrants p_{jkt} that currently live in region j who are looking to move to region k at time t, times the total stock of people currently residing in region j, s_{jt}. $p_{jkt} \in [0,1]$.

The RUM model of migration with dyadic decisions is written as:

$$U_{ijkt} = w_{jkt} - c_{jkt} + \epsilon_{ijkt} \tag{2.2}$$

This function gives the utility of individual i, located in region j at time t - 1, looking

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[4]A migration decision is being dyadic if it *only* depends on the attractiveness between two destinations (Forte and Portes, 2017). Of or consisting of a dyad; being a group of two

to move to region k at time t. The first two components are deterministic. w_{jkt} is the instantaneous payoff associated with moving to region k, and c_{jkt} gives the cost of moving from region j to region k at time t. ϵ_{ikt} is an individual error structure. If we assume an independent and identically distributed extreme value type 1 error structure ala (McFadden et al., 1973) (i.i.d EVT- 1) we can write the expected share of migrants that are looking to move from region j to region k as:

$$E[p_{jkt}] = \frac{e^{w_{jkt}-c_{jkt}}}{\sum\limits_{l \in D} e^{w_{jlt}-c_{jlt}}} \tag{2.3}$$

Inserting equation (2.3) into equation (2.1) allows us to write the expected migration flows as:

$$E[m_{jkt}] = \frac{e^{w_{jkt}-c_{jkt}}}{\sum\limits_{l \in D} e^{w_{jlt}-c_{jlt}}} s_{jt} \tag{2.4}$$

By re- branding the terms, we can re- write equation (2.4) and thereby make it resemble a gravity equation. If we call; $y_{kt} = e^{w_{kt}}$, $\phi = e^{-c_{jkt}}$ and $\Omega_{jt} = \sum\limits_{l \in D} \phi_{jlt} y_{lt}$, equation (4.4) can be written as:

$$E[m_{jkt}] = \phi_{jkt} \frac{y_{jkt}}{\Omega_{jt}} s_{jt} \tag{2.5}$$

Expected migration flows depend on four components: (i) s_{jt}, is the total stock of potential migrants; (ii) y_{kt}, the attractiveness of region k; (iii) $\phi_{jkt} \leq 1$, the cost of moving from region j to region k (Accessibility) and; (iv), Ω_{jt} which is the expected utility of prospective migrants from the different regions, and represents a heterogeneity term in terms of the preference of migration.

Note: $\frac{d\Omega_{jt}}{d\phi_{jlt}} = y_{lt} > 0$: A decrease in the accessibility of an alternative regions l will lead to an increase in the expected bilateral migration flows[5].

To remove expectations we need to add an error term η_{jkt} with $E[\eta_{jkt}] = 1$, which delivers:

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[5]Because of the inverse relationship

$$m_{jkt} = \phi_{jkt} \frac{y_{jkt}}{\Omega_{jt}} s_{jt} \eta_{jkt} \tag{2.6}$$

We wish to estimate the empirical counterpart to the log- odds ratio by means of OLS. The log- odds ratio is:

$$ln[m_{jkt}] = w_{kt} - w_{jt} - c_{jkt} + \eta_{jkt} \tag{2.7}$$

Gross migration flows depend on the payoff of moving to region k, minus the payoff of staying in region j, minus the cost of moving to region k from region j. The last term is an error term. It is important to note that Ω_{jt}, which accounts for cross sectional dependence disappears when calculating the log odds ratio.

2.2   Review of empirical strategies

A number of studies focus on the presence of serial- or cross sectional correlation (cross-sectional dependence) in the dependent variable as a source of bias and inconstancy in the estimates. Beine et al. (2016) develops the micro- econometric foundation further to account for cross sectional dependence. Allowing for cross- sectional dependence allows for consistency under less rigid assumptions regarding the decision to migrate. This characteristic in the data has been termed "Multilateral resistance to migration" in Bertoli and Moraga (2013) (From here on termed MRM). In essence, MRM is a term coined to describe the nature of the migration decision not being dyadic in its nature, but also factoring in the relative attractiveness of alternative destinations. Pesaran (2006) propose a method for dealing with cross sectional dependence. This is the Common Correlated Effects model (CCE).

Bai (2009) shows that by not accounting for cross sectional correlation in panels with large T and large N, one will obtain inconsistent estimates. A regular within transformation does not suffice as the unobserved aspects correlate with the regressors. For example, migration flows from one country or region to another can be accelerated by the simultaneous deterioration of economic conditions in one, or several alternative destinations. This will produce an upward bias in the estimates, as there are external forces influencing the

decision to move from one destination to another. Bertoli and Moraga (2013) control for the influence of alternative destinations on the decision to migrate and show that MRM produce upward biased estimates. Bertoli et al. (2016) argue that a source of MRM is the observation that people tend to move more than once in their life, which produces serial correlation in the data. The decision to migrate is not necessarily myopic, but can also be sequential. Both papers utilize the CCE model in their analysis and find it to be a more robust model.

Often in migration or trade data, researches are confronted with the issue of many zeroes in the dependent variable, which is a source of bias. Adjusting the zeroes to slight positive quantities has been attempted as a means of dealing with zeroes by Ortega and Peri (2013), but they failed to get rid of the bias. Westerlund and Wilhelmsson (2011), Silva and Tenreyro (2011) and Forte and Portes (2017) show that utilizing the Poisson fixed effects estimator (PPML) when estimating gravity models, has the advantage of eliminating the problem of zeroes in the data. It also controls for heterogeneity and performs well with small samples. The PPML estimator is a Maximum Likelihood analogue to the linear model.

In Bertoli et al. (2016) they estimate a linear Fixed Effects model to argue the presence of MRM in migration to Germany as a point of reference for the consistency of the CCE estimator. Forte and Portes (2017) use a linear FE model as a point of reference for the improvements made by the PPML model. The linear Fixed Effects model is only consistent in the case of no, or few randomly distributed zeroes in the dependent variable and independence of alternative destinations, in which case one can assume dyadic decisions.

In light of these findings an ideal data set would have a country unit dimension as it would allow us to control for MRM. We were unable to obtain this. We have a unit dimension too small to control for MRM, but on the other hand, few zeroes in the dependent variable. Hence we adopt a simple fixed effects model in our analysis. A more extensive discussion into the validity of assuming dyadic decisions can be found in chapter 6.2.

2.3 Review of empirical findings

Forte and Portes (2017) explores the extent to which migration is driven by a selection of macroeconomic variables and free movement within the European Economic Area (EEA). The paper finds that free movement within the EEA, together with UK GDP growth and GDP at origin significantly impacts migration flows, and argue that Brexit can cause a sharp fall in immigration from EEA countries for that reason. Their analysis also show significant effects from the unemployment rate at origin (though less so than UK GPD growth) and a weak effect from the exchange rate. Like Forte and Portes (2017), Bertoli et al. (2016) finds a significant relationship between bilateral migration, the unemployment rate at origin- and free mobility. In addition they find a significant effect from sovereign bond yields at origin.

Economic conditions at home are by many thought to be the most important single reason for migration. Unemployment, for example, is one measure of how a country's economy is doing. It has been shown that countries with high unemployment rates tend to move to countries with lower unemployment rates (Thielemann and Schade, 2016). Unemployment rates, and specifically youth unemployment, have spiraled in southern Europe since the beginning of the financial crisis. This has greatly increased incentives for emigration from countries affected in such ways. For instance, in 2014 more Spanish than Polish citizens arrived in the UK.

Following this literature, we chose the key regressors of our analysis to be sovereign bonds maturing in ten years, unemployment rate, exchange rate and the UK GDP growth. In addition we control for the UK inflation rate.

3 Methodology

3.1 Empirical Model: Gravity Model of Migration

A standard empirical specification associated with equation 2.7 is a gravity model. A gravity model is any model that is driven by the relative attractiveness of destinations. Lewer and Van den Berg (2008) developed a gravity model of migration, which builds on the previously developed gravity model of trade. International trade and international migration has many of the same characteristics as they are both influenced by the relative attractiveness of locations.

The Gravity Model we use for estimating the determinants of migration to the UK[6] takes the form:

$$ln(f_{jt}) = ln(x'_{jt})\beta + \alpha d_t + \theta d_j + \eta_j + \gamma_{jt} \qquad (3.1)$$

$ln(f_{jt})$ is the log of bilateral migration flows and $ln(x'_{jt})$ is the matrix of independent variables and control variables. The inclusion of region dummies d_j control for region specific time invariant effects, such as distance between sending- and receiving country or significant cultural, linguistic or religious differences, all of which increase the actual- or perceived cost of moving. They also control for any time- invariant policy regimes that exist in the regions (The inclusion of region dummies is is the Fixed Effects specification which controls for the errors captured in j). Belot and Ederveen (2012) proves that linguistic, cultural and religious, as well as physical distance is a crucial factor in explaining migration flows. The inclusion of time dummies d_t control for UK specific variation and common elements that vary over time across all regions (financial crisis, migration crisis etc.). The last two terms make up a composite error structure consisting of a unit specific error term and an idiosyncratic error term; $\eta_j + \gamma_{jt} = \epsilon_{jt}$.

One of the assumptions behind OLS estimation is the lack of a heteroskedastic- or serially correlated error structure. A breach of these assumptions do not lead to biased estimates, but could lead to problems with inference because the estimated variance, and consequently

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[6]We have omitted subscript k as we only have one destination region

the standard deviation of the estimates will be based on wrong formulas. Statistical inference based on uncorrected standard deviations is not valid and can give misleading results (Verbeek, 2017), p.95-96). The error term is heteroskedastic in our case if omitted factors that affect migration differs between regions. We assume this to be the case and estimate the model with cluster robust standard errors. Needless to say, we cluster by regions as this is the only operational unit.

4 Data

In this section we proceed to describe the data we have collected together with the sources from which they are derived. These sources include the Office for National Statistics (ONS), the International Monetary Fund (IMF), the Organisation for Economic Co-operation and Development (OECD) and Macrobond.

We have assembled an unbalanced panel with a quarterly time dimension and regional unit dimension. The unit dimension distinguishes between 6 sending regions; EU15, EU8, South Asia, East Asia, Sub-Saharan Africa and North America[7], and one receiving region; the UK. The time dimension stretches from the beginning of the last quarter in 2008, to the end of the second quarter in 2018[8]. The data set is unbalanced due to missing values in some variables. Data limitations will be extensively discussed in section 6.2.

4.1 Regions

Table 4.1. shows the main countries of birth of migrants in the UK. This table influenced our choice of regions (Vargas-Silva and Rienzo, 2018). Every country listed in that table is included in our analysis, except Romania. Romania is part of EU2 together with Bulgaria. We decided not to include EU2 as it was difficult to obtain high quality data from this region. The data we did find was either low frequency or contained a high percentage of

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[7]The EU15 includes: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Republic of Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and Sweden. The EU8 includes: The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.

[8]The 2018 data used to compile the LTIM and IPS estimates in this report are provisional. All estimates for year ending March 2018 and year ending June 2018 are therefore provisional. Final estimates will be published on 28 November 2019 (Office for National Statistics, 2019a)

zero observations. In addition we included North America.

Table 4.1: Top Country of Birth of migrants in the UK

Rank	Country of birth	Region Code	Number	Percentage share
1	Poland	EU8	922.000	9.8
2	India	South Asia	829.000	8.8
3	Pakistan	South Asia	522.000	5.6
4	Ireland	EU15	390.000	4.1
5	Romania	EU2	390,000	4.1
6	Germany	EU15	318.000	3.4
7	Bangladesh	South Asia	263.000	2.8
8	Italy	EU15	232.000	2.5
9	South Africa	Subsaharan Africa	228.000	2.4
10	China	East Asia	216,000	2.3

4.2   Dependent variables

Net Migration

Our primary dependent variable is net migration, which is the number of individuals entering minus the number of people leaving the UK. This variable is collected from the Office for National Statistics' (ONS) Long- Term International Migration (LTIM) data. All estimates are rounded to the nearest thousand, and totals may not add exactly due to this rounding. The primary source for the LTIM estimates is the International Passenger Survey (IPS), but include adjustments based on other sources, such as the Labour Force Survey, the Home Office data on asylum seekers, the Irish Central Statistics Office and the Northern Ireland Statistics and Research Agency. Since Migrants' future intention to stay in the UK can change, the ONS also adjusts for 'visitors switchers[9]' and for 'migrants switchers[10]'(Vargas-Silva and Sumption, 2018).

Our dependent variable is a product of:

LTIM= IPS flows + Irish flows + adjustments for asylum seekers and enforced removals + adjustments for people who change their intentions (switchers).

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[9]Those whose original intention was to stay for less than one year but who subsequently stay longer
[10]Those who intended to stay for more than twelve months but left within a year

Main reasons for migration

In addition to providing data on general bilateral migration flows, the migration data from ONS distinguishes between reasons for moving to the UK. These are: (i) Definite job; (ii) Looking for a job; (iii) Studying[11]; (iv) Accompany/join[12]; (v) Going home to live[13]; (vi) Other reasons and (vii) No reason. The data that has been used to estimate "reasons" is only based on IPS data[14]. The IPS does not provide data on net migration by reason, so we only look at inflows[15]. Being able to distinguish between groups of migrants give us more information about what drive migration to the UK as it allows us to observe if different groups of migrants respond differently to shocks.

Almost three-quarters of EU immigration to the UK is work related. In June 2016, 41 percent of EU migrants reported having a definite job, while 31 percent reported that they came to the UK looking for a job. Two years later, 37 percent reported having a definite job as their main reason, while only 18 percent reported that they were looking for work. From table 4.2. and 4.3. we observe that inflows of people coming for a definite job and people coming to look for work have decreased after the referendum from the EU. That people looking for work in 2018 makes up a much smaller percentage share of the total number of migrants compared to 2016, tells us that the decrease has been bigger for this group.

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[11]Since we are looking at long term international migration this only includes students who choose to study in the UK for minimum 12 months.

[12]Accompany or joining family members or other relatives

[13]Going home to live is stated when no other reasons related to work, study or accompany/join is given.

[14]IPS relies on self-reporting of reason for migration and only includes the main reason; people may have more than one reason for moving, however. It is also important to have in mind that the IPS estimates are based on a person's intention to migrate, and not actual behaviour (Blinder and Fernández-Reino, 2018).

[15]"Main reason for migration" always refers to the reason for the current migration. For a former immigrant leaving the UK this is their main reason for leaving and may well be different to their previous main reason for immigrating into the UK. Because former immigrants' reasons for immigration and emigration can vary in this way, care should be taken if comparing inflow and outflow by "main reason for migration". Furthermore, the inflow and outflow estimates cover the same period (rolling year) and thus do not consider the same cohort of people. To avoid potential confusion about the contribution that particular groups of migrants make to total net migration figures, the previously published 'balance' figures by reason have been removed (Office for National Statistics, 2019a)

Figure 4.1: Inflow of people coming with a definite job
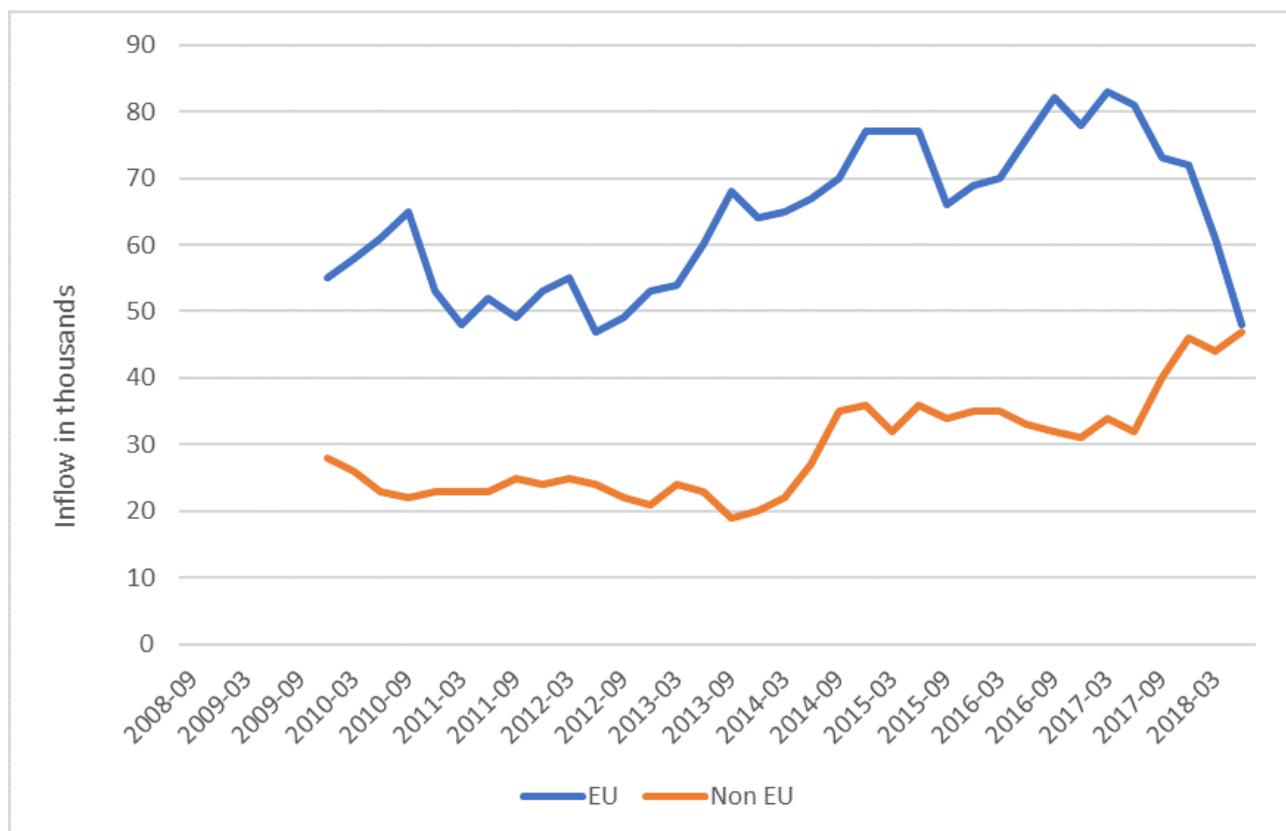
Figure 4.2: Inflow of people looking for work
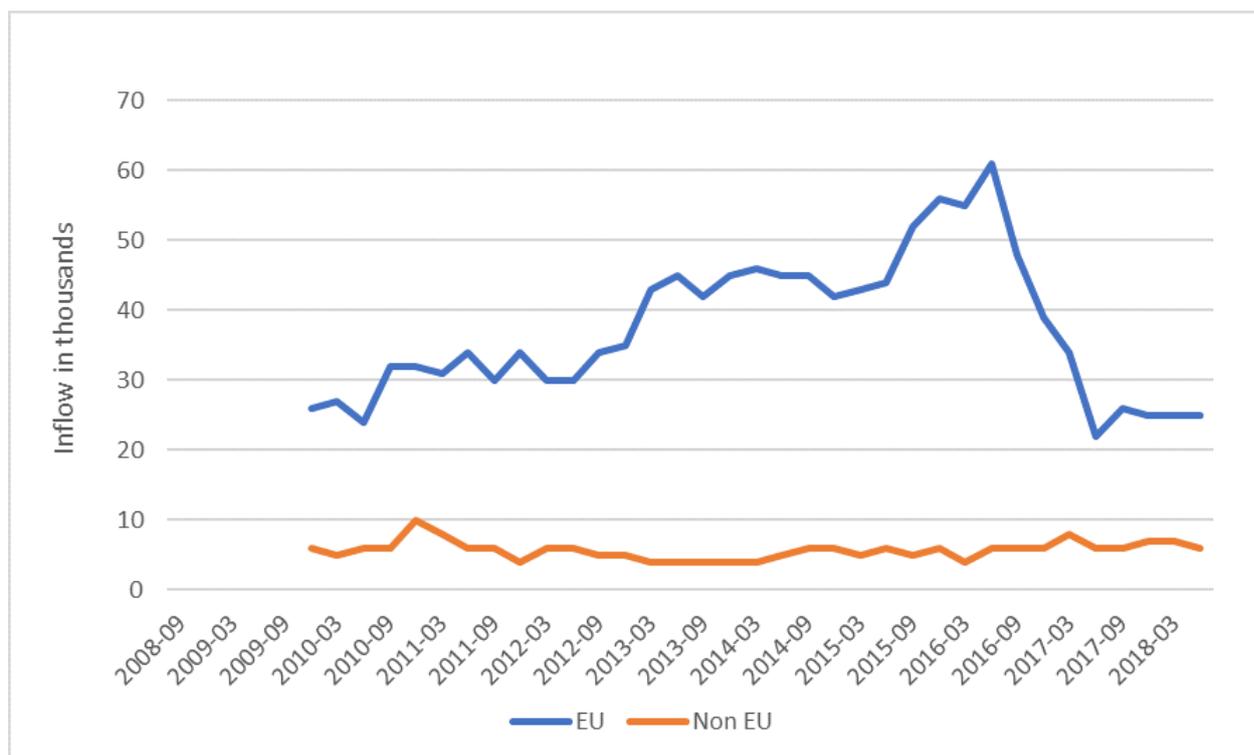
Studying is another important reasons for migrating to the UK. In June 2016 an estimated 70 percent of students who entered the UK came from non- EU regions. This distribution was pretty much the same when looking at the data two years later. We observe from table 4.4. that student inflows has increased after the referendum from both EU- and non-EU regions.

Figure 4.3: Student inflow
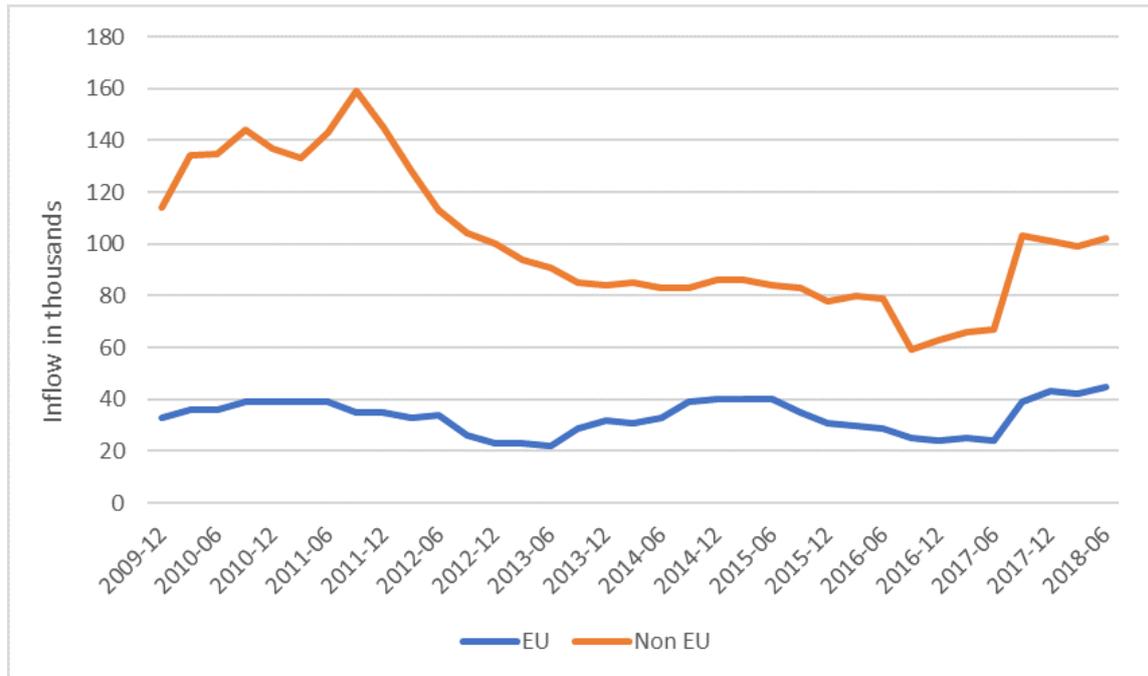
It is important to note that the unusual decrease in student immigration estimates for 2016 is not present in other EU sources. The temporary decrease is therefore thought to be a statistical anomaly rather than a real change in the student inflows. This is discussed more extensively in chapter 6.2.

We will only be looking into reasons (i), (ii) and (iii) as they account for almost all flows. The others have been roughly stable in our time period, and does not account for much of the migration flows to the UK.

4.3   Independent variables

Recent studies have suggested that macro- economic factors and free movement are driving migration flows between EU countries. Our pick of independent variables and control variables is influenced by these findings. Unfortunately, the lack of available data on migration before 2008 do not let us examine to which extent free movement has influenced the EU migration directly.

Describing controls

To account for current economic conditions we have collected OECD data on the unemployment rate[16] and IMF data on exchange rates[17]. Since most rates were originally denominated in their local currency per USD, we converted all data on exchange rates to Pound Sterling (GBP) per local currency. An increase in the exchange rate means that the pound depreciates. We also include data on GDP growth and the inflation rate in order to control for baseline economic conditions. Both the data on GDP growth and inflation is collected from OECD.

In order to measure future attractiveness and political uncertainty we have collected data on sovereign bond yields maturing in 10 years. This is collected from OECD for all regions, except East Asia, where we have used Macrobond.

Sovereign bond yields as measure of Political Uncertainty

A government bond is a financial instrument issued by countries who wish to borrow money for investments. Investors can purchase government bonds and in effect be lenders to the issuing country. The bond pays interest periodically. This is the yield to maturity. The yield on government bonds maturing in ten years is valuable as a means of economic inference as it provides a good measure of the risk associated with lending. More risk means investors will demand higher yields on their investments as compensation for taking

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[16]Unemployment rate is the number of unemployed people as a percentage of the labour force, where the latter consists of the unemployed plus those in paid or self-employment. Unemployed people are those who report that they are without work, that they are available for work and that they have taken active steps to find work in the last four weeks.

[17]The exchange rates collected from The International Monetary Fund (IMF) are reported daily by the issuing central bank, but the IMF does not maintain exchange rates on weekends and some holidays. This means that the quarterly given exchange rates in this data set is the average exchange rate for that quarter.

on more risk.

Cuadra and Sapriza (2008) show that countries with more domestic disagreement are charged with higher risk premia than other countries. Eichler (2014) provides evidence that the degree of political stability is an important determinant of sovereign bond yields and Huang et al. (2015) establish a significant link between sovereign bond pricing and international political risk. The UK after the referendum is the text book definition of a country struggling with domestic disagreement and where the political climate is more unstable than usual. It also has international implications as the potential consequences will have effects beyond UK borders.

Before we move over to descriptive statistics we need to define our independent variables. Sovereign bonds and the unemployment rate are defined as fractions with data from the UK in the numerator and data on the other regions in the denominator. For example, the unemployment variable looks like this: $unem_{jt} = \frac{unem_{uk,t}}{unem_{jt}}$. This definition allows for the independent variables to vary with sending and receiving country, and time, not only receiving country and time. This is useful as it allows us to investigate the effect of their relative dynamic on migration. In the following, every time we refer to a relative increase or decrease in one of these independent variables, it is always an increase or decrease in that variable in the UK relative to the other regions.

This definition has not been applied for GDP growth and the inflation rate as there are periods of deflation and negative growth. Weak deflation or negative growth in the denominator creates large negative values even for moderate levels in the numerator. For example, if we look at the first quarter of 2009, the average inflation rate in the UK was 2.933 while it was -0.039 in the US. If we had used fractions we would have obtained a value of -74.88. Instead we included GDP growth and inflation in the UK. These are to be interpreted as pull factors.

Challenges with data collecting

Having used data from countries all over the world have confronted us with difficulties in obtaining quality data on all the variables. In certain instances we have been forced to let data from one country in a region represent the entire region.

In EU15 there were no challenges obtaining quality data. Almost every country use Euro (EUR), so we have allowed the Euro to be the currency that represents EU15. With all the other variables we have collected data on every variable for every country and taken the average across all countries in every quarter. We decided to use Polish Zloty to represent the exchange rate for EU8 as it was difficult finding quality data from the other countries. As for the other variables, we did the same as in EU15. We did not include Hungary in EU8, as data availability was an issue. From every region outside the EU we have let one country represent the entire region for all independent variables. We used data from the countries represented in table 4.1. China represents east Asia, India represents South Asia, the US represents North America and South Africa represents Subsaharan Africa[18].

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[18]Currencies: Chinese Yuan (CNY), Indian Rupee (INR), South African Rand (ZAR) and US dollars (USD).

4.4   Summary Statistics

Table 4.2 reports the summary statistics of all our key variables. We begin by presenting overall statistics, before presenting statistics at a regional level.

Table 4.2: Summary Statistics

Variables	N	Mean	Max	Min	St. Dev
Total					
Net Migration	222	34.892	120	-14	23.724
Defjob	222	15.455	62	1	14.172
Lookjob	222	7.113	34	0	8.708
Study	222	22.176	91	3	19.328
Bonds	222	0.646	1.302	0.097	0.342
Inflation$_{uk}$	234	2.123	4.067	0.333	1.006
Unemployment	234	0.968	2.278	0.146	0.573
GDP$_{uk}$	225	0.353	1.191	-2.172	0.573
Exchangerates	234	0.314	0.908	0.01	0.320
EU15					
Net Migration	37	51.216	84	18	21.478
Defjob	37	38.54	62	20	12.725
Lookjob	37	18.243	34	8	6.755
Study	37	26.676	38	17	5.143
Bonds	39	0.893	1.302	0.352	0.272
Inflation$_{uk}$	39	2.123	4.067	0.333	1.017
Unemployment	39	0.648	0.899	0.477	0.165
GDP$_{uk}$	39	0.333	1.191	-2.172	0.613
Exchangerates	39	0.836	0.908	0.717	0.05
EU8					
Net Migration	37	30.459	51	-14	16.934
Defjob	37	24.973	35	14	4.997
Lookjob	37	18.378	27	7	5.267
Study	37	6.649	11	3	2.003

Tabel 4.2 Continued					
Variables	**N**	**Mean**	**Max**	**Min**	**St. Dev**
Bonds	39	0.728	1.214	0.34	0.248
Inflation$_{uk}$	39	2.123	4.067	0.333	1.017
Unemployment	39	0.686	0.861	0.601	0.046
GDP$_{uk}$	39	0.333	1.191	-2.172	0.613
Exchangerates	39	0.20	0.223	0.169	0.014
North America					
Net Migration	37	12.135	23	5	4.739
Defjob	37	7.162	11	4	1.908
Lookjob	37	1.405	2	0	0.644
Study	37	8.054	14	5	2.516
Bonds	39	0.943	1.292	0.483	0.232
Inflation$_{uk}$	39	2.123	4.067	0.333	1.017
Unemployment	39	0.959	1.103	0.809	0.09
GDP$_{uk}$	39	0.333	1.191	-2.172	0.613
Exchangerates	39	0.665	0.807	0.594	0.059
East Asia					
Net Migration	37	35.216	56	17	10.544
Defjob	37	4.243	7	1	1.402
Lookjob	37	0.919	3	0	0.894
Study	37	45.081	64	23	9.867
Bonds	39	0.666	1.282	0.305	0.255
Inflation$_{uk}$	39	2.123	4.067	0.333	1.017
Unemployment	39	1.444	1.855	0.848	0.37
GDP$_{uk}$	30	0.483	1.191	-0.229	0.303
Exchangerates	39	0.103	0.118	0.089	0.008
South Asia					
Net Migration	37	60.486	120	27	28.529
Defjob	37	15.459	27	9	4.658
Lookjob	37	2.081	5	0	1.382
Study	37	35.459	91	7	28.895

Tabel 4.2 Continued					
Variables	**N**	**Mean**	**Max**	**Min**	**St. Dev**
Bonds	27	0.236	0.325	0.118	0.053
$Inflation_{uk}$	39	2.123	4.067	0.333	1.017
Unemployment	39	1.811	2.278	1.131	0.407
GDP_{uk}	39	0.333	1.191	-2.172	0.613
Exchangerates	39	0.012	0.0147	0.01	0.001
Sub- Saharan Africa					
Net Migration	37	19.838	33	12	5.199
Defjob	37	2.351	6	1	1.252
Lookjob	37	1.649	7	0	1.274
Study	37	11.135	16	8	2.189
Bonds	39	0.286	0.486	0.097	0.11
$Inflation_{uk}$	39	2.123	4.067	0.333	1.017
Unemployment	39	0.258	0.326	0.146	0.067
GDP_{uk}	39	0.333	1.191	-2.172	0.613
Exchangerates	39	0.067	0.092	0.044	0.014
End of Table					

Table 4.2 presents all relevant statistics.

Looking at the mean of all regions, we observe that the quarterly average net migration to the UK is almost 34 900. We see that this number fluctuates considerably as it has a big standard deviation of around 23 700. The quarterly average of people coming to the UK for a definite job is 15 455, while it is 7113 for people coming to look for work. As with net migration, these values fluctuate as there are big differences between maximum and minimum values and high standard deviations. The average inflows of students are 22 176, which means that overall, there is an approximate fifty/ fifty distribution of work- and study related immigration.

South Asia is the biggest sending region to the UK with an average net migration of 50 486 per quarter and EU15 is the second biggest sending region with an average net migration of 51 216 per quarter. Comparing EU15 and EU8 we observe that for both

regions, work related migration is the most common reason for moving to the UK. The UK receives almost as many people looking for work from EU8 as from EU15, suggesting that there is more low skilled labour coming from EU8 relative to its size than from EU15. Also, there are far more students coming from EU15 than EU8. All non- EU regions have in common that studying is the most common reason for moving to the UK[19]. East- and South Asia are responsible for most student migration to the UK.

As for the control variables, we observe that the average GDP growth in the UK is 0.353. It is worth noticing that this rate also has been negative. In the fall of 2008 the world experienced a financial crisis. Many economies were struggling after the US housing bubble burst, and the UK was no exception. The average inflation rate is close to the Government's target of an annual rate of 2 percent (Bank of England, 2019).

When measuring the unemployment rate in EU15 and EU8, we obtain pretty much the same result. An average value of 0.648 in EU15 and 0.686 in EU8 indicates that the unemployment rate has been lower in the UK compared to these two regions. The average value for sovereign bonds reveal that the risk of investing in EU8 has been lower then investing in EU15 with relative values of 0.728 in EU8 and 0.893 in EU15.

Outside the EU, the results differ a lot between regions. While the relative value of sovereign bonds is close to 1 in North America, the value is much lower in South Asia and Sub- Saharan Africa. This means that the investment risk is much higher in these two regions compared to the UK. When looking at unemployment, we observe that the unemployment rate is lower in the Asian regions compared to the UK, while it is much higher in Sub- Saharan Africa compared to the UK. The region most similar to the UK, when comparing the independent variables in our summary statistics, is North America.

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[19]Work is the most common reason for migrants coming from North America if you add the inflows of people coming for a definite job and people coming to look for work

5   Results

In this section we begin by analyzing how flows have shifted after the referendum, without looking at the specific impact of independent variables. After that, we present the estimates from the Gravity Models in which we look at the specific impact from independent variables. Each model utilize a different dependent variable; (1) Net migration, (2) definite job, (3) looking for job and (4) study. Model (2), (3) and (4) represent a sensitivity analysis. First, we estimate the models to look at the determinants of migration over the entire focus period, before we extend the models to look at how the impact of certain variables differ after the referendum, inside and outside the EU. We extend the gravity models by interacting each independent variable with an EU dummy and an after dummy. This isolates the group and time we see as being most exposed to uncertainty.

Other Shocks

When estimating a regression model, it is always a concern that relevant variables unintentionally have been excluded from the model. Omitted variables that correlate with one or more of the independent variables will produce a correlation between the independent variables and the error structure, which is a breach of the Gauss Markov assumptions. Some concerns regarding omitted variables are unfounded with our model specification. The Fixed Effects specification removes the heterogeneity problem between regions by looking at variation over time within regions. Therefore, permanent differences between regions that correlate with the error structure do not lead to any bias. The inclusion of time dummies d_t makes for a flexible specification as it controls for all aggregated factors, namely, factors that are common for all regions that affect migration.

The only omitted variables that can cause problems in this analysis are those that vary over time within regions. This could be policies that directly- or indirectly alter the scale and composition of migration inflows and outflows, by affecting who is eligible for a visa to come to the UK (The Migration Observatory, 2015).

Non- EU migrants face other restrictions than EEA citizens regarding immigration to the UK. EEA citizens are free to live and work in any of the member states (the UK is currently still a member) without a visa, as long as they are exercising a treaty right: a

right to work, study or to live independently (The European Union Committee (2017), page 21). International migrants on the other hand, are subject to immigration control, and visas are therefore required. Which visa you should apply for depends on why you want to enter the UK. The UK separates the applicants into five 'tiers'[20], and in order to get your visa you must pass a points- based assessment (Workpermit.com).

Within the time span of this analysis, the British government has introduced changes to the visa system[21] in an effort to reduce migration to the UK. On 21 March 2011 the Home Office (HO) announced major changes to the student visa system, making it tougher for non EU students to enter the UK[22] (GOV.UK, 2011). These policy changes are most likely an important reason why we observe a big fall in student immigration from South Asia. We observe from Figure 5.1 that student immigration from this region decreased from 91 000 student in September 2011, to 32 000 students in September 2012.

Figure 5.1: Student immigration per region
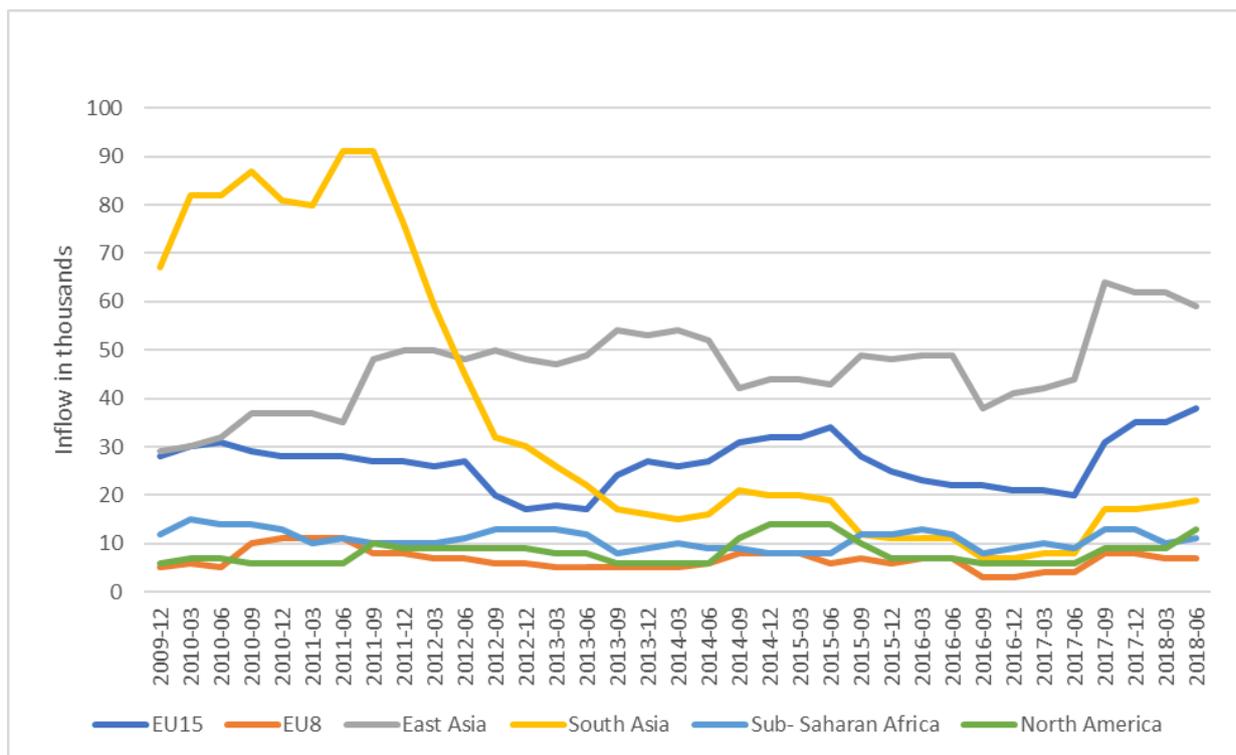
The British government has also made efforts to restrict work related migration. The goal

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[20]See Appendix A2 for an overview of the visa system

[21]The UK government aim to cut net migration to under 100 000.

[22]See Appendix A2.1. to get a summary of the changes facing international students

is to reduce the number of low skilled immigrants to make more jobs available for the UK population. Tier 2 is an "umbrella" that many potential working immigrants fall under. Since its introduction in 2008, Tier 2 immigration has become much more stringent. There has been an increase in the skill requirement and minimum salary threshold[23] (Singhal, 2018). These new laws and regulations with respect to migration will alter international migration flows and potentially produce significant biases to our estimates, if we do not control for them.

To control for new laws and regulations, we will perform a robustness check on each model by including an interaction term between a sub-period dummy- and a region dummy in every model[24]. Results are not robust if they are sensitive to small changes in the model specification.

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[23]The threshold has increased from £20,000 in 2008 to £30,000 in 2017.
[24]sub-periods: 1 = 2008 - 2011, 2 = 2012-2014, 3 = 2015-2018

5.1   The impact of Brexit

Here we present the results from the model in which we look at average effects of Brexit on migration.

Table 5.1: Shift in bilateral migration after referendum

VARIABLES	Net migration	Defjob	Lookjob	Study
	(1)	(2)	(3)	(4)
EU	1.020***	2.929***	2.551***	0.849***
	(0.103)	(0.075)	(0.108)	(0.091)
After	-0.235	0.014	0.158	-0.388**
	(0.179)	(0.130)	(0.195)	(0.159)
After x EU	-0.625***	-0.270**	-0.378**	0.112
	(0.151)	(0.106)	(0.155)	(0.129)
Cons	2.854***	0.721***	0.756***	2.385***
	(0.183)	(0.134)	(0.207)	(0.163)
Time dummies	YES	YES	YES	YES
Region dummies	YES	YES	YES	YES
Sub time dummies	NO	NO	NO	NO
Time Dimension	2008q4 - 2018q2	2008q4 - 2018q2	2008q4 - 2018q2	2008q4 - 2018q2
Obs	220	222	201	222
N	6	6	6	6
R^2	0.6659	0.9236	0.8881	0.8059
Adjusted R^2	0.6378	0.9173	0.8777	0.7897
(*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$)				

We observe that flows have been 1.020 %, 2.929 % 2.551 % and 0.849 % higher in net migration, defjobs, lookjobs and study, respectively, in the EU compared to non EU. After the referendum, net migration, defjobs, lookjobs, decreased by an additional 0.625 %, 0.235 % and 0.378 %, respectively, in the EU compared to outside the EU. Inflows of students decreased by 0.388 % after the referendum in non- EU. This makes no sense as it is counter to what other sources show. This will be discussed in the next chapter. There is no significant difference student inflows the EU compared to non- EU.

Now, we perform the robustness check to the model presented in table 5.1 by controlling for new laws and regulations.

Table 5.2: Shift in bilateral migration after referendum: robustness check

VARIABLES	Net migration	Defjob	Lookjob	Study
	(1)	(2)	(3)	(4)
EU	0.649***	2.882***	2.046***	0.821***
	(0.128)	(0.098)	(0.131)	(0.119)
After	-0.134	-0.030	0.327*	-0.329**
	(0.176)	(0.134)	(0.185)	(0.163)
After x EU	-0.929***	-0.138	-0.843***	-0.065
	(0.192)	(0.143)	(0.190)	(0.175)
Cons	2.978***	0.736***	0.952***	2.395***
	(0.177)	(0.135)	(0.192)	(0.165)
Time dummies	YES	YES	YES	YES
Region dummies	YES	YES	YES	YES
Sub time dummies	YES	YES	YES	YES
Time Dimension	2008q4 - 2018q2	2008q4 - 2018q2	2008q4 - 2018q2	2008q4 - 2018q2
Obs	220	222	201	222
N	6	6	6	6
R^2	0.6972	0.9251	0.9071	0.8081
Adjusted R^2	0.6684	0.9180	0.8973	0.7900
(*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$)				
Note: Interaction between sub-period dummy and region dummy included, not reported				

We perform an F- test in model (1), (2), (3) and (4) for the validity of the interaction term as a valuable extension of the original model. The null hypothesis is that the coefficient in front of the interaction equals zero. We discard the null hypothesis in every case (test results can be found in Appendix, tables A2.2 - A2.5).

Here we observe that flows have been 0.649 %, 2.882 % 2.046 % and 0.821 % higher in net migration, defjobs, lookjobs and study, respectively, in the EU then non EU. These estimates are not too dissimilar from table 5.1. After the referendum in non- EU, inflows of lookjobs increased by 0.327 %, which was not significant in table 5.1, and study decreased by 0.329 % (which is still inaccurate). There has been an additional decrease in net migration and inflows of lookjobs by 0.929 % and 0.843 % respectively, in the EU compared to non EU. These estimates are stronger with respect to net migration and lookjobs compared to table 5.1, but inflows of defjob has ceased to be significant after controlling for new laws and regulations.

5.2   Including independent variables

Here we present results from the gravity models in which we control for the effect of different independent variables on flows.

The log-log specification makes for a straight forward interpretation of the estimated beta coefficients; a one- percent increase in an independent variable will lead to a percent change in the dependent variable by an amount equal to that of the estimated beta coefficient.

Table 5.3: Gravity Models

VARIABLES	Netmig (1)	Defjob (2)	Lookjob (3)	Study (4)
Bonds	-0.0193	-0.085	0.026	0.061
	(0.257)	(0.109)	(0.132)	(0.142)
$Inflation_{uk}$	-0.493	-0.244**	-0.198	-0.201
	(0.361)	(0.061)	(0.309)	(0.126)
Unemployment	-1.381*	-0.996**	-1.426**	0.118
	(0.670)	(0.274)	(0.273)	(0.286)
GDP_{uk}	-0.085	-0.052	-0.070*	-0.068
	(0.058)	(0.038)	(0.034)	(0.046)
Exchange rate	1.118	1.406***	1.733***	0.300
	(0.724)	(0.247)	(0.417)	(0.522)
Cons	4.865**	4.568**	3.518***	3.567**
	(1.158)	(0.505)	(0.777)	(0.979)
Time dummies	YES	YES	YES	YES
Region dummies	YES	YES	YES	YES
Sub periode dummies	NO	NO	NO	NO
Time dimension	2008q4 - 2018q2	2008q4 - 2018q2	2008q4 - 2008q2	2008q4 - 2018q2
Obs	183	185	168	185
N	6	6	6	6
Within- R^2	0.3275	0.4927	0.3102	0.3102
Between- R^2	0.1458	0.0224	0.2523	0.2523
Overall- R^2	0.0441	0.0442	0.2243	0.2243

(Standard errors clustered at region level in parenthesis)
(*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$)
Netmig is net migration, Defjob is inflow of people
coming with a definite job, Lookjob is inflow of people looking for work and Study is inflow of students.

From table 5.3, the relative unemployment rate and exchange rate are the variables with the most significant impact on net migration. Columns (1), (2) and (3) estimate that a 1

% relative increase in the unemployemnt rate causes net migration (netmig), definite job (defjob) and looking for work (lookjob) to decrease by 1.382 %, 0.996 % and 1.426 %, respectively. An interesting observation is that the effect on lookjobs is bigger than on defjobs. Columns (2) and (3) show that a 1 % depreciation of the exchange rate leads to an increase in inflows of defjobs and lookjobs by 1.406 % and 1.733 %, respectively. Column (2) shows that inflows of defjobs decrease by 0.244 % when UK inflation increases by 1 %, and column (3) shows that inflows of lookjobs decrease by 0.07 % when the UK GDP rate increases by 1 %. Sovereign bonds yield insignificant results in all models.

Table 5.4 contains the results from the same robustness check we performed in 5.2, but on the models in table 5.3.

Table 5.4: Gravity Models(bencmark model): Robustness check

VARIABLES	(1)	(2)	(3)	(4)
Bonds	0.248	0.067	0.045	0.358
	(0.192)	(0.121)	(0.196)	(0.149)
$Inflation_{uk}$	-0.394	-0.115	-0.290	-0.143
	(0.296)	(0.075)	(0.276)	(0.106)
Unemployment	-3.037*	-1.505***	-3.202***	-0.195
	(1.116)	(0.288)	(0.429)	(0.214)
GDP_{uk}	-0.070	-0.044	-0.052	-0.051
	(0.058)	(0.027)	(0.036)	(0.041)
Exchange rate	0.525	0.523	2.001*	0.054
	(0.714)	(0.280)	(0.864)	(0.736)
Cons	3.937*	3.055**	4.308*	2.990
	(1.334)	(0.471)	(1.626)	(1.292)
Time dummies	YES	YES	YES	YES
Region dummies	YES	YES	YES	YES
Sub periode dummies	YES	YES	YES	YES
Time dimension	2008q4 - 2018q2	2008q4 - 2018q2	2008q4 - 2008q2	2008q4 - 2018q2
Obs	183	185	152	185
N	6	6	6	6
Within- R^2	0.5494	0.6413	0.4822	0.5167
Between- R^2	0.2501	0.0019	0.2066	0.0019
Overall- R^2	0.0886	0.0011	0.1719	0.0011

(Standard errors clustered at region level in parenthesis)

(*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$)

Note: Interaction between sub-period dummy and region dummy included, not reported

Also here, an F- test suggests that this term is a valuable extension of the model as it

rejects the null hypothesis that the interaction term is equal to zero in every instance with profound margin[25].

The inclusion of the interaction term made some changes to the estimates from the original model. It reduces the variability by rendering many previously significant estimates insignificant. Column (1), (2) and (3) still show significant effects from an increase in the relative unemployment rate. A 1 % increase in the relative unemployment rate now decreases net migration, defjobs and lookjobs by 3.037 %, 1.505 % and 3.202 %, respectively. Inflows of lookjobs are still more sensitive to an increase in the relative unemployment rate than inflows of defjobs. Both the effect from the UK inflation rate and exchange rate in column (2) and the effect from the GDP growth in column (3) have ceased to be significant. In column (3) we see that an 1 % depreciation of the exchange rate causes inflows of lookjobs to increase by 2.001 percent. The effect is higher than in table 5.3, but less significant, at only 10 %. Column (4) still yield no significant results, making the original estimation of that model withstand the robustness check. The robustness check yielded no significant effects from sovereign bonds on flows.

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[25]See Appendix, tables A2.6 - A2.9 for test results

5.3   Responses to pull factors after the referendum

Now that we have established that flows have shifted after the referendum, and what
the general determinants of migration to the UK are, we wish to see if flows are more
sensitive to changes in certain variables after the referendum compared to before. It is
also interesting to see if the variables that yielded significant results in table 5.4 will
yield additional effects after the referendum, or if other variables than the "regular"
determinants of migration to the UK will become increasingly significant after the
referendum. Table 5.5 gives the results from an analysis in which we have interacted all
independent variables with an after dummy and an EU dummy. These interactions are
an extension to the model specification in equation 5.4.

Table 5.5: Extended Gravity models

VARIABLES	(1)	(2)	(3)	(4)
EU	-1.061*	-0.277	-1.370	-0.611
	(0.513)	(0.407)	(0.979)	(0.978)
After	-.565*	-0.055	1.127*	0.049
	(0.267)	(0.365)	(0.449)	(0.205)
EU x After	2.068	-1.334	-1.761	7.256***
	(1.792)	(1.251)	(1.935)	(1.116)
Bond	-0.656*	0.010	-0.332	-0.764
	(0.312)	(0.261)	(0.315)	(0.449)
Bond x EU	1.191*	0.075	0.504	1.183*
	(0.337)	(0.270)	(0.328)	(0.502)
Bond x After	0.456	-0.086	2.116***	0.987
	(0.274)	(0.370)	(0.337)	(0.616)
Bond x After x EU	-2.535***	-1.343	-1.053*	-0.833
	(0.578)	(0.690)	(0.465)	(0.877)
Inflation	-0.195	-0.311*	-0.156	-0.064

VARIABLES	(1)	(2)	(3)	(4)
	(0.312)	(0.142)	(0.244)	(0.257)
Inflation x EU	0.558	0.387	0.489*	0.256
	(0.300)	(0.197)	(0.142)	(0.191)
Inflation x After	0.840*	0.675*	-1.048	0.547*
	(0.412)	0.279	(0.591)	(0.202)
Inflation x After x EU	-1.809**	-0.495*	-0.877**	-0.622*
	(0.534)	(0.246)	(0.234)	(0.258)
Unemployment	0.330	-0.591***	0.012	(0.409)
	(0.261)	(0.136)	(0.509)	(0.582)
Unemployemnt x EU	-1.920***	-0.814***	-1.377**	-0.720
	(0.210)	(0.129)	(0.384)	(0.559)
Unemployment x After	-0.253*	-0.082	-1.011***	-0.496
	(0.109)	(0.141)	(0.173)	(0.281)
Unemployment x After x EU	1.835	-1.557	-0.022	9.536***
	(2.224)	(1.247)	(1.799)	(0.997)
GDP	-0.050	-0.141	-0.092	-0.063
	(0.054)	(0.088)	(0.052)	(0.070)
GDP x EU	-0.029	0.154	0.032	-0.050
	(0.053)	(0.096)	(0.061)	(0.074)
GDP x After	0.215*	0.231	-0.125	0.206**
	(0.098)	(0.138)	(0.098)	(0.078)
GDP x After x EU	-0.047	-0.148	0.121	0.063
	0.069	(0.077)	(0.103)	0.089
Exchange rate	0.366	1.249***	1.258*	0.558
	(0.353)	(0.219)	(0.544)	(0.610)
Exchange rate x EU	-0.881	-0.652	-1.242	-1.558
	(1.290)	(0.571)	(1.811)	(0.866)

Continuation of table 5.5

Continuation of table 5.5				
VARIABLES	(1)	(2)	(3)	(4)
Exchange rate x After	-0.274**	0.028	-0.754	-0.251
	(0.072)	(0.097)	(0.123)	(0.235)
Exchange rate x After x EU	1.826**	-0.180	0.473	2.828***
	(0.622)	(0.310)	(0.429)	(0.169)
Cons	3.648***	3.453***	3.391**	3.482**
	(0.563)	(0.273)	(0.895)	(1.070)
Time dummies	YES	YES	YES	YES
Region dummies	YES	YES	YES	YES
Sub time dummies	YES	YES	YES	YES
Time dimension	08q4 - 18q2	08q4 - 18q2	08q4 - 18q2	08q4 - 18q2
Obs	183	185	168	185
N	6	6	6	6
(Standard errors clustered at region level in parenthesis)				
(*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$)				
Note: Interaction between sub-period dummy and region dummy included, not reported				
End of Table				

From the extended Benchmark models in table 5.5 we observe that a 1 % increase in relative sovereign bonds causes net migration to decrease by 0.656 % in non EU before the referendum. A relative increase of sovereign bonds by 1 % caused inflows of lookjobs and students from non EU to increase by 1.191 % and 1.183 %, respectively, before the referendum. Sovereign bonds have no significant additional impact on defjobs or students in the EU after the referendum. A 1 % increase in relative bond yields causes net migration and inflows of lookjobs to decrease by an additional 2.535 % and 1.053 %, respectively, in the EU compared non EU after the referendum.

In non- EU before the referendum, a 1 % increase in the UK inflation rate causes inflows of defjobs to decrease by 0.311 %. A 1 % increase also casuses inflows of lookjobs to increase by an additional 0.489 % in the EU compared to non EU before the referendum.

A 1 % increase also causes net migration, inflows of defjobs and inflows of students to increase by an additional 0.840 %, 0.675 % and by 0.547 %, respectively, in non EU after the referendum. A 1 % increase causes net migation, and inflows of defjobs, lookjobs and students, to decrease by an additional 1.809 %, 0.495 %, 0.877 % and 0.622 %, respectively, in the EU compared to non EU after the referendum.

A 1 % increase in the relative unemployment rate causes inflows of defjobs to decrease by 0.591 %, but has no effect on net migration and inflows of lookjobs from non EU before the referendum. In the EU, a 1 % relative increase in the unemployment rate causes an additional decrease in net migration, inflows of defjobs and inflows of lookjobs to decrease by 1.920 %, 0.814 % and 1.337 %, respectively, compared to non EU. We also observe that a 1 % relative increase in the unemployment rate causes net migration and inflows of lookjobs to decrease by 0.253 % and 1.011 %, respectively, more in non EU after the referendum compared to before. There is no significant additional effect on migration from a relative increase in the unemployment rate in the EU after the referendum compared to non EU.

There is an additional positive effect from a 1 % increase in UK GDP growth on net migration and inflows of students by 0.215 % and 0.206 %, respectively, after the referendum in non EU.

A 1 % depreciation of the exchange rate causes inflows of defjobs and lookjobs to increase by 1.249 % and 1.258 %, respectively before the referendum in non EU. A 1 % depreciation of the exchange rate causes net migration to slow down by an additional 0.274 % after the referendum in non EU compared to before. We also see that after the referendum, in the EU, there is an additional positive effect by a 1 % depreciation of the exchange rate, where it causes net migration and inflows of students to increase by 1.826 % and 2.828 %, respectively, compared to non EU.

6 Discussion

6.1 Results

In the previous chapter, we established that migration flows from EU regions and non-EU regions shifted after the referendum. In the following, we will look at what has caused this shift, analyzing which migration drivers that has become increasingly significant to determine flows after the referendum. We will focus on relative sovereign bonds as they are connected to political uncertainty. We will also comment on the relative unemployment rate because this was the most significant determinant of migration over the entire focus period, and the link between students and the exchange rate. Model weaknesses and data limitations will be discussed in section 6.2.

6.1.1 Uncertainty after Brexit

It is not controversial to suggest that there has been political uncertainty in the UK after the referendum vote. The outcome was an unexpected shock to UK politics and the economy. The EPU index tries to measure political uncertainty by counting the frequency with which language related to political uncertainty[26] appears in news outlets. In the UK it focuses on 11 outlets[27]. Data from the UK from 2008q4 to 2018q2 give the following graphical dynamic:

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[26]It utilize the number of news articles containing the terms uncertain or uncertainty, economic or economy, as well as policy relevant terms (scaled by the smoothed total number of articles). Policy relevant terms include: 'policy', 'tax', 'spending', 'regulation', 'Bank of England', 'budget', and 'deficit'.

[27]The FT, The Sunday Times, The Telegraph, The Daily Mail, The Daily Express, The Times, The Guardian, The Mirror, The Northern Echo, The Evening Standard, and The Sun

Figure 6.1: EPU index
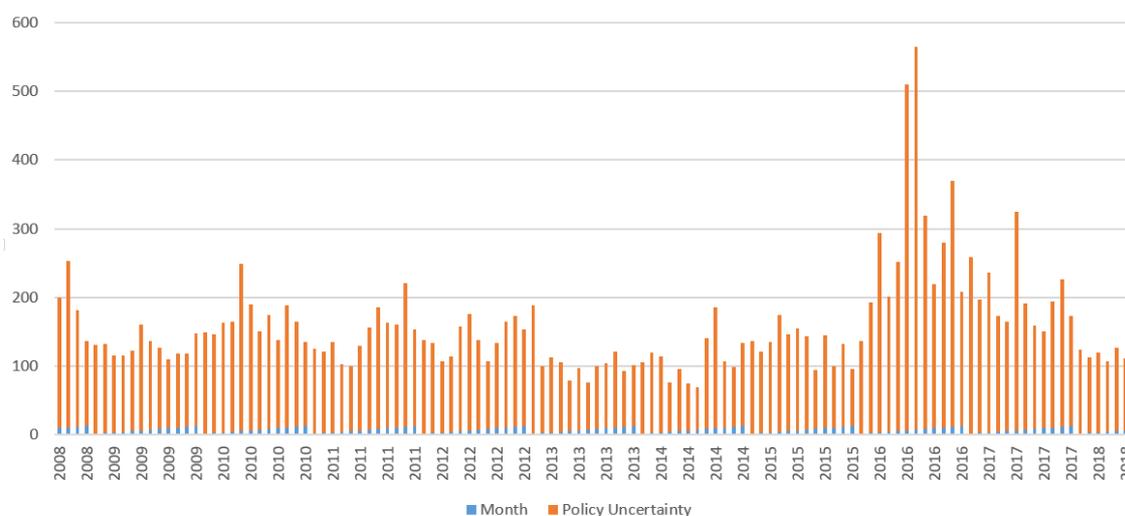
From this figure we see that uncertainty spiked around the time of the referendum, and remained higher until 2018 where it reached normal values[28]. (For more information about the EPU index, visit: http://www.policyuncertainty.com/index.html (EPU, 2019)).

There are big concerns among EU nationals regarding the ongoing negotiations between EU and the UK, and whether they will result in a "no deal" scenario. A "no deal" would put an end to the free movement of labor to the UK for European citizens. In the year following the referendum, nearly 28,500 EU nationals applied to become British citizens, which is an 80 percent increase from the previous year (Office for National Statistics, 2017). A likely explanation is that EU citizens currently residing in the UK are hedging against the outcome of the negotiations.

Stephen Clarke, a senior economic analyst at the thinktank "The Resolution Foundation", said the following about the situation: "While UK politicians are seemingly unable to provide any clarity on where Britain is heading post-Brexit, EU migrants are increasingly doing so – by leaving." (Partington, 2019)

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[28]It has increased after the second quarter of 2018, but that is outside our time period

Figure 6.2: Net migration
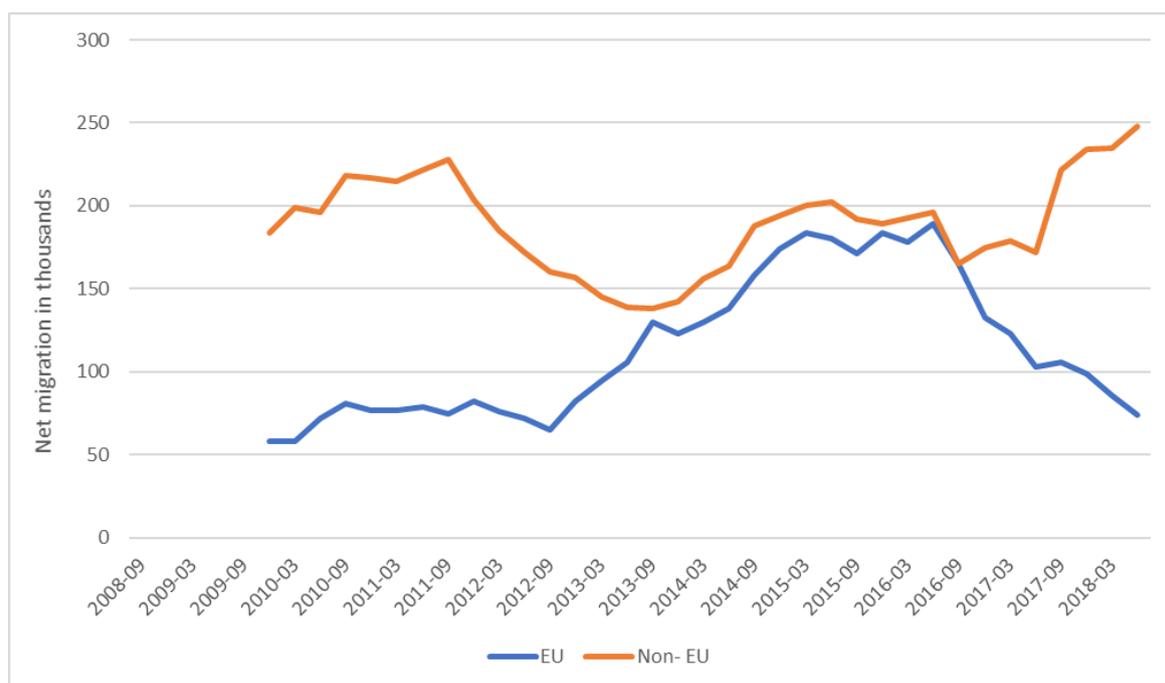
Forte and Portes (2017) found the effect of free movement on bilateral migration flows to the UK to be significant. Bertoli et al. (2016) make similar findings for Germany. We do not have access to data before 2008 and are therefore unable to measure the effect of free movement within the EU on bilateral flows to the UK. We therefore have to rely on previous findings. If we had a longer time period we would have been able to measure the effect of free movement by observing how migration flows from regions that has joined the EU changed after becoming member of the EU[29]. People seem to be responding to a fear that the UK's relationship with the EU will restrict free movement in the future.

The number of migrants who report "definite job" or "looking for job" as a reason for migrating to the UK from outside the EU has increased through out the referendum process. From table 5.2, we see that this is nearly the opposite reaction to what the response has been within the EU. This underscores the point that uncertainty regarding the UK's future relationship with the EU, and consequently, its citizens' right to free movement is imperative in explaining the fall in bilateral migration flows post referendum.

That inflows of EU citizens looking for work has had the sharpest fall, makes sense as they would be most vulnerable to policy restrictions[30]. This decrease in work related migration

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[29]EU2 countries joined the EU in 2007 and EU8 countries joined in 2004.

[30]Unskilled labor is most likely to be affected by the implementation of wage thresholds, as is the core

is compatible with us observing a fall in net migration after the referendum. The Office for National Statistics in February 2019 has observed a similar trend. Despite there being unusually high rates of migration to the UK the year before the referendum, there is little doubt that there has been a significant shift in flows after the referendum.

While students coming from the EU enjoys the same rights as British students, and are a part of the Erasmus+ program[31], non EU students have to apply for a student visa to be permitted into British universities. British universities enjoy a world- class reputation and regularly dominate international university rankings (Study.EU, 2019), which can explain why it is such a popular destination for students. In addition, English is the second most spoken language in the world, and many international students are learning this language as their second language, which reduces the "cost" of studying in the UK compared to many other countries with bigger language barriers. A "no deal" scenario could mean higher tuition fees and loss of financial support for students coming from outside the UK.

6.1.2   Increased impact of migration drivers after the referendum

We have argued that political uncertainty have been much higher after the referendum by showing that the UK suffered from higher than usual volatility in the EPU index after the referendum.

With the extension of the Benchmark models in table 5.5 we observe that an increase in relative unemployment rate has an additional impact on net migration and inflows of lookjobs after the referendum in non EU. There is no additional impact in EU on net migration or inflows of any work related migration after the referendum in the EU compared to outside the EU. Mirroring this to the migration patterns we observe after the referendum, tells us that the most significant determinant of migration to the UK can not explain the changing patterns after the referendum. This shows that there are other drivers that is altering flows in times of uncertainty.

When political uncertainty spiked after the referendum the results we observe from sovereign bonds on net migration and inflows of lookjobs makes it reasonable to argue that

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of the restrictions

[31]Erasmus+ is the EU's program to support education, training, youth and sport in Europe (European Commission (European Commission))

political uncertainty has affected bilateral flows, and work related migration in particular. The absence of a significant impact on inflows of defjobs, suggests that those with more certain job prospects has been less affected by the political uncertainty in the UK than those with more uncertain job prospects. We saw a similar dynamic in table 5.4 where we saw that individuals who move to the UK looking for work are more sensitive to changes in the unemployment rate than individuals who are moving to the UK having already signed an employment contract. Intuitively it makes sense that individuals with more uncertain prospects will be more sensitive to changes that add to that uncertainty. An increase in the unemployment rate is synonymous with difficulties acquiring a job. From this it is reasonable to infer that increases in the unemployment rate decreases the utility of individuals who are looking for work more than among individuals who already have a job. The same argument can be made for the the impact of a relative increase in sovereign bonds. It is a recurring theme that lookjobs respond more strongly than defjobs to changes in migration drivers.

We observe no effect from sovereign bond yields on student immigration. The claim that uncertainty regarding free movement after the referendum has affected inflows of student from the EU negatively, and that general political uncertainty has not scared students form outside the EU is therefore unfounded. Even though students can be affected by the outcome of the negotiations, their response to the outcome of the referendum has been the opposite of workers. From table 5.5 one can observe that there is a strong additional positive effect from a depreciation of the exchange rate on inflows of students after the referendum in the EU. Compared to many other European countries, the cost of living in the UK for students are high as tuition fees at universities is included. As opposed to workers, who gets their salary in local currency, living expenses for students decreases with a depreciation of the currency as their money has to be converted from their home currency.

6.2   Model Weaknesses and Data Limitations

Any source of bias or inconsistency to the estimates that cannot be avoided by changing the model specification is a weakness to the data. In the following we will point to the most central weaknesses affecting our analysis.

6.2.1   Weaknesses with the Fixed Effects method

Using the Fixed Effects Method comes at a price. This model specification only exploits within- variation, discarding time- constant factors that affect migration (for instance the effect of being an English speaking region). Only exploiting variation across the time dimension requires enough variation within regions over time to estimate the connection between our independent variables and migration. This implies that the estimated effect of variables with little within variation will become imprecisely estimated (high standard errors). If the variable also contains measurement errors, the combination of little within variation and measurement errors are a problem in that the estimator becomes biased towards zero (Wooldridge (2017) p. 435-441 and Verbeek (2017) p. 386-388).

6.2.2   Endogeneity

A central assumption behind OLS is the lack of correlation between the error term and the independent variables. A violation of this assumption would cause our estimates to be biased and inconsistent. If one of our independent variables is correlated with the error term, ϵ_{jt}, for any reason, this variable is said to be an endogenous explanatory variable. Unfortunately, we will never know for sure whether the average value of the unobserved factors is unrelated to the independent variable (Wooldridge (2017), p. 76- 77). The three main sources that could cause endogeneity in our analysis is: (i) Omitted variables; (ii) Measurement error and; (iii) Simultaneity. Since we controlled for (i) in the robustness check, we will only discuss (ii) and (iii).

Measurement error

To include variables that contain measurement error, namely, observed values that deviates from their true value, would cause imprecise estimates. As discussed in our data description, our migration numbers are highly based on IPS data. Since IPS is a survey of randomly-selected passengers rather than an actual count, it only yields estimates of migration (Forte and Portes, 2017). This means that changes in reasons to migrate can come from variations in the surveys, rather than changes in real migration. It is therefore realistic that our estimates come with significant errors as well as possible unknown biases. As a

result, the standard deviation of our error term will be bigger compared to a case without measurement errors in the dependent variables.

An important weakness with our data is that it shows an unusual decrease in student immigration estimates for 2016, which has not been seen in earlier comparable non EU-data sources. For instance when looking at visa data[32], it shows that the number of visas issued to non- EU students increased by 9 percent from 2016 to 2017 (Blinder and Fernández-Reino, 2018). These measurement errors directly translates in to inaccuracies in our own estimates where we find that student inflows decreased after the referendum from both EU- and non- EU regions in table 5.1 and 5.2.

The ONS (2018) has stated that the decrease in student IPS data was probably because in 2016 there were fewer interview shifts than expected in September, which is the peak month for student arrivals. Since the student arrivals are clustered in a single month, the errors on IPS student estimates are likely to be higher than for other categories (ONS, 2018). Due to this uncertainty, the Office for Statistics Regulation (2017) has recommended to mark this data as "experimental statistics". One should therefore be cautious making year to year comparisons and instead look at larger time horizons when comparing student immigration.

More accurate estimates would also have made it easier to examine how the uncertainty after Brexit has affected migration. According to population estimates, the number of people born in the EU now residing in the UK increased by nearly 1.5 million between 2009 and 2017. Logically, net migration of EU nationals to the UK should have been approximately the same. However, IPS data shows a net EU migration of only 950,000 (Portes, 2018).

Looking at non- EU migration, we observe a similar discrepancy. While IPS data suggests a total net migration of nearly 1.5 million, population estimates show that people born outside the EU residing in the UK have increased by less than 900,000. Since the IPS counts people by citizenship[33], not country of birth, one would not expect these two series to match precisely. It is also likely that the population estimates contain errors.

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[32]Visa data are actual counts of all visas issued. The data used are for 'entry clearance' and thus will not include people who switch in-country to a student visa from a different visa. Visa data also include people who get visas but never come to the UK – a Home Office (2010) report on students found that, 20 percent of those offered admission and granted a visa did not enter the UK.

[33]This indicates that probably some emigrants are foreign- born Brits

However, Portes (2018) argue that EU migration has been significantly higher, and non-EU migration, significantly lower than the IPS data suggests. This could mean that the implications of Brexit on EU- migration to the UK are even larger than previous numbers suggests. However, since the LTIM (of which the IPS is a principal component) still remains the official source of migration statistics, we rely on this as our main source.

Our independent variables are carefully measured macro- variables where measurement error is highly improbable. Since measurement error in our case is limited to the dependent variables, our estimators will still be unbiased and consistent.

Simultaneity

If dependent and independent variables are simultaneously determined, it opens up for the possibility of certain variables being over- or underestimated. In our paper there could be a simultaneity problem when estimating the effect of both inflation and the exchange rate. A depreciation typically leads to an increase in demand for exports. The law of supply and demand dictates that prices will rise as a result, which leads to an increase in inflation. According to Breinlich et al. (2017), the British pound depreciated by 10 % immediately after the Brexit vote which led to inflation rising by 0.71 % after the Brexit vote. There is an obvious lag effect to this mechanism. We have not used lags, which may cause this problem to be a non- problem as the effects does not have time to manifest itself.

6.2.3   Missing Observations

A frequently encountered problem in empirical work, is that of missing observations (Verbeek (2017), p. 51-52). Ideally speaking, all variables should have an observation for each unit N and time period T. This rarely happens. Since our data set contains missing values in some characteristics, our data set is unbalanced.

There is no optimal solution to get around this problem. One strategy can be to discard any variable with incomplete information. This is a sub-optimal strategy as a substantial amount of information will be lost, and the only way to prevent it is to include all variables with incomplete information. Although this involves a loss in efficiency, it is often the best one can do. Since the missing observations in our data set are properly indicated, our

regression software will automatically calculate the estimator using the complete cases only.

The bias in the estimator will be reduced when the number of time periods increase. As a rule of thumb, the bias is gone when T > 20. Since we have 39 time periods this should not be a problem in our analysis.

The problem with missing observations is much more severe if the observations are not missing at random. We have missing values in the following variables:

- Migration data (including reasons): No data for the first and third quarter of 2009.

- GDP growth: No data on GDP growth for East Asia from 2008 to 2010.

- Sovereign Bond Yields: No data from 2008 to the end of the third quarter of 2011 for South Asia

Since our missing observations are non- random, our sample may be subject to sample selection bias.

6.2.4   Dimension Size

A good panel data set capable of delivering unbiased and consistent estimates, needs a sufficient time- and unit dimension (T > 20 and T < N). The latter is not present in our data and is a potential source of bias. Our unit dimension is not as fragmented as it could be. Ideally, our unit dimension would be countries, not regions. This would enable us to correct for more of the unobserved heterogeneity and give us more credible estimates.

6.2.5   Is dyadic decisions a valid assumption?

The first thing we do in the methodology chapter is to assume dyadic decisions and present the underlying micro- foundation that is powering the gravity model as if that assumption is valid. In Beine et al. (2016) they point out that this assumption is overly rigid and continue to build on this foundation in an effort to arrive at a structure that can support more flexible assumptions about the nature of migration[34]. In the literature review we

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[34]Here we are talking about Multilateral Resistance to Migration and the serial and cross- sectional correlation that is powering it.

discussed the issue of MRM, and identification strategies to get around it. In order for MRM to be a significant problem you need a rich variety of alternative destinations, whose relative attractiveness influences ones decision to go to the UK. Pesaran (2006) says that for N < 10 one can rely on more ordinary methods, even in the presence of cross- sectional dependence. Just because we have a small unit dimension does not mean MRM is not present in our data. It may be the case that some students from East Asia actually wanted to study in America, but because of the US presidential election in 2016 ended up going to the UK. This would be an example of MRM as there is an external force influencing the decision to go to the UK from East Asia. However, because of a small unit dimension this problem is scaled down considerably. Having N < 10 made us decide against using the CCE model. The reason for making this argument and not completely disregard MRM as an issue is because the only reason we are able to rely on the simple FE specification is due to a small unit dimension. If we had had a good panel with a proper unit dimension, we would have made an over- simplification in assuming dyadic decisions and relying on simple FE specification. The weakness of having a small unit dimension propagates through out the entire analysis, and forces us to rely on a substandard model for our analysis.

7 Conlusion

The aim of this thesis has been to investigate how migration flows to the UK have changed after the Brexit referendum, and to study potential changes in the responsiveness to migration drivers. To do that we used a simple Fixed Effects Model. Our analysis shows that after the referendum, overall net migration from the EU has fallen, while it has continued to increase from outside the EU. In the general analysis of the determinants of migration, we find the unemployment rate to be the most significant determinant to migration, and that it has affected lookjobs more than defjobs. When we looked at changes in the responsiveness to migration drivers after the referendum, the unemployment rate yielded no additional effects. Here we see that sovereign bonds had a significant additional effect on net migration and inflows of lookjobs in the EU, suggesting that political uncertainty after the referendum has affected migration flows. Students did not become more sensitive to sovereign bonds after the referendum in- or outside the EU. Students from the EU has responded more positively on the depreciation of the exchange rate than outside the EU. This suggests that they have not been as affected by the political uncertainty as workers, but responded to lower costs associated with studying in the UK.

In conclusion, our analysis shows that flows have shifted after the referendum, and that the unpredictability of the current situation for EU nationals with respect to the UK future relationship with the EU is the root cause of this shift.

Having a larger time period before the referendum is another factor that would have been useful in measuring the effect of free movement on bilateral migration to the UK. Having a larger time horizon would allow us to look at regions before they joined the EU and gained the right of free movement, to see if the inflows from these regions increased after becoming members. For instance the Government's decision to open the UK labour market to East European workers in May 2004 led to a large increase in flows from the EU8 countries (Czaika and de Haas, 2017).

It would also be interesting to do this analysis with country level data. Having data on bilateral migration flows from countries would allow for a more detailed and precise analysis of the determinants of migration to the UK, as we are able to control for more of the unobserved heterogeneity when we deal with countries, not regions. The last thing we

discussed in Chapter 6 was the rigid assumption of dyadic decisions upon which we have built our entire analysis. In the future it would be interesting to repeat this project with a panel that would support a richer structure of fixed effects. Employing a CCE model to this analysis would allow us to determine whether MRM is a significant presence in the migration dynamic to the UK.

If the negotiations reaches an agreement that changes the UK's relationship with the EU with respect to free movement of labor, it would be interesting to repeat this analysis in a few years. That would allow for an analysis of bilateral migration under three different states; (i) No uncertainty and free movement before the referendum, (ii) Great political uncertainty regarding free movement, and (iii) one period with no uncertainty, but limited, or no free movement of labor. In this thesis, we have only been able to look at the difference between (i) and (ii).

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Appendix

A1   Main reasons for immigration

Figure A1.1: Main reasons for migration inflows
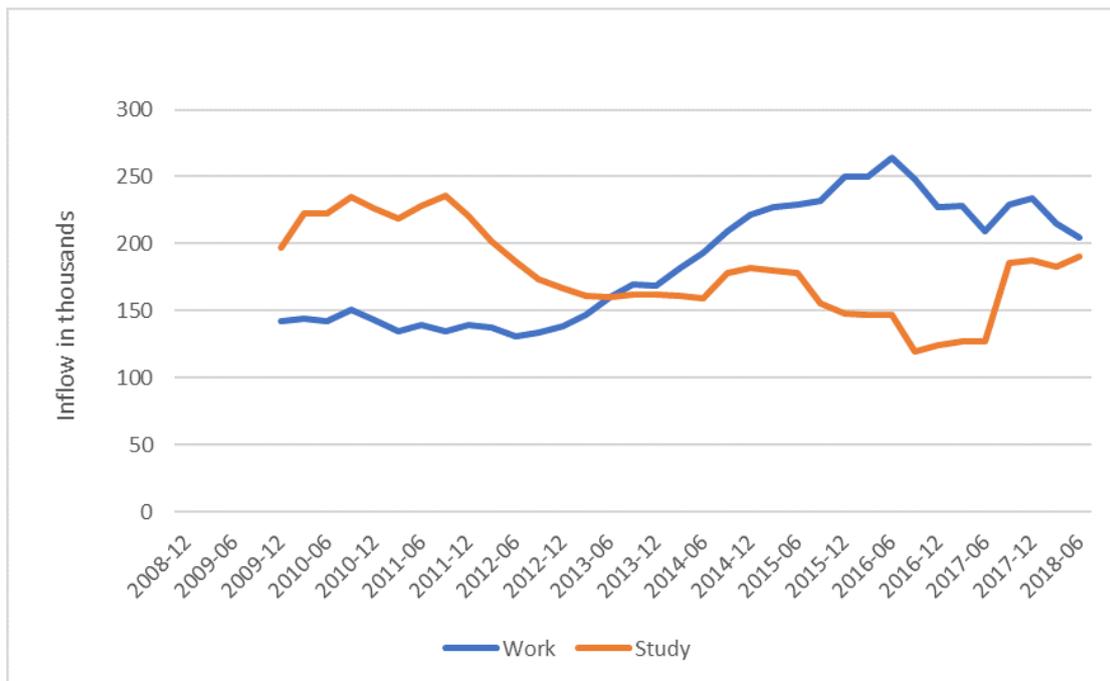
"Work" includes migrants coming to the UK with a definite job and migrants looking for work

Figure A1.1. provides a graphical representation of how work related migration (the migrants coming with to the UK with a definite job and the migrants coming to look for work) and study related migration has evolved over our time period. Studying was the most common reason for entering the UK from mid 2009 to June 2013, until work related reasons took over.

A2   The UK Visa System

Currently, the UK is using the following visa system[35](Workpermit.com):

- Tier 1 Visa: This visa category is for 'high-value migrants' from outside the EEA and covers entry of investors, and those very few people who come under the 'exceptional talent' visa.

- Tier 2 Visa: This category is for 'skilled workers'[36]

- Tier 3 Visa: This category was designed for low-skilled workers filling specific temporary labour shortages. The Government has so far never allocated any visas under this scheme, and it is not possible to apply.

- Tier 4 Visa: This category is for students aged over 16 from outside the EEA who wish to study in the UK.

- Tier 5 Visa: The Tier 5 visa allows entry to work in the UK in a number of different circumstances, such as for charity workers, entertainers, diplomatic staff, and sport athletes. Most Tier 5 workers need a job offer from a licensed Tier 5 sponsor in the UK, but people from one of the countries[37] whose nationals can come under the Youth Mobility Scheme(YMS)[38] can gain entry without a job offer.

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[35]Some of these visas allow you to apply to bring dependants such as children and partners

[36]In order to be classed as a skilled worker, you must have completed vocational training, completed higher education or have special qualifications from outside the EEA with a job offer in the UK (UDI).

[37]These countries include: Australia, Canada, Japan, Monaco, New Zealand, Hong Kong, Republic of Korea and Taiwan

[38]YMS is a visa that gives you the right to live and work in the UK for up to 24 months for people aged 18 to 30. You can enter the UK at any time while your visa is valid, and leave and come back at any time during your stay (GOV.UK)

A2.1   Changes in the Tier 4 Visa

From April 2012, all institutions wanting to sponsor international students would have to be classified as 'highly trusted sponsors'(GOV.UK, 2011).

One of the criteria of getting the Tier 4 Visa is namely that you can proof that you have enough money to pay for the first nine months of living costs in the UK, together with student fees. The amount of finance required to satisfy this criteria depends on whether you are studying in London or outside the city.

On April 2012, the Government increased the monthly amount required to cover living costs from 800 to 1000 pounds for students studying in London, and from 600 to 800 pounds for students studying outside the city (Home Office, 2012). This meant that students staying for nine months or longer had to show proof of 1800 pounds more when arriving the UK in order to obtain a visa.

In order to meet this financial criteria, students can apply for a financial sponsor. However, as a result of the new classification system, 836 education providers[39] lost their licences, preventing them from sponsoring non- EEA students[40] (Blinder and Fernández-Reino, 2018)

After April 2012, those coming to study at degree level also had to speak a higher level of English. The UK Border Agency became able to refuse entry to students who could not speak English without an interpreter and who therefore did not meet the required standards. From April 2012 it was also placed restrictions on work, with among other things the closing of the "post study work route", which allowed students two years to seek employment after their course.

Only those graduates having an offer of a skilled job from a sponsoring employer, in Tier 2 of the points- based- system, would be able to stay for work after the closing of the "post study work route" (GOV.UK, 2011). These new restrictions were introduced to prevent abuse of the student visa route, particularly the scenario where non- EEA migrants move to the UK under a formal study visa, when they are actually there to work. Student visas are temporary, which means that they do not provide a direct legal route to settlement.

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[39]This happened between 1 May 2010 and 7 October 2014
[40]They were not prevented from sponsoring domestic or EEA- students.

According to data published by the Home Office, only 14 percent of the people who had a student visa at the end of 2011 still had a valid leave to remain in the UK five years later (Blinder and Fernández-Reino, 2018).

The Home Secretary at that time, Theresa May, said the following about the new rules: "International students not only make a vital contribution to the UK economy but they also help make our education system one of the best in the world. But it has become very apparent that the old student visa regime failed to control immigration and failed to protect legitimate students from poor quality colleges.The changes I am announcing today re-focus the student route as a temporary one, available to only the brightest and best. The new system is designed to ensure students come for a limited period, to study not work, and make a positive contribution while they are here." (GOV.UK, 2011)

A2.2   The current financial system for international students

Table A2.1: The finance required to satisfy the points- based assessment

Length of course	Where you will study	Finance needed
9 months or less	London- based	£1020 for each calendar month
9 months or less	Outside London	£820 for each calendar month
9 months	London- based	£9180 to cover the first 9 months
9 months	Outside London	£7380 to cover the first 9 months

This is the current working financial criteria for international students, and together with this comes full course fees for the students studying for 9 months or less, and first years of fees for the students staying for more than 9 months (Cambridge Education Group).

A2.3   Robustness check F- test

Here we give the test results in which we tested for the significans of the sub- period
dummy/ region dummy interaction in table 5.2. We tested for each model.

Hypothesis: $\rho = 0$

Table 5.2

Table A2.2: F- test Net Migration

$F(4, 200) = 88.53$
Prob $> F = 0.000000$

Table A2.3: F- test Definite job

$F(4, 202) = 215.63$
Prob $> F = 0.000000$

Table A2.4: F- test Lookjob

$F(4, 201) = 3.63$
Prob $> F = 0.0071$

Table A2.5: F- test Study

$F(4, 202) = 191.32$
Prob $> F = 0.000000$

Table 5.4

Table A2.6: F- test Net Migration

$F(5, 5) = 3404.75$
Prob $> F = 0.000000$

Table A2.7: F- test Definite job

$F(5, 5) = 8663.53$
Prob $> F = 0.000000$

Table A2.8: F- test Lookjob

$F(5, 5) = 1479.15$
Prob $> F = 0.000000$

Table A2.9: F- test Study

F(5, 5) = 757.07
Prob > F = 0.000000

A3   Exchange rate movements

The following graphs show how the British pound has moved against the other currencies in our sample.

Figure A3.1: GBP/EUR
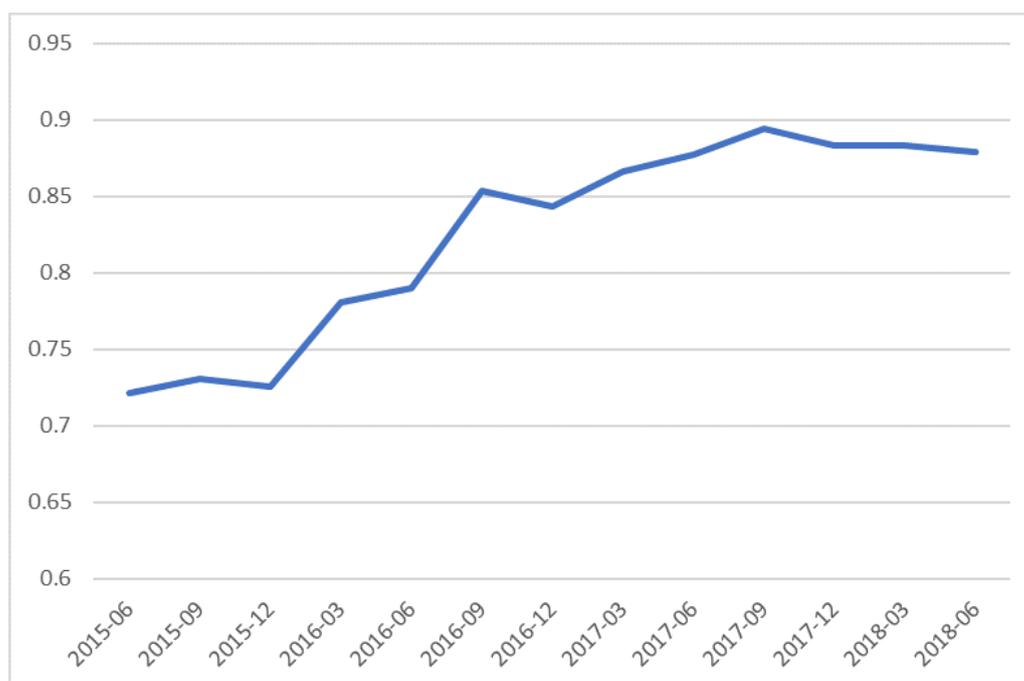
Figure A3.2: GBP/PLN
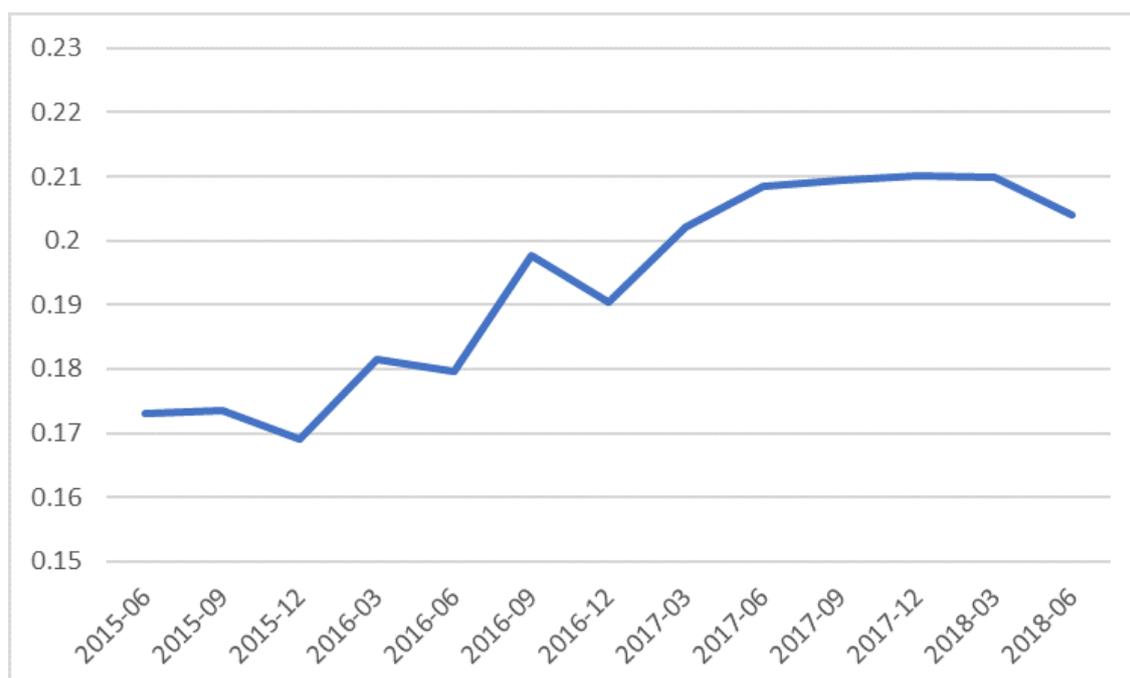
Figure A3.3: GBP/CNY
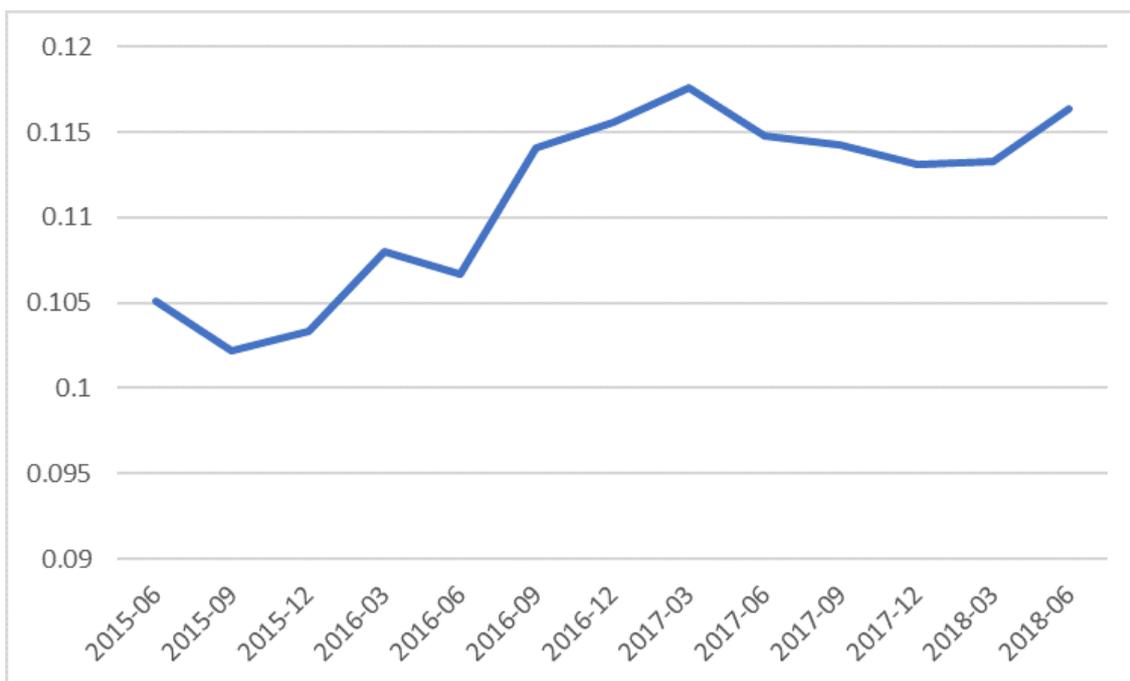
Figure A3.4: GBP/INR
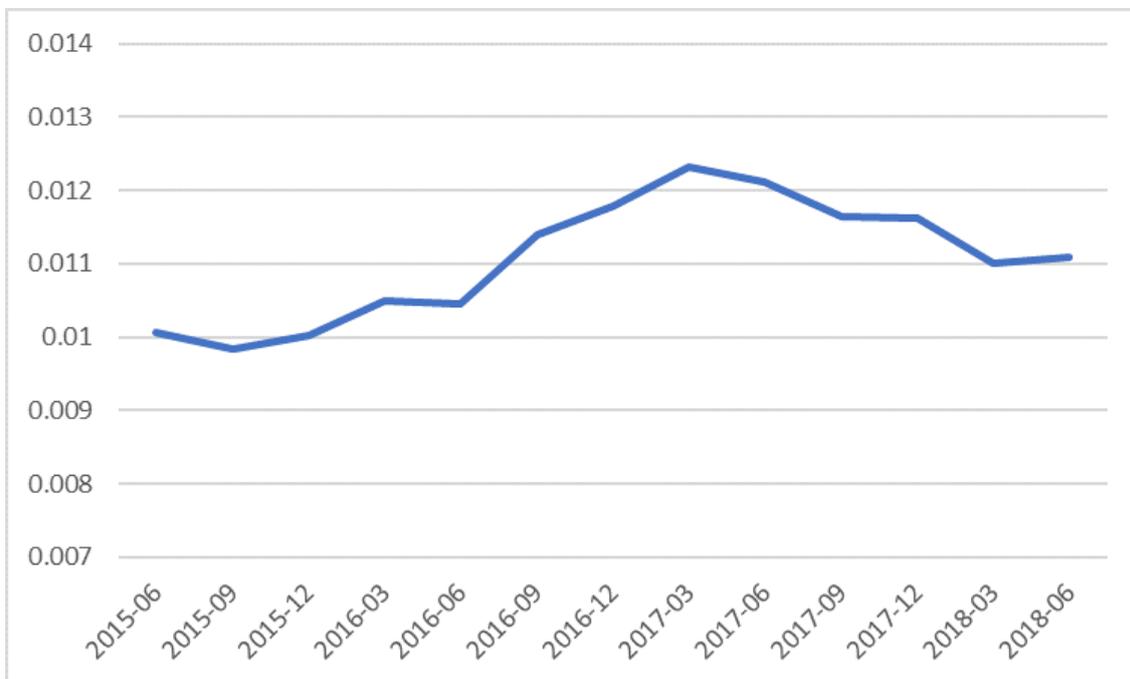
Figure A3.5: GBP/ZAR
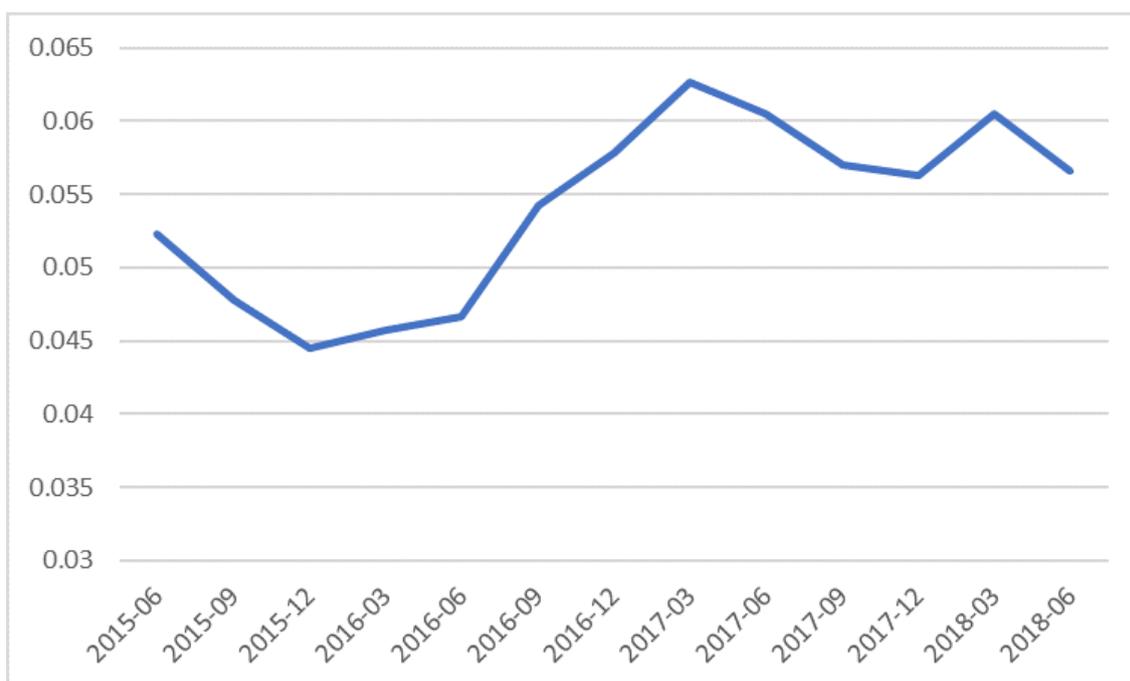
Figure A3.6: GBP/USD
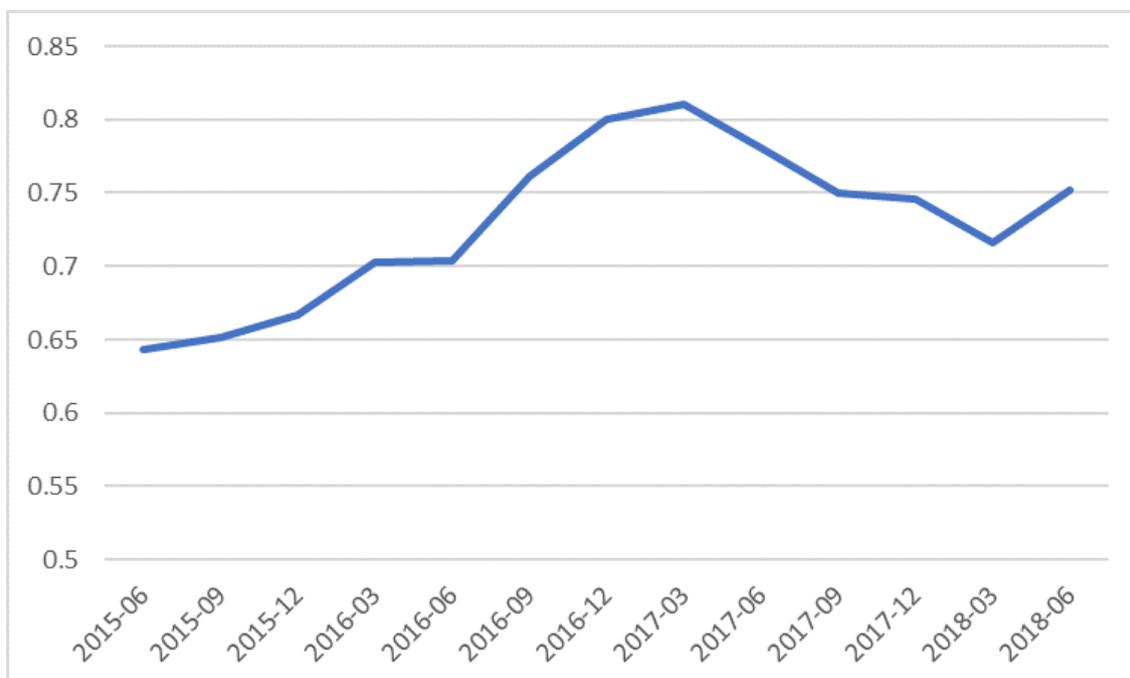
A4   Bond movements

Figure A4.1: Bond yield UK