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# The Brexit Impact on Inward FDI in the UK

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## Abstract

This paper examines the potential Brexit impact on inward FDI (foreign direct investment) through its potential impact on the variables of the benchmark characterising the macroeconomy. Therefore, we propose to use automatic structural vector regression of Markov system change to distinguish between fluctuating and steady-state states of economics and compute, among others, the contemporary effects that FDI frequency innately generates. Our finds propose that Brexit leads to a depreciation of the pound sterling in the present economic ambience, which will lead to a long-term negative impact on foreign direct investment. The FDI inflows might be affected positively (at most) by the post-Brexit depreciation of the pound sterling only if this circumstance drove the UK economy into a period of inflation, highly volatile growth, interest rates and exchange rates: a rather unlikely scenario. Until then, the benefits of a lower pound sterling will only last for a short time.

**Keywords:** Brexit; Currency volatility; Economic growth; Inward investment; Markov switching; Structural vector auto-regression

**JEL-Classification:** C32; E65; F21; F23; O52

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\* To our heroic NHS staff, always go over and beyond their call of duty. You are quick in action and cooperative. Please keep up the spirit. I like to express my gratitude, in particular, to King's College Hospital Hepatology Department for the tremendous effort in treating me from this insidious disease after so many years of agony, pain and suffering. My special greetings and sincere respect to Dr Abid Sadel, Dr Wayel Jassem and Dr Ali Amir, Dr Carol Gayle.

## 1 Introduction

Since the UK's exit ("Brexit") from the EU referendum, there has been a lot of comment about the potential nature of the UK's trading relationship with the EU countries and the rest of the world. However, despite its importance to the UK economy, the impact on foreign direct investment (FDI) received little comment during the referendum debate, and only recently have the positions of Japanese automakers in the UK come into focus. This is even though 40 years ago the UK was not open only for domestic investment but highly sought after for foreign investment in all sectors. Many British and non-British companies have seized the opportunity to develop supply chains that cross to and from the UK many times over. The location of these funds and the UK's ability to continue to pull inward FDI is probably to be one of the most important economic aspects of Brexit.

It is well known that the UK has a long-standing trade handicap, but what has received much less attention is the extent to which the negative long-term effects of this have been offset by the amount of inward FDI the UK is attracting. To date, any analysis of the potential impact of Brexit in terms of geolocation decisions has focused on seeking to explore the extent to which these decisions have historically been affected by the United Kingdom's membership in the European Union. A more targeted approach is to explore the short-term and long-term dynamics of FDI in the UK and use them to infer the implications of Brexit. This is the approach we propose. Thus, the purpose of this paper is to explore the potential impact on inward investment in Brexit, with a particular focus on distinguishing between the long-term drivers of inward investment in the UK, also and the impact of short-term volatility.

This is a very timely issue. In the lead-up to, and since the referendum on UK membership of the European Union in June 2016, a debate has developed within the academic literature, but notably in the popular press, regarding the potential impact on the UK economy. A looser relationship between the United Kingdom and the European Union, through Brexit (see for example Crafts (2016)). However, the focus of this debate, even 20 months after the referendum, has been on influencing

Trade focuses on the trade of imported goods, rather than, for example, the importance of value chains that cross countries, sometimes multiple times. It now seems that politicians are waking up finally to the significance of inward investment after, for example, the warnings of the Japanese ambassador.

The significance of this matter stems from the fact that Brexit will be the first example of a developed economy leaving the customs union, but also from the fact that inward investment is of particular importance to the UK economy. The United Kingdom is one of the largest, if

not the most open economies in the world, and has long run a notoriously low trade deficit. However, this is largely disguised by the amount of inward FDI that the UK is attracting (Fig. 1). In many sectors, more than 50% of value added in the UK is generated by foreign-owned companies, and all in all, more than 50% of R&D in the UK private sector is foreign-owned. Because of this, supply chains in many high-value sectors are dominated by foreign firms, and thus, many regions of the UK depend on inward investment for economic development.

More importantly, interestingly, Brexit raises a more general issue that the literature on FDI has not yet addressed. In particular, there have been a large number of papers focusing on the impact of joining a free trade area or customs union and especially the European Union; We still know surprisingly little about moving back, leaving a free trade zone or a customs union, since noteworthy examples are too few to draw even speculative conclusions. (Seychelles and Madagascar left the SADC for a period and are members of the Central European Free Trade Agreement when a country joins the EU. To our knowledge, these are the only examples of countries that have left the customs union). The approach, which has been advanced at times by politicians in the run-up to the referendum, and indeed by some for the 12 months leading up to the 2017 UK general election but rejected almost unanimously by policymakers, academics and the popular press would only be an assumption that the impact would be on Foreign direct investment is simply zero, with new opportunities offsetting any adverse effects. However, what might happen to (inward) foreign direct investment is more than an important concern; It is a basic economic criterion for deciding whether or not to stay in a free trade area or customs union. Given that the country contemplating such a move is the United Kingdom, and the union that includes it is the European Union, having a framework for studying how a foreign direct investment might react to such an event is as appropriate an issue as ever could be.

Furthermore, although relevant literature has begun to develop about Brexit and inward investment, this only extends the literature on spatial distributions of FDI to the issue of Brexit (see for example Bruno et al. (2016) or Simionescu (2017)). Specifically, the aim thus far in this literature has been to quantify the (positive) 'EU effect' in explaining FDI in the UK and, by doing so, to infer the (potentially negative) impact post-Brexit. However, this reasoning is terrifying, as it is likely to underestimate the impact of the competing attraction that the UK has to compete with the EU on foreign investment, but also the impact of the volatility regime through which the UK will leave the EU and whether this event will affect it or not. This has been ignored, for example, by Gudgin et al. (2017) in their analysis of the effects of Brexit. In this respect, by proposing to study the dynamics of inward FDI to the macroeconomy using the structural autoregressive (SVAR) model, we provide a more complete picture of the

impact of Brexit on inward FDI.

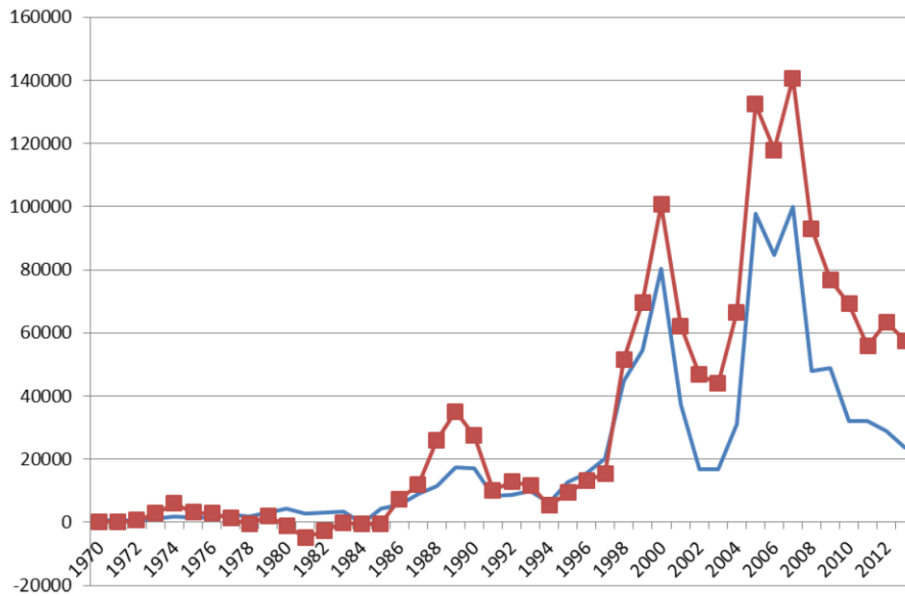
Specifically, we adopt the SVAR framework for switching the Markov system of Ehrmann et al. (2003) departs significantly from the existing FDI literature in several ways but does so primarily for three reasons: first, to distinguish between periods of economic stability and periods of economic uncertainty, an advantage, apart from the fact that it enables reasonable guesses about the economic environment post-Brexit, it allows us to treat economic uncertainty as a systemic feature rather than an exogenous variable; second, to capture the contemporary impact of structural shocks, a critical feature given the low frequency (quarterly) of FDI measurement, which, surprisingly, has not been raised as an issue in this literature; Third, to address the problem of having to deal with structural trauma compounds to which the microform of VAR is subject, an essential feature of isolating the impact of different macro variables. (This third point is also the reason why SVAR models were developed in the first place, i.e. incorporating into theoretical models (structures) the new performance of VAR (theoretical) models when classifying data and making predictions.) As a result, it becomes so. A robust analysis is possible of how shocks to each macro variable in isolation affect FDI inflows. Then, the question about the potential impact of Brexit on inward FDI can be divided into the question of whether or not Brexit will push the UK into a period of economic uncertainty and the question of how the shocks of various macro variables will affect domestic foreign direct investment in each period. Thus, we offer an approach that seeks to deepen our understanding of FDI flows, their drivers and how they enter a macroeconomic context, which is also essential when it comes to discussing a multifaceted event such as Brexit.

Using macroeconomic data since the 1960s, we show empirically that the greatest changes in the structure of inward investment have been caused by currency fluctuations and economic uncertainty. This is perhaps not surprising when we consider how FDI is funded, and those entry decisions are essentially based on the difference between the cost of investment (which one assumes the parent incurs initially in its home country) and the discounted cash flow from that investment, which is earned in local currency. When our results are used as the prism through which to portend the effect of Brexit on the UK's inward FDI, we find that, if Brexit triggers a sterling depreciation in the current economic climate, this will fuel a prolonged negative effect on inward FDI. Inward FDI flows may be positively affected only by sterling depreciation after Brexit if the latter drives the UK economy to a period of highly volatile growth, inflation, interest and exchange rates, which is a scenario, that is rather unlikely. And, even then, the sterling depreciation benefits cannot last long.

The rest of the paper is organized as follows. Section 2 places our work within the FDI time

series literature and Section 3 provides some theoretical considerations about examining the FDI aspect of Brexit. Section 4 presents our model whereas Section 5 presents our econometric methodology. Section 6 discusses our empirical results. Finally, Section 7 contains our concluding remarks.

**Figure 1:** When the UK trade deficit masks inward FDI: the UK quarterly trade deficit (in billions of pounds sterling); FDI inflows into the UK (in billions of pounds sterling)



## 2 FDI Literature Overview

The literature on time series analysis of FDI flows into the UK, or indeed on time series analysis of FDI data at the macro level more generally, has made surprisingly little progress since the analysis of Barrell and Pain (1997). Typically, this sought to address two classes of problems. The first, often within Granger's standard causal framework, involves estimating the relationships either between FDI and trade or between FDI and economic growth (see for example Nair-Reichert and Weinhold (2001)). The second, largely within the standard univariate time series setting, relies on Barrell and Pain (1997) to identify determinants of FDI in or from a given country (see for example Basu et al. (2003)). In this regard, the preparation of the multivariate time series that we propose here seeks to build on existing literature following the work of Shan (2002), De Santis et al. (2004) and, more recently, Tolentino (2010). This setting evolved from Tolentino's (2010) critique of the existing literature, regarding

*“Weak assumptions about uniformity and homogeneity of variables; and additional definition problems arising from time constraints when variables are the same as policy expectations.”*

In particular, we propose two methodological innovations in the empirical analysis of FDI flows. The first step involves using structural modelling rather than a VAR micro-model. This enables us to isolate the effect of (structural) shocks on FDI (by contrast, error terms in the shorthand form of VAR are components of structural shocks and thus may be misleading as to the impact of each variable on FDI). Equally important, we can determine the contemporary impact of other variables on FDI. This is particularly important for data with a low sampling frequency (FDI data is released every quarter but it is unlikely that the effect of other variables on FDI will be very slow, which in turn means that at this low frequency, it will inevitably appear as contemporary). The second involves using a Markov system switching approach to capture uncertainty. In other words, rather than incorporating economic uncertainty into our model through some proxy variable for volatility, we consider it a systematic feature of the economy that manifests itself through changing the influence of the studied variables on FDI. In this way, we can account for a large class of potential nonlinear factors, including for example structural changes or the periodicity of business cycles, which is also a very attractive characteristic when trying to measure the impact of multifaceted events such as Brexit, with pronounced increases in volatility and economic uncertainty. (among other types). The remainder of this section discusses another major factor influencing FDI that we also account for in our model, which is currency fluctuations.

### ***The Currency Fluctuations' Importance***

Existing literature explores the importance of both the level and volatility of exchange rates in explaining FDI (see for example Pain and van Welsum (2003)). The literature discusses, though largely failing to isolate, the competing forces arising from exchange rate fluctuations. The basic premise is that, on the one hand, raising a country's exchange rate may deter foreign investors as it becomes nominally more expensive to invest in the home country's currency. On the other hand, currency appreciation increases the nominal value of the assets held by the host country and potentially increases future discounted earnings flows to foreign investors (in domestic currency) thus foreign investment retention becomes more likely. These competing relationships explain why researchers such as Görg and Wakelin (2002) have not been able to determine the nature of the relationships between FDI and currency fluctuations, and why Pain and van Welsum (2003) referred to the 'Gordian knot' in terms of the relationships between currency fluctuations, and in terms of the modelling identification problem.

However, although the current literature is somewhat contradictory, what is clear is that currency volatility, and currency uncertainty, have been associated with changes in FDI in different contexts. This issue has been explored in the most recent literature that explores the

relationship between currency fluctuations and uncertainty that may inhibit foreign direct investment. Boateng et al. (2015) provide a recent example of this topic, arguing that of the two competing effects that exchange rates may have on FDI, they expect that the initial cost associated with currency appreciation outweighs the potential for greater returns over time, although they concede that this is an empirical question. Blonigen (1997) extends this argument, allowing for the possibility that different forms of RMS currency may respond differently to shocks in currency movements. In turn, he found a strong inverse relationship between currency movements and foreign direct investment coming to the United States of America. This is a similar result of the work of Goldberg and Kolstad (1995) who argued that when PE firms engage in FDI to achieve the lowest cost location for a particular activity, currency uncertainty inhibits FDI. Currency uncertainty, unlike what we do here, is not viewed as an effect of the state of the economy at specific points in time.

Thus, the key question in the aftermath of Brexit is how uncertainty will play out, in the periods before and after the British government invokes Article 50 of the Lisbon Treaty. For example, there is an expectation that the pound sterling will be more volatile and prone to devaluation. (To some extent, this scenario materialized immediately after the announcement of the referendum results, but it remains to be seen whether or not this characterizes the post-Brexit period. Therefore, a pivotal aspect of our analysis and our contribution to it is the impact of this uncertainty on investment Foreign direct, short and long-term.

The basic arguments are summarized in Russ (2004). The relationships between exchange rates, foreign direct investment, and exchange rate volatility depend on the nature of the shocks affecting exchange rates. Ross (2004) showed for example that where volatility originates, the source of volatility determines the response in terms of FDI inflows, something not addressed in the literature discussed above. This develops Campa's (1993) earlier argument that the exact nature of the relationship between currency volatility and FDI depends on the nature and level of sunk costs required to facilitate entry into the host country, which itself is a function of the expected level of currency volatility. The conclusions of Ross (2004) are particularly relevant to the Brexit debate because they highlight that not only fluctuations in the real economy, but the source of that volatility are likely to influence the relationship between currency fluctuations and foreign direct investment. This issue has been explored in more detail by Chenaf-Nicet and Rougier (2016). The analysis here is similar to that of gross capital flows. For example, Lin and Melissi Ferretti (2012) explored the impact of the recent financial crisis on aggregate flows using a cross-country model. Its basic premise is to relate exchange rates—elasticity—to current account volatility and to explore the role that capital flows play in this adjustment. They found that in countries with exchange rates



pegged, post-crisis adjustment occurred through a change in “non-bank private flows” and that countries with large current account deficits experienced large-scale capital inflows. This suggests that, in terms of the relationship between currency fluctuations, the relationship between customs union membership and foreign direct investment deserves further study.

In addition to understanding the broader issue of Brexit, we seek to develop existing literature that explores the relationship between currency volatility and FDI flows. Much of the recent literature in this area addresses the impact of the euro, either in terms of the overall impact of foreign direct investment in the European Union or terms of euro membership in a particular country. However, recent literature seeks to distinguish between the influence of the Euro and that of the European Union in terms of explaining FDI inflows. This is essentially an empirical extension of the work of Flam and Nordstrom (2008) based on the theoretical foundations of Goldberg and Kolstad (1995) and this line of analysis highlights another important aspect of our contribution, namely that we seek to separate fluctuations in FDI inflows from Fluctuations that arise elsewhere in our model. Denja and Dengova (2011), for example, try to distinguish between the influence of the euro and that of the European Union in explaining FDI flows. Dinga and Dingovac (2011) show that while the influence of the euro decreases where one allows for heterogeneity between countries, the influence of the European Union is positive and stable in explaining bilateral FDI flows. This suggests that there are two components to the positive impact of UK membership in the European Union on FDI inflows. First, there are trade creation effects, which are linked to attracting foreign direct investment into the EU, as Serbian companies can serve EU markets. In addition, there is a positive effect of FDI within the EU, as companies perceive greater certainty in relations between countries and institutions when seeking to locate certain activities.

In theory, this links the time series literature on currency volatility more coherently to the theoretical literature on FDI decisions. For example, Schiavo (2007) found that building on the foundations of FDI was eg Markusen and Venables (1998), who argued that customs unions have a positive impact on FDI by reducing currency uncertainty. Essentially this is an extension of the theoretical approach, treating customs unions or currency unions as a way to reduce transaction costs and expand the borders of the PRC (see for example Horstmann and Markusen (1996)).

In general, therefore, we seek to develop this literature in two ways. First, we treat volatility as a systemic feature. This is an empirical challenge that has been recently addressed in the macroeconomic literature with Markov transform SVAR models that we propose as a fruitful approach. We stress that Brexit will generate volatility in the pound sterling which will in turn lead to more volatility in FDI inflows, at least for a relatively short period. As such, it is

essential to be able to treat volatility as a systematic feature of economics rather than just one of the explanatory variables. As we show below, this is important both theoretically and methodologically in light of the question posed. Secondly, although the underlying long-term trend in FDI is interesting, we build on the huge literature on FDI that indicates that there is a high degree of stability in FDI inflows at the republic level, sectoral level, and even at the national level. aggregate, so that any instability in foreign direct investment flows leads to a decline in the short term.

### **3 The importance of Brexit for FDI**

As is well understood, inward investment is of vital importance to the UK economy, not least because of the jobs created by foreign companies, often in areas with high unemployment. Not surprisingly, there are microeconomic-based debates regarding the effects of training, productivity implications and secondary employment, but perhaps the most important contribution that FDI makes to the economy is in mitigating the effects of a semi-permanent trade disruption (see Figure 1). In this regard, Brexiteers often comment on how trade will not be affected, as long as the UK will remain within a more flexible trade arrangement with the EU, assuming clearly that inward investment will remain unchanged. However, these discussions are essentially taking place in a vacuum, given the paucity of knowledge about the drivers in the diversification of FDI in the UK over the past 50 years.

Typically, an empirical analysis examining the effect of joining a customs or monetary union simply adds a dummy variable to the model in question to distinguish between periods before and after an economy's entry into the union. However, given the lack of examples of countries leaving customs unions, the most common approach when seeking to examine the potential effects of exit (mainly in the mainstream press) is to reinterpret the evidence for the impact of accession in terms of the reverse process. This is an awful approach mainly because it ignores even the causes or tendencies of the broader traumas associated with such a move as well as any potential inconsistency. Perhaps most importantly, the diffuse modelling approach adopted so far was based on externally defined dummy variables to study the pre- and post-joining union effect, effectively ignoring the important achievements in econometrics during the past three decades. Therefore, the approach we propose is fundamentally different from the rest of the site analysis conducted in the emerging literature in this field (see for example Bruno et al. (2017) and Simionescu (2017)) and sheds some light on how Brexit might affect European Union on domestic foreign direct investment. We do this by building on the idea of examining the response of inward FDI to shocks of key macroeconomic variables and then linking this to the broader economic environment. Before discussing our approach, however, it is worth examining what the literature finds in terms of the relationship between FDI and

customs union membership.

### ***FDI and Customs Union Membership***

The initial literature examining the potential impact of FDI flows on a country's accession to a customs union has essentially extended the well-understood concepts of "trade creation" and "trade diversion" to the issue of FDI. This gives a series of forecasts concerning both FDI inflows into a country from outside the customs union, as well as concerning FDI within the union. Much of the analysis that seeks to link FDI decisions to country-level decisions regarding economic integration is based on Rowthorn's (1992) analysis.

These can be summarized as follows: firstly, a country's membership in a customs union makes it more attractive for inward investment from outside the region (Collie, 2011), with a general increase in "interbloc" FDI (Donnenfeld, 2003). This is in turn related to the 'optimal tariff' literature; see for example Blonigen and Cole (2011), who applied the model of Blanchard (2010) to the case of Chinese accession to the World Trade Organization. Theoretically, one could adopt a similar analysis to the case of Brexit, concluding that the UK may seek to attract 'tariff jumping' FDI at the expense of the EU. This is, however, not a position that those advocating Brexit have yet adopted, for fear that retaliation from the EU would cause a reduction in FDI to the UK from outside the EU. Bajo-Rubio and Lo'pez-Pueyo (2002) for example argued that Spain became more attractive for non-EU inward investment as the EU moved towards the single market in 1992.

The second argument concerns the expected reduction in intrabloc FDI, as firms seek to capture economies of scale by concentrating activities and then benefitting from free trade to service the different national markets. Here, the theoretical predictions concerning a reduction in intra- EU FDI turned out to be somewhat wide of the mark; see for example Cantwell (1987) or more recently Cardamone and Scoppola (2015). This essentially is because the theoretical analysis failed to consider fully the relative importance of a reduction in the costs of coordinating activities across locations within a customs union, compared with the economies-of-scale effects in production. The single market significantly reduced the costs of coordinating activities across European countries and, as a result, multinational firms remained dispersed with the EU. Indeed, although firms have expanded into accession countries seeking lower production costs, they have also retained activities near customers in rich markets. (This is often illustrated concerning the automotive industry, which has, within the EU, retained a relatively dispersed production network, with very high levels of intrafirm trade; see for example Rhys (2004).) The evidence, however, suggests that this effect in the case of the EU has not materialized, as firms have sought to take advantage of the reduction

in costs of co-ordinating activities within the EU, and to engage in technology transfer as they seek the lowest cost locations for a given activity (Barrell and Pain, 1999).

This highlights a key question within the Brexit debate. Whereas it is difficult to characterize the specific 'leave' position on this issue, it is clear that the dominant paradigm among leavers hardened through 2017, evolving from a stated intention to stay in the customs union, to, by March 2018, a stated intention to leave it. However, it is certain that the 'harder' the Brexit, that is to say, the further the UK is removed from the pillars of the single market, the more challenging the business environment will be for inward investors seeking to use the UK as a gateway to Europe; and, in the same vein, the inevitably higher transaction costs will make the UK less attractive for FDI from the rest of Europe.

The association of Brexit with uncertainty in the business environment is of potentially equal importance. The exact mechanisms by which trade will be administered and the associated costs for UK-based firms in co-ordinating activities in Europe are still uncertain. Predictably, such costs will only increase if the UK seeks to diverge substantially from EU regulations and standards. (Consider for example the institutions and regulations that govern the single market, such as vehicle emissions requirements. Firms within the EU face one set of emissions requirements, and so coordinate activities across EU plants, with very large volumes of intrafirm trade. The same can be said of food standards, electrical equipment etc. If these regulations were to diverge, then the cost of co-ordinating activities would increase.) In this spirit, Los et al. (2017) examined the spatial distribution of the likely effects of Brexit and highlighted the issue of value chains that cross between the UK and the EU several times. When they speculated on the likely outcome for these Post-Brexit, they made the point that the outcome for many multinational firms will be to relocate supply chains to the EU, and then merely to import the finished product into the UK. In turn, this poses two related questions, the first regarding the effect on investment that is already here, and the second regarding the effect on future investment. Los et al. (2017) made a very persuasive argument concerning why some investors in the UK may leave, and, acknowledging that some FDI into the UK is reinvestment by existing firms, we focus on the prospects for future investment. This is consistent with our findings regarding new investment.

At the same time, the level of uncertainty in the business environment can be seen as a determinant and influence of the broader state of the UK economy in the aftermath of Brexit. In this regard, its subsequent impact on FDI may be related to the stable or unstable economic system prevailing in the post-Brexit era, which we classify, according to the prevailing paradigm, as a low or high volatility regime respectively. Thus, our analysis focuses on how internal investment responds to changes in variables that reflect the macroeconomic

environment within which risk management systems operate. At the same time, we must allow for the fact that this environment has changed over the years and is likely to change due to Brexit, even in the short term. We do this by using a time-series approach to track the dynamic relationship between FDI and key macro variables, i.e. the SVAR model, to also separate the effect of different structural shocks on FDI, which we construct within a Markov system switching framework. framework, to include the potential impact of uncertainty this dynamic relationship might exhibit. This is what we explore in detail in Section 5.

There is of course a huge literature on the impact of inward FDI on the UK, much of it based on sectoral or regional data, examining questions such as employment effects, comparison across different regions of the UK, or alternatively the effects of productivity or technology transfer. This usually seeks to build on or challenge the policy agenda of the beneficial effects of FDI, particularly at the domestic level.

Similarly, there is a large literature, which is conceptually based at the country level, and mainly seeks to explain why the Republic of Macedonia chose a particular location, or why some locations prove more popular for FDI than others. These usually adopt a panel structure and focus on demand groups (market size) and location factors (labour costs).

As such, time series analysis, most of which is about 20 years old, takes this as a starting point and then seeks to explain FDI flows at the observed macro level in terms of other macroeconomic variables.

#### **4 The Model**

Standard approaches to FDI decision modelling begin with one of two perspectives. The first perspective, built for example on Rowthorn (1992) or Horstmann and Markusen (1996), is based on the assumption that the firm has two options in terms of serving the foreign market (or three, including licensing), namely export and investment, and usually, The decision to serve this market has already been made. Analyzes on economic integration then seek to explore the relative importance of saving factors, relative cost, and market structure, and how these will change after a country enters a customs union. Such changes, in turn, are used to explore potential site decisions that could be made inside and outside the customs union after the union is established. Ekholm et al. (2007), for example, related location decisions to production and trade costs after the formation of a customs union.

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The data that are analysed in the paper and the programs that were used to analyse them can be obtained from <https://rss.onlinelibrary.wiley.com/hub/journal/1467985x/seriesa-datasets>

At first, we might consider the problem of determining the effect of leaving the customs union similar to this. However, in the event of a UK exit from the EU, what would rather be expected

would be the UK's "withdrawal" from the pool of institutions that enforce the union while retaining some sort of membership in the free trade area. Moreover, as the discussion develops, it becomes clear.

The main concern for business leaders and commentators, as well as policymakers, is not the potential changes in UK inward investment that such an event would bring, but rather the uncertainty it would generate in terms of future investment flows. Thus, it seems natural to base an analysis on the theoretical contribution of Antras et al. (2009) who linked FDI to risk or volatility. There is a large empirical literature that seeks to link FDI decisions to risk, although this is usually in terms of sovereign risk (see eg Aizenman and Marion (2004)) or the extent to which corruption increases agency problems and other transaction costs, It thus deters foreign direct investment (see eg Javorcik (2004) and Wei (2008)). (It should be noted that the applied and theoretical literature finds rather complex relationships between corruption and foreign direct investment for example, and is dependent on first-mover advantage, the indigenous group and the possibility of realizing the first advantage; see for example Hakkala et al. (2008). Therefore, we adopt the approach used in the empirical literature, which is to treat the FDI decision as a subset of the investment literature. The basic model of foreign direct investment is based on the probability of entering a particular location (the first model):

**Model I**

$$P(\text{Entry}) = \phi_1 \left[ \sum_{p=0}^T \left( \frac{1}{1+r} \right)^p \prod_{t+p}^e \right]$$

Where  $T$  is the expected life of the investment, and  $r$  is the discount rate. This is obviously not observable, but it can be written as a vector function of the state-level properties (model II):

**Model II**

$$\sum_{p=0}^T \left( \frac{1}{1+r} \right)^p \prod_{t+p}^e = \phi_2(x_{1i})$$

Within a time series setting, this is then operationalized, following Campa (1993) who introduced exchange rates into a model of the FDI decision at the firm level. The analysis, which is based on options theory, seeks to link the firm level of decision to enter a market through foreign production. This links the investment decision, not merely to the expected returns and the sunk costs of entry, but also to the level of uncertainty, i.e. the volatility of the exchange rate:

$$\int_0^{\infty} (R_t p - w) \exp(-\rho t) dt = (R_0 p) / (\rho - \mu) - (w / \rho) \geq Rk$$

Where  $R_t$  the value of the exchange rate at time  $t$ ,  $\mu$  is the deviation of the exchange rate,  $p$  is the dollar price of the commodity,  $w$  represents the variable costs in foreign currency of producing the commodity and  $\rho$  is the discount rate. According to this equation, you will enter volume as long as the expected value of future dividends is greater than the entry cost  $K$ . A model using pricing theory will transform the previous equation on the entry decision by the following equation:

$$\left\{ \frac{\hat{R}p}{\rho - \mu} \right\} - \frac{w}{\rho} - \{ \hat{R}p / ((\rho - \mu)\beta(\sigma)) = \hat{R}k$$

Where  $\hat{R}$  is the critical value of the exchange rate that leads to entry,  $\beta(\sigma)$  is a known function of exchange rate volatility and  $\beta'(0) < 0$ . Therefore, the higher the exchange rate volatility, the higher the exchange rate level must be for the firm to decide to exercise its option to enter the market. As shown by Campa (1993), the current model makes clear predictions about the effects of exchange rate uncertainty on foreign investment. It predicts that as the uncertainty  $\sigma$  and the degree of sunk investments  $k$  needed to enter the market, the more valuable the entry option, the fewer entry events we will notice. In contrast, the higher the exchange rate and rate of change, the higher the expectations of future profits from entering the market. Finally, the lower the variable costs of production  $w$  with respect to other competitors, the higher the probability of entry.

The relationship between this approach and the trade-theory-based analysis of FDI in Rowthorn (1992) and De Fraja and Norman (2004) was introduced by Bergstrand and Egger (2007), who related FDI decisions to market size as well as distance, providing a rationale for using the gravitational equations to analyze Patterns of foreign direct investment (see for example Barba Navaretti and Venables (2004)). Omitting uncertainty from this highlights why previous analyzes did not detect any relationship between currency and FDI flows. As the value of the host currency rises, so does the cost of the home country currency to invest, but so do expect returns.

But the uncertainty cannot simply be ignored. As the first model showed, when we introduce uncertainty, while the expected return may not change, the variance or risk associated with that investment increases, and the investment becomes less likely. But even in this model, the focus is on the expected value, rather than variance if that leads to uncertainty. Indeed, as discussed by Blonigen and Piger (2014), although uncertainty is recognized as an essential factor, it is rarely explored in the literature. In this respect, our approach is similar to the

foundations of Kampa (1993), which sought to relate investment to uncertainty. In their case, it is assumed that uncertainty can be explicitly determined by employing the real exchange rate and went on to show that exchange rate variance reduces domestic investment. Also, they argued that these effects may be underestimated when we impose a model with fixed parameters. In our case, uncertainty is a systematic property of the system in which the economy finds itself at each point in time. (In general, under a Markov switching system, a highly volatile economic regime is generally associated with high currency uncertainty, and a low volatility regime is generally associated with low currency uncertainty. However, it allows (in short-lived) bouts of high currency uncertainty during a low-volatility regime and low currency uncertainty during a high-volatility regime.) In the context of the above model, this can be translated as mode  $\beta.\sigma/$  to be dependent also on the economic system as determined by its projection of the interrelated dynamics of the key variables that characterize the economy Aggregates such as economic growth, participation rates and policies. Therefore, it should be expected that if uncertainty is significant, economic systems with higher volatility will attract lower levels of investment. (There has been much speculation as to why the UK did not experience a greater decline in growth after the referendum, although evidence is now emerging from the Office for National Statistics that the 'Brexit bounce' was driven by consumer spending when it, In the long run, the investment decreased.)

In this spirit, our model seeks to link inward foreign direct investment to the vector of macroeconomic variables, and specifically to the shocks that may appear on each of the macroeconomic variables. We estimated the SVAR model determined using a highly elastic (signal constraints) scheme. In this way, we can capture the contemporary effect of changes in each macro variable on FDI flows and, through an impulse-response graph, how this effect evolves over time. Furthermore, we build our model under a changing Markov system to distinguish between periods of high and low volatility in the economy, and to approximate periods of high and low economic uncertainty. This enables us to note the extent to which uncertainty, as a feature of the entire economy now, affects the impact of macro variable shocks on inward foreign direct investment. Finally, we seek to improve the robustness of our analysis by also considering the dominant variables of our model to investigate whether our results are consistent across different sets of modelling assumptions.

Indeed, one of the main goals of this approach is to combine understanding derived from previous time-series analysis, which focused on providing econometric explanations for the observed variation in FDI flows, with a broader understanding of the relationship between FDI and development. Thus, our work can also be seen as an attempt to develop a well-



understood albeit empirically limited literature (based on panel data analysis, building on eg Borenstein et al. (1998)) that examines the contributions that FDI can make to inward growth. Exploring the implications of Brexit in this context becomes a natural application to highlight the value of this approach.

## **5 Econometrics and Data Methodology**

Overall, our approach is to look at the possibility of a hard Brexit through well-thought-out time-series lenses. This allows us to base our analysis explicitly on the UK and how its economy and foreign direct investment have responded to external shocks over the past century or so. Thus, we bypass the insurmountable challenge of drawing parallels between Brexit in the United Kingdom and similar events in other countries – which historically did not exist.

However, investigating the impact of such an extraordinary event in this way dictates, to a large extent, the choice of variables: multi-country data are hardly relevant because the topic is country-specific, and industry-wide data are inherently irrelevant because of their very low frequency (usually annually). ) and the short period. Therefore, a time series approach is the most appropriate way to make data-based estimates of the 'Brexit impact'. In this regard, the macroeconomic literature has provided a solid platform on which to build.

Then, our data set spans the period 1963, Q1 - 2013, Q4 (quarterly repeat), and contains, apart from UK foreign direct investment, Gross Domestic Product (GDP), Consumer Price Index, Price Foreign exchange against the US dollar and policy interest rates. (The last sample note is due to the FDI series - the NSO has stopped updating the particular (long) FDI series we use). He joined the European Communities in 1976 to ensure that our results were not affected by the inclusion of observations before the UK became a member in an early manifestation of what has now evolved into the European Union. In anticipation of what we report in the Results section (Section 6), it should be noted that our results are nearly identical, as the model is robust to this change. Table 1 provides an overview of the statistical properties of the variables, which were accordingly transformed (normative values for FDI, policy rate differences and log differences for the remainder) to ensure stability. (We discuss our adopted method of analysis further but a familiar reader may also note that we are in the same setting with a dominant SVAR that solves for the Keynesian dynamic general equilibrium (DSGE) model of macroeconomics (see for example Arestis et al. (2016)), which we increased with the investment variable And this is no coincidence: from another perspective, we are actively interested in capturing how inward FDI interacts with the macroeconomy (or more precisely, with the factors widely seen as capturing macroeconomic dynamics).)

**Table 1:** Statistical overview of the data

Statistic	FDI	GDP growth	Inflation	Foreign exchange rate (returns)	Rate (difference)
Mean	0.003	0.632	1.355	-0.274	-0.004
Standard deviation	1.002	0.998	1.460	5.025	0.263
Skewness	3.702	0.244	1.744	-0.760	0.410
Kurtosis	22.721	6.880	7.357	5.566	7.707

In terms of methodology, we adopt the Markov transform approach of the SVAR system. This involves a two-step procedure that combines two important developments of VAR analysis: estimation within a Markov system switching framework to control, for example, a duty cycle, and identification of key contemporary influences to enhance the excellent performance of VAR models for time series data with theoretical underpinnings. In particular, the estimation (reduced form) of VAR within a Markov system switching framework enables all the estimated parameters to be state dependent. Schematically, it is presented by

$$X_t = c(S_t) + \sum_{j=1}^p A(S_t) X_{t-j} + B(S_t) u_t \quad (1)$$

$$\Omega(S_t) = E \{B(S_t) u_t u_t' B(S_t)'\} = B(S_t) \Sigma_u(S_t) B(S_t)' \quad (2)$$

Where

$$X_t = \begin{bmatrix} FDI_t \\ y_t \\ \pi_t \\ r_t \\ \Delta_{1t} \end{bmatrix}, \quad c(S_t) = \begin{bmatrix} c_{1,S_t} \\ c_{2,S_t} \\ c_{3,S_t} \\ c_{4,S_t} \\ c_{5,S_t} \end{bmatrix}, \quad u = \begin{bmatrix} u_{1,S_t} \\ u_{2,S_t} \\ u_{3,S_t} \\ u_{4,S_t} \\ u_{5,S_t} \end{bmatrix}$$

*FDI*, *y* and *r* denote FDI inflows, GDP growth, foreign exchange rates against US dollar earnings (log-),  $\Delta_{1t}$  is first differences in policy rates, *S* of order (1 or 2 represents what is Distinguishing it as a system of low and high volatility respectively) and *u* terms of innovation. (This is a typical approach in the SVAR literature aiming to make a robust appreciation of the system against very fixed interest rates. Indeed, when we experimented with levels of interest rates, in some cases the impulsive reactions were explosive. Adopting two systems seems to be the tacit convention in the empirical literature often justified by the fact that it comes with a plausible but natural explanation of what each of the two systems means. It should be noted; however, that it's also largely dictated by the available information as the introduction of more systems exacerbates the dimensional curse that plagues VAR models.

As an example; in this particular case, introducing a third system would bring the number of parameters to be estimated to around 100 which would effectively distort any conclusion drawn from these estimates due to the inevitable lack of a sufficiently long sample.

Thus we, together with other similar studies, are somewhat compelled to follow the prevailing paradigm; in fact, the adoption of two regimes seems inevitable given the low frequency (quarterly) of FDI and the extent of data available.) This indicates the setup which effectively addresses the definition problem, leads to the definition of the  $B(S_t)$  pulse matrix, which can then be used to extract the contemporary interactions between the  $X_t$  elements. Determination of  $B(S_t)$  requires  $n^2$  constraints within each system while estimation of  $B(S_t)$  provides constraints  $[n(n+1)/2]$ . This means that a complete definition requires another  $[n(n-1)/2]$  additional constraints. Sims (1992) in his seminal SVAR paper derived these constraints by recursively ordering internal variables. We choose the recursive form of the definition by following the scheme of Ehrman et al. (2003). In our models, we impose constraints that (normal) changes in FDI will respond positively to shocks in GDP growth, and exchange rate growth, and negatively to shocks in interest rate changes. However, it is worth emphasizing that the main advantage of the above identification approach is that if the restriction is invalid, it will be rejected by the form of impulse responses – i.e. the impulse-response graph will not display what the limitations dictate. (It is worth noting that, to maintain our degrees of freedom, our results with respect to different effects are similar (e.g. depreciation of the exchange rate and appreciation of each system will have the same effects in absolute terms on FDI albeit with different markers). Future studies may mitigate this assumption.).

Models (1) and (2) (Model A) are general enough to allow us to combine system changes for all parameters which means that it is not clear what characterizes different systems. Changes in the unobserved state variable can be associated with the phase of business cycles (i.e., switching in the junction), with changes in the propagation mechanism (i.e., changes in the dynamical structure of the automatic regressive Markov system altering the VAR coefficients) or with changes in Markov errors in the switching of the VAR system (i.e. changes in the variance of innovations). Thus, it is worth looking at the relevant overlapping models to get a clearer picture of the source of the system's transitions.

Model A, the general model presented in equations (1) and (2), represents the combined contribution of all possible sources. In other words, apart from the influences built into the other two models (business cycle and luck), it also accounts for shifts in the diffusion mechanism, which are often views usually driven by changes in market expectations - see for example Stock and Watson (1988), Pesaran et al. . (1993), Pivetta and Reis (2007) and Pancrazi and Vukotic (2013). Thus, this model also captures the impact of changes in shaping market expectations on FDI.

Model B is built on the assumption, that only intercepts change across systems, while the parameters of the automatic regression and variance matrix of the reduced shape shocks

remain constant. In this setting, systems are identified as low-growth, high-impact, high-low, and, in effect, aiming to control the business cycle. Schematically, we have

$$X_t = c(S_t) + \sum_{j=1}^p A_t X_{t-j} + B u_t \quad (3)$$

$$\Omega = B \sum_u B' \quad (4)$$

Where the effect matrix  $B$  remains constant across the different systems (i.e.  $B(S_t) = B$ ), which also means that since only  $c(S_t)$  changes, the advantages of the impulse responses remain the same across the different systems.

Finally, Model C is built on the assumption that changes in the system are solely driven by luck, following the bulk of the literature on the Great Equinox. In other words, the system transitions are limited by the variance of structural innovations while the drive matrix  $B$  is invariant across the  $(S_t)$  states, an approach similar to that proposed by Rigobon (2003) and Rigobon and Sack (2003) to quantify SVAR by the heterogeneity of elasticity. However, it should be noted that here we relax the assumption that changes in the covariance structure occur at fixed points over the sample period. Schematically, we can get it

$$X_t = c + \sum_{j=1}^p A(S_t) X_{t-j} + B u_t \quad (5)$$

$$\Omega = B \sum_u (S_t) B' \quad (6)$$

Lanne et al. (2010) showed that identification of  $B$  can be achieved if  $\Omega(S_t) = BB'$  for  $(S_t) = 1$  and  $\Omega(S_t) = B' B \Phi(S_t)$  for  $S_t = 2, \dots, N$ . Where  $\Phi(S_t)$  is a diagonal matrix with positive elements. If there are only two systems (i.e.  $(S_t) = 1, 2$ ) the definition requires that  $\Phi(S_t)$  elements be distinct. Model C has been used in the Great Equinox literature to test the null hypothesis of 'good luck'. (From a certain perspective, the variable closest to a typical (uni-system) SVAR model can also be considered since, apart from the innovation term, the estimates of other parameters (intercept and coefficients of lagging dependent variables) will be the same across the two systems. Therefore, they should not be His reactions are far from those that result in the simplest SVAR variant.)

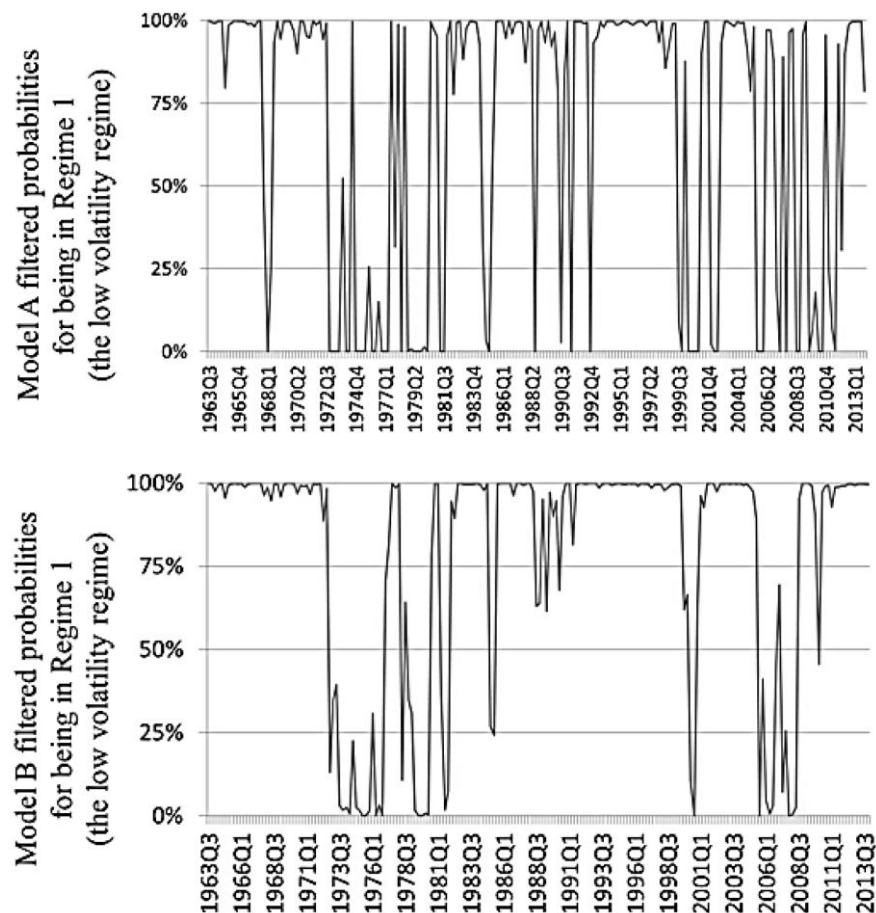
## 6 The Results

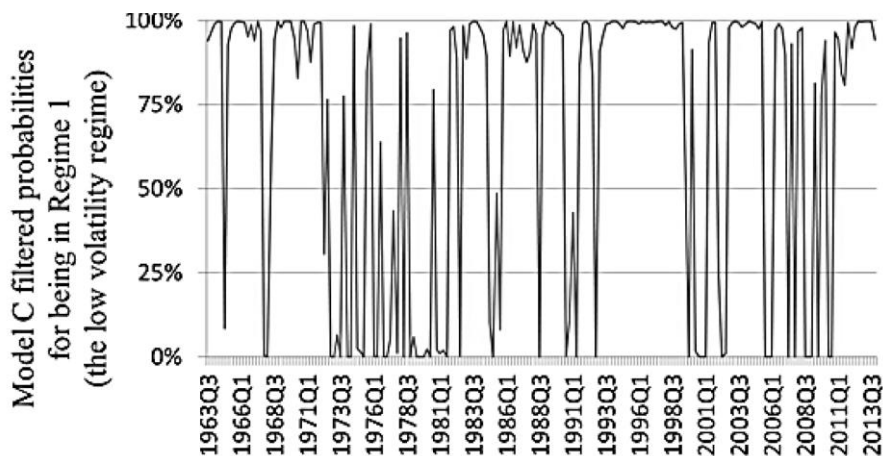
Overall, the candidate probabilities for all three models (shown in Figure 2) are well-recognised periods of high and low volatility in macroeconomic variables and more generally periods of relative economic stability in the UK economy (e.g. the turbulent 1970s or the so-called Great Moderation in the UK from 1992 to 2008).

At this point, it should be noted that, in contrast to spontaneous and especially models, 'SVAR

models in the current experimental literature are overwhelmingly evaluated by reporting values of information criteria, primarily for model selection (listed in Table 2, along with linear - single system - test) and impulse and response graphs, to ensure that the estimated model is stable and well behaved. (Theoretically, if we can set up to the fore and perfectly calibrate the base DSGE model of the British economy that captures the data, it would also be possible to evaluate the SVAR estimates by comparing their novelties simulated by the calibrated DSGE model since DSGE model will be the linear logarithmic approximation of SVAR. In practice, however, this path is difficult to hit because even under the most implausible assumptions that the DSGE model is conceivable (and more importantly, that it becomes widely accepted), it may be of little practical use: although the DSGE model generally has a VAR of finite order resolving in all its variables, it is highly unlikely that this is the case when only observable variables are included (see for example Kapetanios et al. (2007).)

**Figure 2:** Filtered probabilities of the three models:





**Table 2:** Model Selection Criteria and Tests

<i>Model</i>	<i>BIC</i>	<i>LR</i>
A	15.8 (16.17)	294.9
B	16 (16.33)	59.4
C	15 (15.03)	271

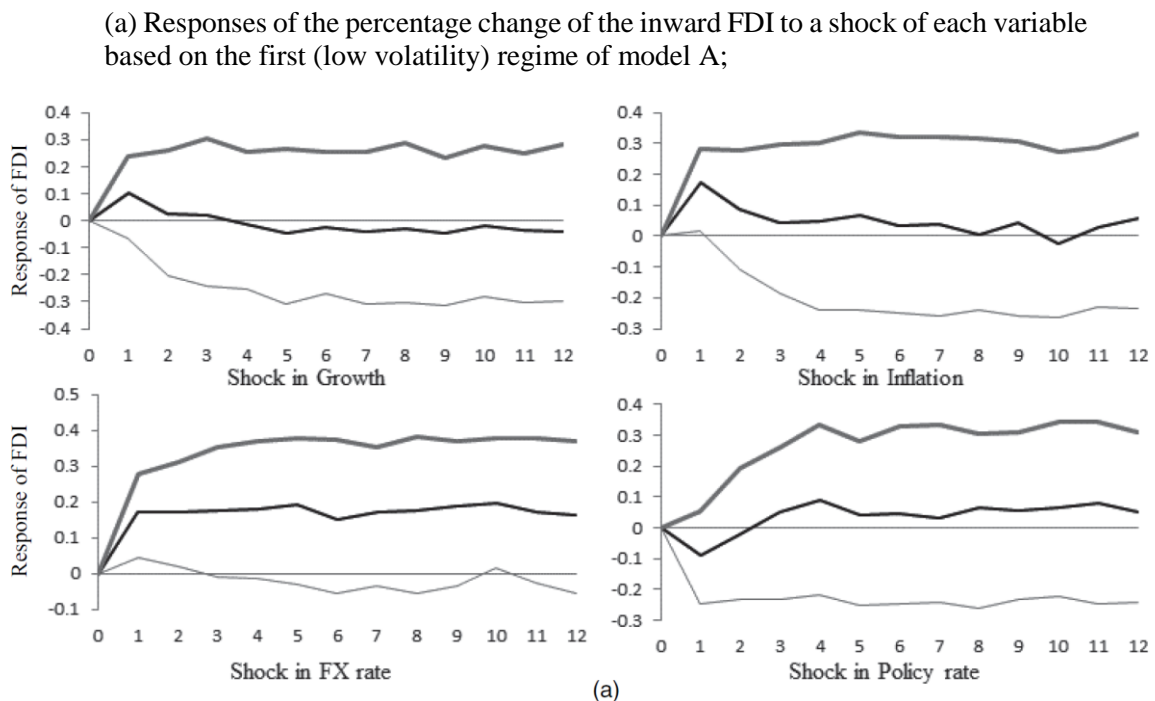
Note: Model selection criteria and test BIC refer to the values of the Bayesian information criterion for a Markov regime-switching SVAR of order 1; its values for a Markov regime-switching SVAR of order 2 are reported in parentheses. LR refers to the value of the likelihood ratio test against the presence of a single regime (linearity) and in all cases, it is statistically significant at the 1% level.

Furthermore, it should also be noted that although at first glance, it may seem tempting to remove some non-significant variables and, perhaps, also, to improve the accuracy of estimates of impulsive responses, there are two important points to keep in mind. First, although results were not reported, dropout variables proved essential in defining systems plausibly (in terms of a general perception of what the UK macroeconomy was like during the sample period considered). This should not be surprising since the residual series distinct elements are given more weight in smaller systems than when all variants are used instead. Second, although uncertainty will still be a feature of the variables that make up the system (on a smaller scale), it is difficult to categorize the system itself as reflective of the macroeconomic state, which, as noted earlier, is actually essential to our analysis. (As explained earlier, we have intentionally adopted the same setup with the dominant SVAR solving for the new Keynesian DSGE model of macroeconomics, which we augment with the endogenous FDI variable.) For these two reasons, we do not consider smaller econometric models.

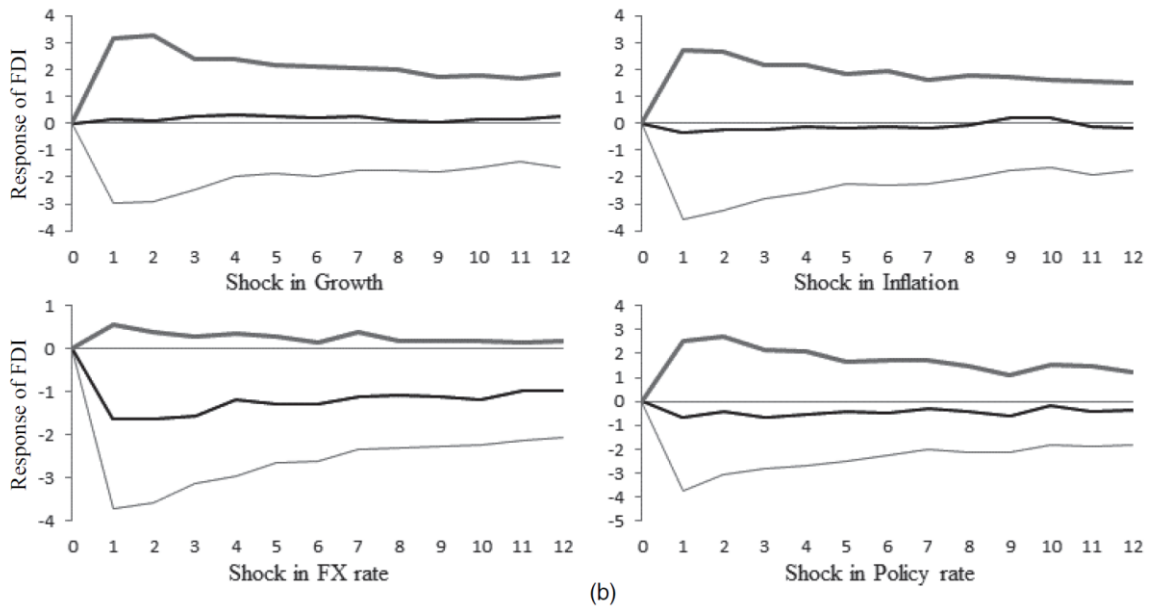
Figure 3 depicts the results obtained from Model A on our data. It shows that FDI flows, in either system, are not affected by shocks in GDP growth or interest rates. In a low-volatility regime, FDI inflows increase either as a result of currency appreciation or, to a lesser extent, an increase in inflow. In a high-volatility regime, FDI inflows decrease due to the positive shock in the foreign exchange rate even though confidence intervals indicate that the effect is within the statistical markers. (Our expression (positive or negative) in our context has no evaluation; it is just a sign of the shocking number (so a positive shock to the foreign exchange rate means a shock that increases the value of the foreign exchange rate, and since this is the rate of the pound against the dollar, it means that it can come from either a cheaper dollar or a more expensive pound sterling or both.) Either way, its impact on FDI inflows tends to slowly wane. Figure 4. Depicting the results from transforming Model B into our data. It appears that the results are similar to those of Model A on both systems. Foreign direct investment is not affected by shocks to the growth or origination of GDP.

In a low-volatility regime, FDI is increased by either positive changes in foreign exchange rates or positive changes in interest rates, whereas in a high-volatility regime, FDI is decreased by either primarily positive changes in foreign exchange rates or positive changes in interest rates. Interest rates are sharper at the beginning and lower. Later. Confidence intervals indicate that the effect of foreign exchange rates is within the range of being statistically significant while the effect of interest rate changes, although in the same direction, is clearly insignificant.

**Figure 3:** Impulse–response graphs based on model A:

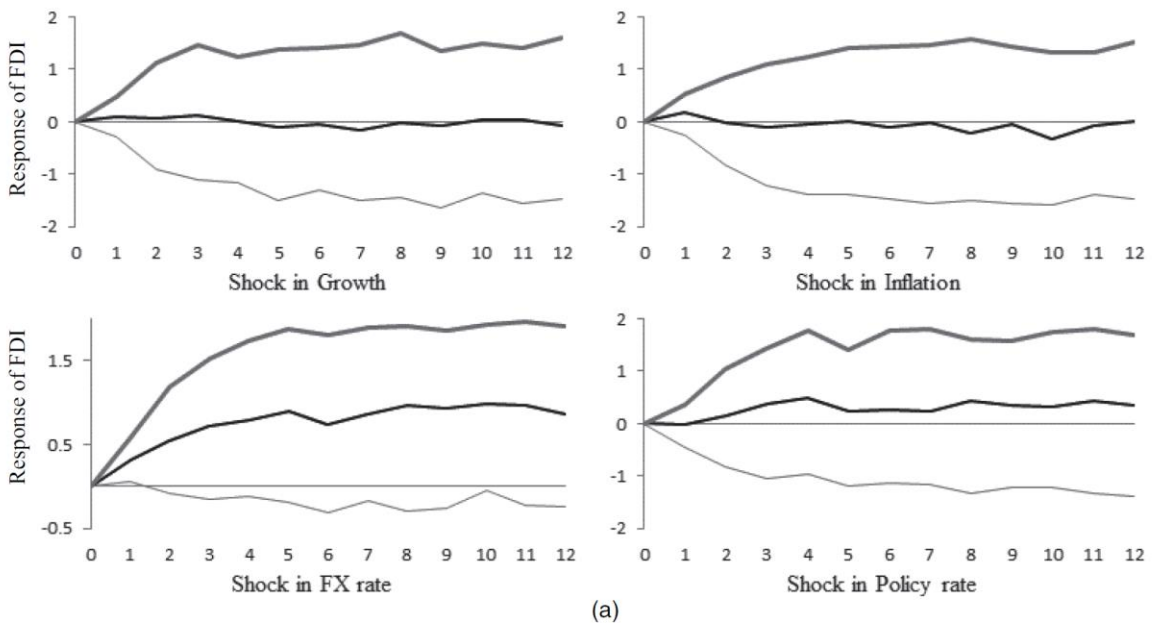


(b) Respective responses based on the second (high volatility) regime; the graphs also depict the 16% and 84% confidence intervals (see for example Uhlig (2005)) obtained by the bootstrap



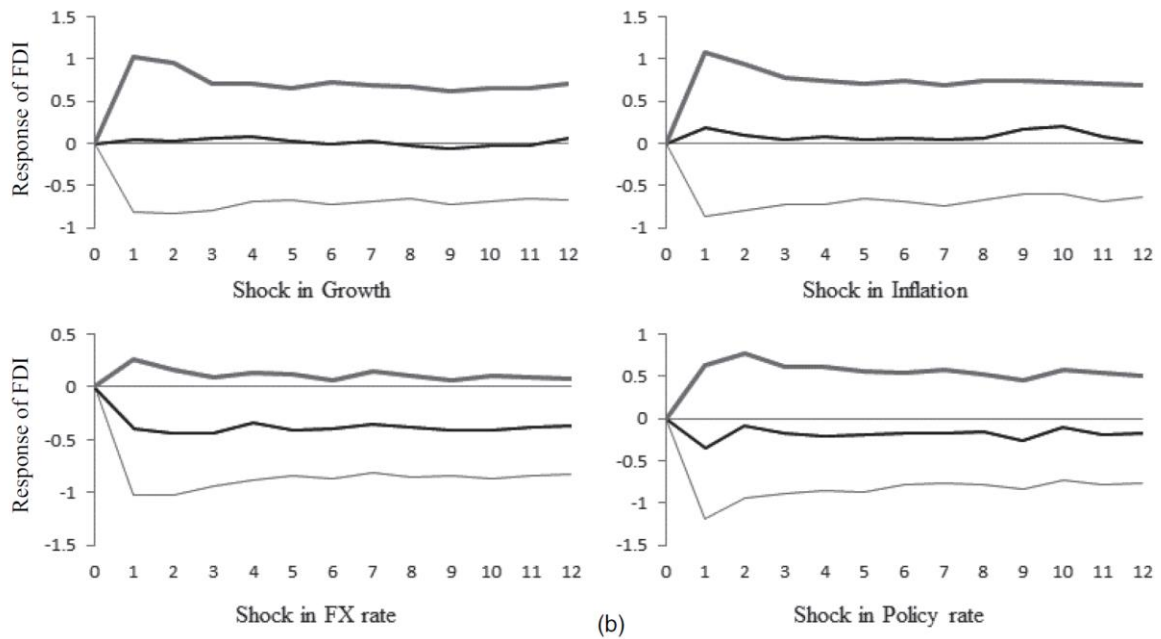
**Figure 4:** Impulse–response graphs based on model B:

(a) Responses of the percentage change of the inward FDI to a shock of each variable based on the first regime of model B;





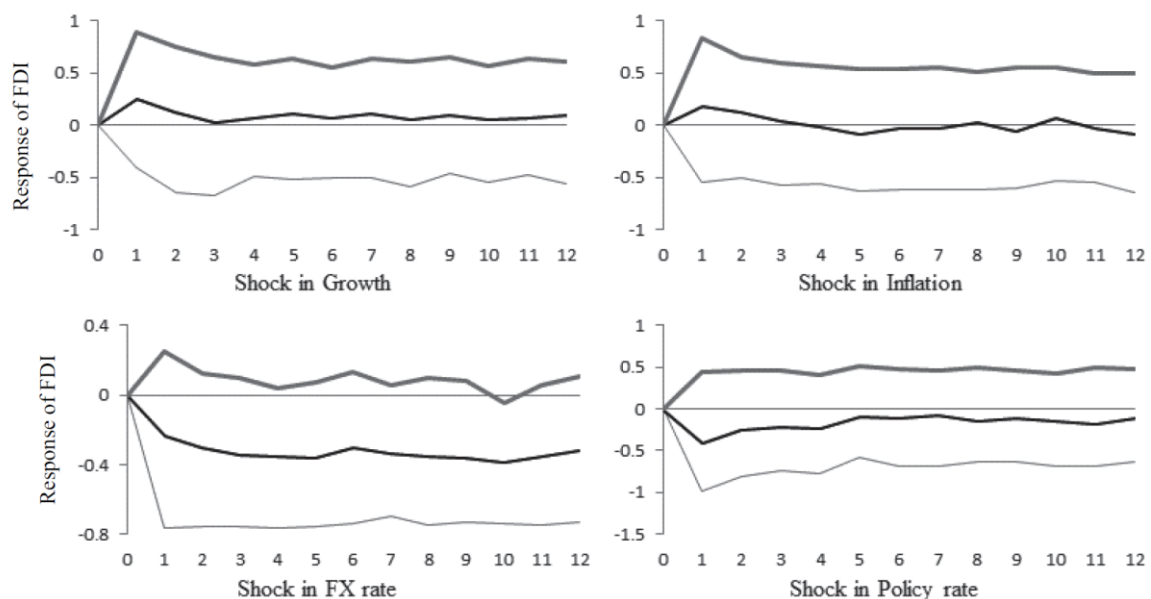
(b) Respective responses based on the second regime; the graphs also depict the 16% and 84% confidence intervals obtained by the bootstrap



Finally, Figure 5 depicts the results of model C testing on our data. As expected, it shows that the results roughly measure the average effect of the Model A and Model B systems. Specifically, FDI flows are unaffected by shocks in growth and impact, while the impact of foreign exchange rate and interest rate changes is negative albeit small (marginally in the former case, overt in the latter).

**Figure 5:** Impulse–response graphs based on model C:

Responses of the percentage change of the inward FDI to a shock of each variable based on model C; the graphs also depict the 16% and 84% confidence intervals obtained by the bootstrap



Overall, the purpose of our approach was to explore the relationship between UK inward investment and key macroeconomic variables in more detail, taking into account uncertainty. For this, we explored the key distinction between periods of high and low volatility, which are found to coincide often although not always with periods of recession and expansion respectively, by using a Markov regime-switching specification of an SVAR to isolate the effect of a shock in each variable on FDI. The results show, perhaps not surprisingly, that, in periods of high volatility, a positive shock in exchange rates only (i.e. a one-period appreciation of exchange rates) deters FDI. Conversely, a negative shock in exchange rates (i.e. a one-period depreciation of exchange rates) increased the growth of inward investment, hence spurring FDI. However, this effect, although substantial in size, was hardly statistically significant.

In contrast, in periods of low volatility, the results are effectively reversed; and, although the effects are at the boundaries of statistical significance, they are persistent since they affect the growth of FDI and not just its level. And, on top of that, inflation seems also to have a lesser albeit statistically significant role to play. This result is one that to the best of our knowledge has not been reported in the empirical literature. In the theoretical literature by Campa (1993), there is only speculation that uncertainty deters FDI. This, however, is expressed differently from the few (typically cross-country panel studies) that seek to link within-year currency fluctuations to FDI flows. We show that the situation is rather more complex than this, as expressed by the ‘Gordian knot’ discussion of Pain and van Welsum (2003), but that, unlike previous analyses, we can highlight the precise nature of the relationship between exchange rate changes and FDI. It appears that, in periods of low volatility, the prospect of increased returns (in home currency) resulting from an appreciation in sterling increases the volume of FDI, whereas, in periods of high volatility, the risk increases mean that the high cost in home currency deters FDI. Conversely, the prospect of decreased returns resulting from a depreciation in sterling decreases the volume of FDI in periods of low volatility, whereas, in periods of high volatility, the risk increases mean that the low cost in home currency attracts FDI. Interestingly, in either regime, the FDI flows seem unaffected by shocks in growth and interest rates.

### ***How the results can be used to examine the Brexit effect on FDI***

If we take the results at face value then the question about the possible effect of Brexit on inward FDI is essentially answered by making informed conjectures about

- (a) Whether Brexit will drive the UK into a period of economic uncertainty that will manifest in the macro-variables or not and

- (b) What will happen to exchange rates and inflation (primarily) and to interest rates (secondarily)?

In terms of conjecture (a) it seems only reasonable to assume that there will be a period of economic uncertainty although, in the near-zero growth, inflation and interest rates period, such uncertainty is still debatable as it can manifest in the macro-variables. In fact, it seems more likely that the economy will remain in the low volatility period or return to that quite quickly. Besides, by examining the filtered probabilities of all three models (see Fig. 2) it becomes evident that, whenever the economy moved to the high volatility regime, it did not stay there for long and soon reverted to the low volatility regime. In terms of conjecture (b) there was a depreciation of exchange rates following the referendum, which, depending on the strength of the exchange rates transmission mechanism, will cause further inflationary pressures that the Bank of England may try to counter by increasing interest rates, which in turn should also reverse, at least partially, the exchange rate depreciation. However, our results suggest that the effect of the exchange rates on FDI is much stronger (and significant) than the effect of inflation and interest rates. Consequently, it is reasonable to expect that the overall outcome will be a substantial and persistent decrease in inward FDI. Our results suggest that any short-term benefits from the high volatility regime are statistically insignificant; besides, such a scenario is rather unlikely when growth, inflation and interest rates are near zero.

## **7 Conclusions**

This paper seeks to make two contributions. First, we explore why there is a lacuna between the theoretical literature which predicts an inverse relationship between host country exchange rate appreciation and FDI flows, and the empirical literature which at best finds only a weak relationship that is relatively unstable over time. We explore this in the context of two alternative states of the world: one in which the economy is in a low-volatility regime, and one in which it is in a high-volatility regime.

Secondly, on the prospect of Brexit, we get beneficial results on two levels. Firstly, there is a high degree of uncertainty about Brexit and what the effects will be on the UK economy. Although advocates of the UK leaving the EU shifted their stance until 2017, and are adamant that they now want the UK to leave the customs union, there is a high degree of uncertainty about the effects of withdrawal from the many institutions that support and run the region. Free trading. At the time of writing (September 2017) this appears to be the dominant position of the Conservative Party, but they face opposition, not only from the political opposition, who seem to favour remaining in the customs union but also from within their party. and from

bodies such as the Confederation of British Industry and the Institute of Directors. As many business leaders and political commentators argue, this could lead to a period of instability, after the referendum and the period after that while the terms of exit (and return to the free trade area) are negotiated, although it remains unstable. It is not clear if, how, and to what extent this instability will manifest itself in macro variables. In terms of the future, we can speculate at this point that the prospect of a no-deal UK “exit” makes it more likely that inward FDI will be deterred for much longer. In fact, data from the United Nations Conference on Trade and Development (2018) indicated that UK foreign direct investment in new activity has fallen by 90% since the referendum.

Perhaps the biggest impact of Brexit on inward FDI is not Brexit itself, but what it means. We do not discuss in any detail in this paper the prospects for foreign investors leaving the UK (although a significant proportion of new FDI is (re)investment through existing investment funds). However, compared with other forms of capital inflow, it is clear that the withdrawal of foreign investment will be slower than other forms of capital inflow. However, while it is no doubt true that these other forms of capital outflows will have a faster damaging effect on the UK economy, to understand the importance of FDI inflows we need to understand the nature of foreign investment decisions. As Drifeld and Munday (2000) have shown, foreign investment in the UK occurs with a lag of 2-3 years between the decision being made and the investment. This applies to expansion or reinvestment as well as to new investments. For example, decisions about the location of new production lines in the automotive sector for 2021 have already been made, and decisions for 2024 are scheduled for 2020. As such, the lack of new investment is actually analogous to going out, because it actually means moving away from the United Kingdom. It is also likely to cause supporting sectors and supply chains to move away from the UK and increase imports.

It is reasonable to assume, for example, that based on the UK government's current travel trend, and its so-called neoliberal agenda, we will see an increase in the types of policies designed to improve the UK's cost competitiveness. This means, for example, further increases in labour market flexibility, cuts in employment protections and increased trade with low-cost locations such as Asia although it is still a matter of debate, even within the ruling party.

At the same time, however, it is palpable that Brexit already puts and will continue to put pressure on UK exchange rates. One hitherto unexplored relationship concerns the interaction between uncertainty and currency depreciation. In times of uncertainty, devaluation of currency deters new investment, irrespective of the fact that it makes the investment ‘cheaper’ in a firm’s home currency. Taken together, therefore, it is not clear that many macroeconomic

policy responses are open to the government to alleviate the impact of Brexit on inward investment. Rather, building on the wider work in this area, the results suggest a micro- or place-based approach to alleviating uncertainty experienced by firms. As a result of these pressures, the UK may pursue more interventionist policies directly targeting inward investment, such as the types of incentives that were paid before the UK entered the single market. Such policies have proved popular with inward investors, and, allied to the greater labour market flexibility in the UK compared with countries such as Germany and France, have long been linked with the historically high levels of inward investment in the UK. The UK may be in a position to offer more favourable inward investment incentives when not bound by EU rules on state aid, though they tend to work only in the short term. Rather, as Los et al. (2017) suggested, what is required is a series of interventions to protect supply chains, for example, investment in skills, and boosting small firms through access to finance, so that more activity along the whole chain is attracted to the UK. The effectiveness of this, however, will depend on the relative tariff and non-tariff barriers of supplying the UK from the EU or vice versa. Moreover, our results suggest that to remain competitive in attracting inward investment, the incentives that are offered will need to be sizable and may contravene the trade relationships that the UK will seek to form with the EU. There has been some speculation that reduced tax rates may offset some of the negative effects of Brexit, though at the same time tax competition may alienate the EU even further. Irrespective therefore of what precise institutional arrangements the UK agrees with the EU, we expect inward investment to fall in the medium term, though some trade-offs may be possible as sector-level agreements develop. It is this area where we feel that future work should focus.

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