

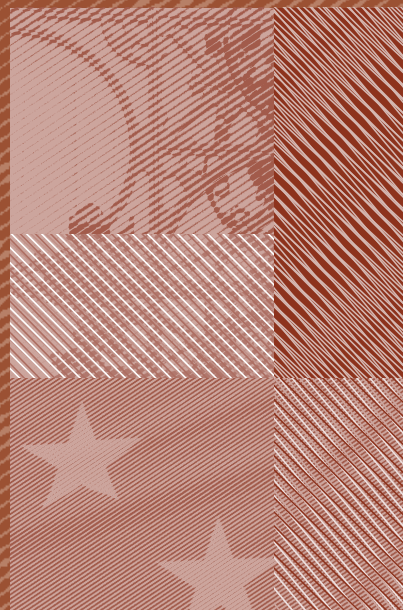
**A TENTATIVE EXPLORATION
OF THE EFFECTS OF BREXIT ON
FOREIGN DIRECT INVESTMENT
VIS-À-VIS THE UNITED KINGDOM**

2019

Ana de Almeida, Teresa Sastre,
Duncan van Limbergen and Marco Hoeberichts

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DE NEDERLANDSCHE BANK

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Abstract

European Union (EU) integration has boosted inward EU foreign direct investment (FDI) into the United Kingdom (UK). Within the EU, the UK has a relatively significant stock of inward FDI, having reached 61% of its Gross Domestic Product (GDP) in 2017 and risen strongly since 2005. The exit of the UK from the EU and the Single Market will probably result in reduced FDI amongst both investment destinations. The aim of this study is to look at the “real-time” effects of the Brexit June 2016 referendum outcome and its aftermath on UK-related FDI activity. Although FDI flows are notably volatile and biased by periodic non-systematic outliers, and despite some caveats on data sources and availability of time series data, we find tentative evidence of a post-referendum slowdown in gross FDI flows between the UK and the EU, notably involving the big EU economies and Ireland. Regarding a very favoured form of FDI, greenfield FDI, we document a post-referendum fall in announced projects and capital expenditures into the UK by both other EU countries as well as one of the most important non-EU partners, the United States.

A different approach is also used to analyse the Brexit effect on FDI activity, based on estimating the effect of two successive stages in the European integration process – EU membership and the Euro area launch – and considering Brexit effects as the reversal of the UK integration into the EU. By using a fixed-effect gravity model to estimate the effects of these integration processes on bilateral FDI activity with the UK, the empirical results suggest that, on the one hand, this country played a role as a gateway for a set of international investor countries outside the Euro area to enter European markets and, on the other, it acted as a hub that reallocated these inflows and those coming from Euro countries across the Euro area itself. Thus the disconnection of the UK from the EU may have further implications for FDI than just reverting the effect of EU membership. Larger trade barriers and lower integration between the UK and the Euro area countries’ markets will likely have a negative impact on FDI activity in the UK and might have, in the short run, a negative effect in the Euro area.

Keywords: foreign direct investment, FDI, Brexit, EU membership, single currency.

JEL classification: F15, F21.

Resumen

La integración en la Unión Europea (UE) ha impulsado la inversión extranjera directa (IED) hacia el Reino Unido, que mantiene un *stock* relativamente importante de entradas en forma de IED. Este ha aumentado notablemente desde 2005, alcanzando el 61% de su producto interior bruto (PIB) en 2017. La salida del Reino Unido de la UE y del Mercado Único probablemente resultará en flujos de IED más reducidos entre ambos destinos de inversión. El objetivo de este estudio es examinar los efectos que el resultado del referéndum del *brexit*, de junio de 2016, ha podido tener en la actividad de IED relacionada con el Reino Unido. Si bien los flujos de IEA son notablemente volátiles, con presencia de un gran número de valores atípicos, y con la cautela precisa por la escasa disponibilidad de datos temporales posteriores al referéndum, el análisis encuentra cierta evidencia de una disminución en los flujos brutos de IED entre el Reino Unido y la UE con posterioridad al referéndum. Esto se evidencia, en particular, en el caso de las grandes economías de la UE y en el de Irlanda. Con respecto a una forma particular de IED, inversión en nuevos proyectos (*greenfield* IED), se encuentra evidencia de un descenso en proyectos anunciados y gastos de capital en el Reino Unido por parte de otros países de la UE en el período posterior al referéndum, así como en la inversión proveniente de Estados Unidos, uno de los socios más importantes no pertenecientes a la UE.

Para analizar el efecto de *brexit* en la actividad de IED, se utiliza también un enfoque diferente, basado en estimar el efecto que tuvieron sobre la inversión exterior dos etapas del proceso de integración europea: la adhesión a la UE de los distintos Estados miembros y el comienzo de la moneda única en la zona del euro. La hipótesis que subyace es que los efectos del *brexit* pueden considerarse como la reversión del proceso de integración del Reino Unido en la UE. El análisis utiliza un modelo de gravedad de efectos fijos para estimar los efectos de estos procesos de integración en la actividad de IED bilateral con el Reino Unido. Los resultados empíricos sugieren que este país desempeñó, por un lado, un papel como puerta de entrada para un conjunto de países inversores internacionales, fuera de la zona del euro, para entrar en los mercados europeos y, por otro lado, actuó como un centro que reasignó estas entradas y las provenientes de los países del euro entre toda la zona del euro. Por tanto, la desconexión del Reino Unido de la UE puede tener implicaciones para la IED que van más allá de la mera reversión de los flujos de IED que, en promedio, se han derivado de la incorporación de un país a la UE. Las mayores barreras comerciales y una menor integración entre el Reino Unido y los mercados de los países de la zona del euro probablemente tendrán un impacto negativo en la actividad de IED en el Reino Unido y podrían tener, a corto plazo, también un efecto negativo en la zona del euro.

Palabras clave: inversión exterior directa, pertenencia a la UE, moneda única, *brexit*.

Códigos JEL: F15, F21.

INDEX

Abstract 5

Resumen 6

1 Introduction and relevance 8

2 Analysis and recent trends of FDI flows vis-à-vis the UK 10

3 An econometric exercise: The “Brexit effect” on foreign direct investment in the UK and the EU countries 15

3.1 Estimating the Brexit effect on FDI 15

3.2 Empirical strategy and data 16

3.3 Estimation results 17

4 Conclusions 22

ANNEX: Methodological and compilation issues concerning the measurement of FDI 23

References 26

1 Introduction and relevance

It is well established that foreign direct investment (FDI) is a source of economic growth and jobs. FDI increases productivity, boosts capital allocation and is a crucial link in global value chains. In addition, it improves competition, trade, innovation and technology transfer. Furthermore, it is seen as a more robust form of international capital flows. FDI provides a means for creating direct, stable and long-lasting links between economies. FDI is thus a category of cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) resident in an economy other than the one of the direct investor. The motivation of the direct investor is a strategic long-term relationship with the direct investment enterprise to ensure a significant degree of influence by the direct investor in the management of the direct investment enterprise. The “lasting” interest is evidenced when the direct investor owns at least 10% of the voting power of the direct investment enterprise.¹ This may involve either creating an entirely new enterprise (so-called “greenfield” investment) or, more typically, changing the ownership of existing enterprises (via mergers and acquisitions). Other types of financial transactions between related enterprises, like reinvesting the earnings of the FDI enterprise or other capital transfers, are also defined as FDI.

According to the recent trends in EU capital flows,² net cross-border investment in the EU remained negative in 2016 and the first three quarters of 2017 with outward FDI larger than inward investment. The EU remained the most-targeted investment destination globally in 2017 through extra-EU mergers and acquisitions (M&A) of European companies, although it is expected to be overtaken by the US with regard to greenfield investments. In contrast to the rest of the world, cross-border M&A continued to increase in the EU in 2017 due to intra-EU activity. For the first time since the crisis, intra-EU acquisitions were higher than extra-EU acquisitions with the latter still remaining at a high level, but declining due to lower inflows from the US. Global greenfield FDI showed a significant decline in 2017 due to a general decrease across the EU of investments from outside, whilst intra-EU investments remained.

European integration has actually boosted cross-border FDI flows. Studies that recently have revisited the effect of EU integration on FDI inflows estimate that EU membership boosted inward FDI flows strongly. An econometric exercise using a gravity model and an EU dummy (see below) confirms that EU membership increased cross-border FDI flows and stocks. Bruno et al (2016) found that joining the EU raised FDI inflows by on average 28%.³ This figure is in the ballpark of results in other studies. Likewise, it is to be expected that leaving the EU and the Single Market will have negative effects on FDI inflows into the UK. The UK becomes a less attractive investment destination if, amongst other factors, its trading relationship with the EU becomes significantly restricted and net migration falls.

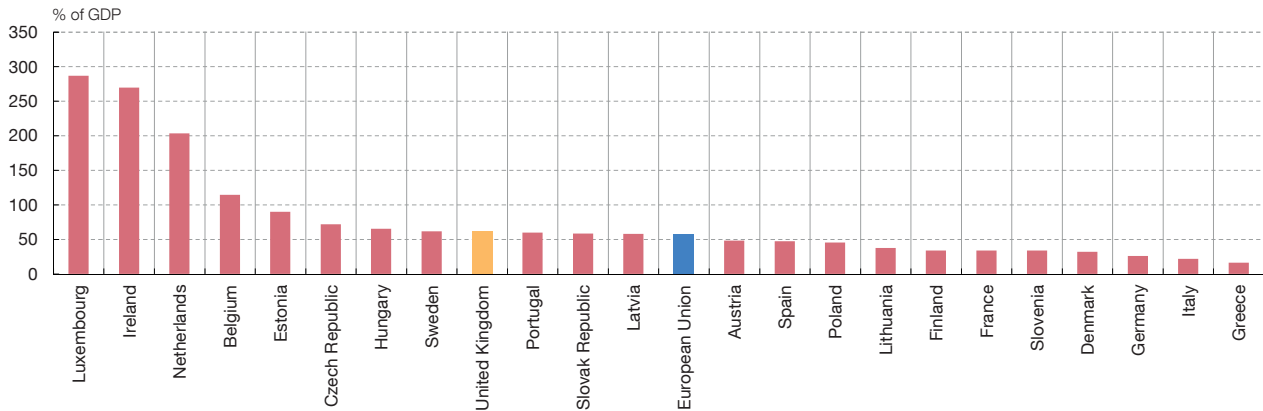
¹ Cf. OECD Benchmark Definition of Foreign Direct Investment-Fourth edition (BD4), 2008.

² Cf. Annual EFC Report to the Commission and the Council on the Movement of Capital and the Freedom of Payments, March 2018.

³ Bruno, Campos, Estrin and Tian (2016), “Gravitating towards Europe: An Econometric Analysis of the FDI Effects of EU Membership”.

INWARD FDI STOCK (2017)

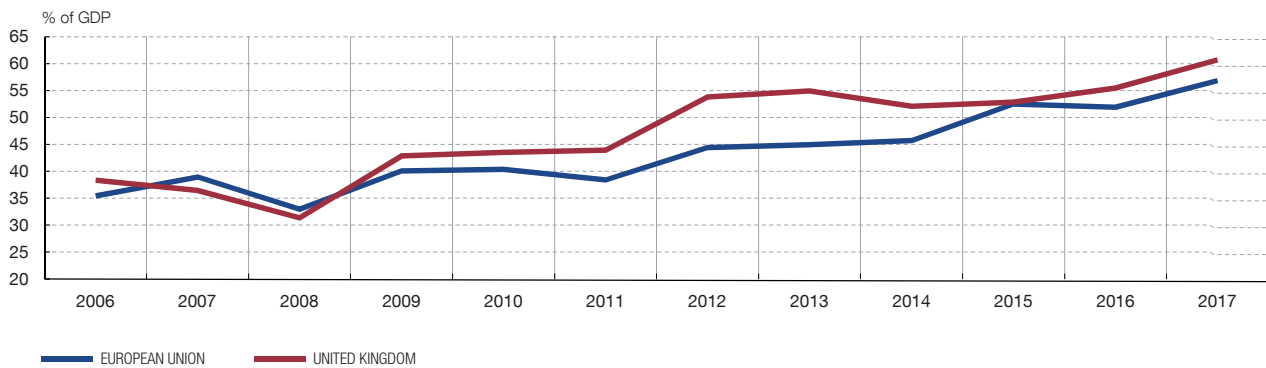
FIGURE 1



SOURCE: OCDE.

INWARD FDI STOCK OVER TIME (2017)

FIGURE 2



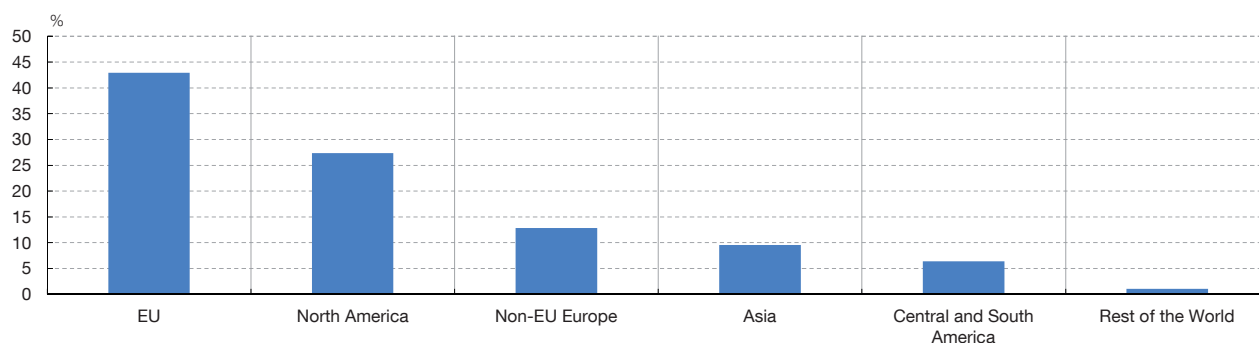
SOURCE: OCDE.

The abovementioned study predicts a fall in FDI inflows of 22%. While it is not to be expected that capital mobility barriers emerge in the UK or the EU,⁴ the endogenous effect on capital mobility, such as FDI flows, should be investigated.

Figure 1 documents the attractiveness of several EU countries as an FDI destination.⁵ Within the EU, the UK has a relatively significant stock of inward FDI, having reached 61% of its Gross Domestic Product (GDP) in 2017 and risen strongly since 2005 (31%). Since 2009, the UK looks more attractive for FDI than the EU, although both have approached their positions as investment destinations more recently (Figure 2). The importance of other EU countries as investment origins for the UK is shown by Figure 3, which depicts the origins of the inward FDI stock in the UK for 2017, when 43% of the inward FDI stock in the UK originated from the other EU countries.

⁴ Some restrictions on FDI flows do exist, as is documented by the OECD FDI Regulatory Restrictiveness Index. Nevertheless, internationally, the European FDI restrictions are amongst the lowest in the world. As the UK is sending signals that it wants to eliminate regulations, it is not to be expected that it will increase FDI restrictions post-Brexit.

⁵ We thank the ECB for data assistance on intra-EU and OECD for extra-EU FDI data.



SOURCE: ONS.

2 Analysis and recent trends of FDI flows vis-à-vis the UK

We analyse FDI flows of EU and non-EU countries vis-à-vis the UK in the light of the referendum outcome of June 2016. Our main goal is to check whether the Brexit vote at the end of 2016Q2 materially affected FDI flows in the UK. In theory, the UK could have become a less attractive FDI destination for two reasons. First, with Brexit, the probability of the UK losing the EU Passport and thus Single Market access has become higher. Second, as trade barriers are likely to emerge, value chain participation becomes less straightforward, which may lead companies to redirect FDI to other markets. As the referendum was held at the end of June, we can compare the period until 2016Q2 as the pre-Brexit era and the period starting in 2016Q3 as the Brexit era. Note that anticipation effects could already have led to a dampening in FDI flows to the UK in the pre-Brexit period.

a General FDI, Intra-EU⁶

A slowdown in FDI flows from the EU-27 into the UK is masked by substantial fluctuations in quarterly data. Therefore, we show a 4-quarter moving average of FDI-flows (Figure 4). While the inflows in the years before the Brexit referendum averaged well over EUR 20 billion quarterly, the four most recent quarters (2017-Q4 to 2018-Q3) show average outflows of more than EUR 2 billion per quarter. A similar pattern emerges for the UK's FDI flows to the EU-27: the pre-referendum quarterly figure averaged EUR 15 billion in outflows, against average inflows of EUR 3 billion in the four most recent quarters analysed.

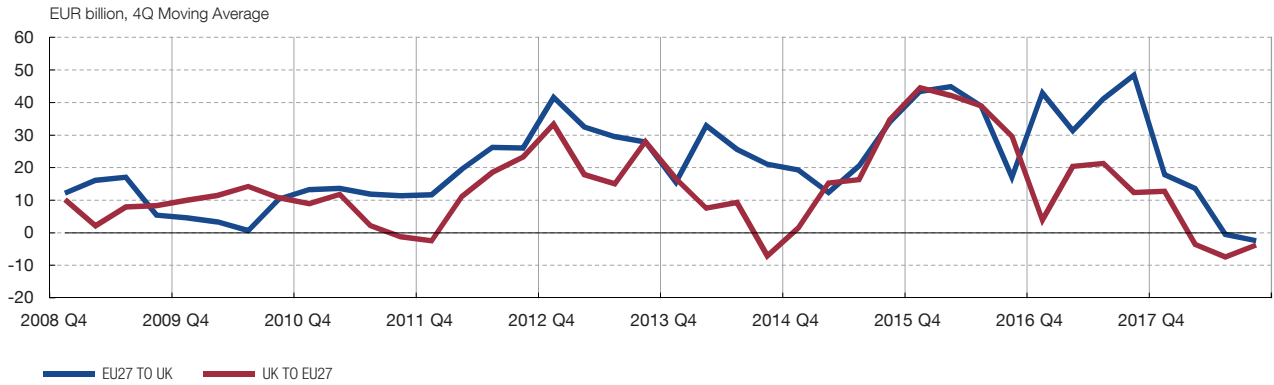
Although FDI flows are notably volatile and biased by periodic non-systematic outliers, and that some caveats on data sources and availability of (still too early) time series data may be identified, tentative evidence is found of a post-referendum slowdown in gross FDI flows from big EU economies and Ireland into the UK.

In an attempt to clean the data for one-offs, we separated the four biggest Euro area economies, Germany, France, Italy and Spain (Figure 5). Interestingly, a Brexit effect seems

⁶ Data source for this section: ECB. Please refer to the Annex for methodological and compilation issues regarding the measurement of FDI.

FDI FLOWS BETWEEN EU27 AND UK

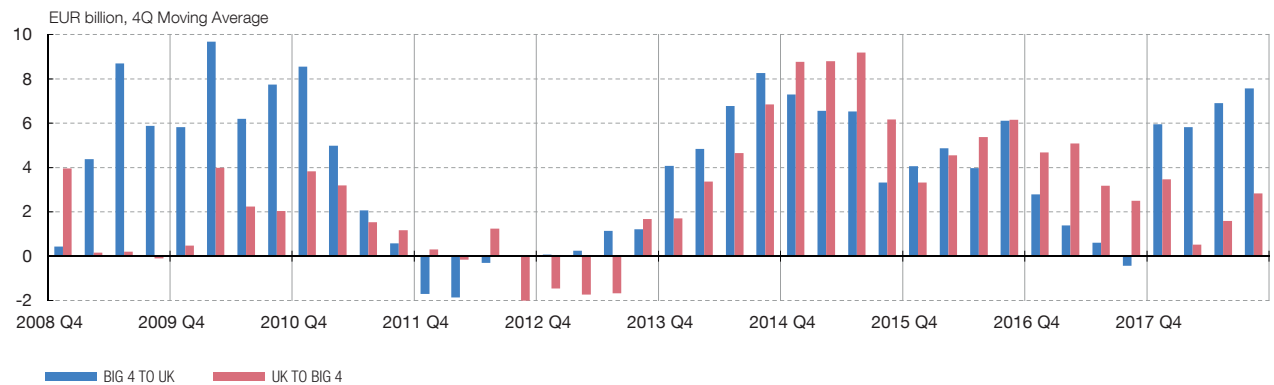
FIGURE 4



SOURCE: ECB.

"BIG 4" VIS-À-VIS UK FDI FLOWS

FIGURE 5



SOURCE: ECB.

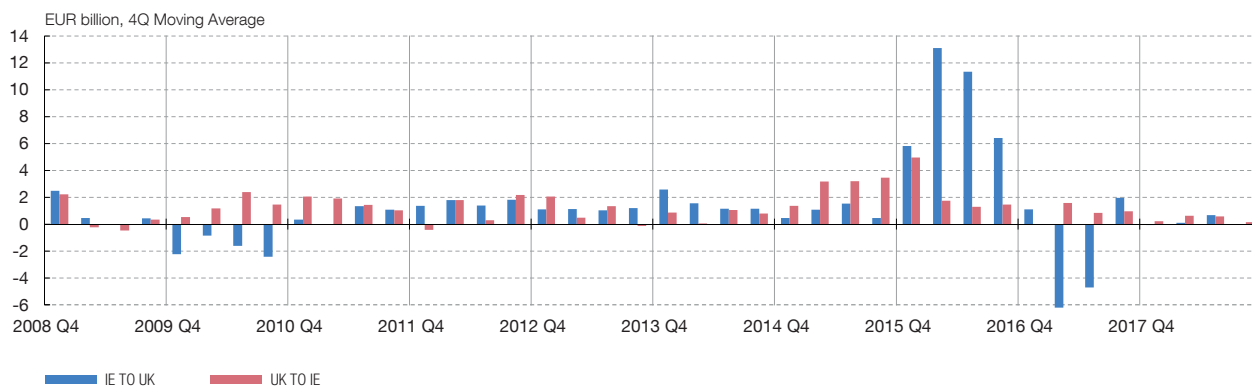
noticeable, although more recently a rebound is visible. Gross FDI flows from these “Big 4” to the UK (to the tune of EUR 5.5 billion) fell to a substantially lower average post-referendum (EUR 0.5 billion, up to 2017Q4). In the last three quarters of our sample period, there is a clear recover to an average of EUR 10 billion, whereas for the EU-27 the trend is downwards. Gross FDI flows from the UK to the Big 4 also seem to be affected by the referendum outcome. They averaged EUR 5 billion before and EUR 2 billion after the referendum.

Another interesting case is Ireland, which is estimated to be the most strongly impacted EU member state by Brexit. Although data are volatile, strong gross outflows from Ireland to the UK in 15Q4-16Q1 dried up around the referendum and even reversed in 16Q3. During the most recent quarters, FDI-flows from Ireland to the UK fell to around zero. In addition, a similar pattern is detected for flows from the UK to Ireland (Figure 6).

Although FDI flows are notably volatile and biased by periodic non-systematic outliers, and that some caveats on data sources and availability of (still too early) time series data may be identified, tentative evidence is found of a post-referendum slowdown in gross FDI flows from big EU economies and Ireland into the UK.

IRELAND VIS-À-VIS UK FDI FLOWS

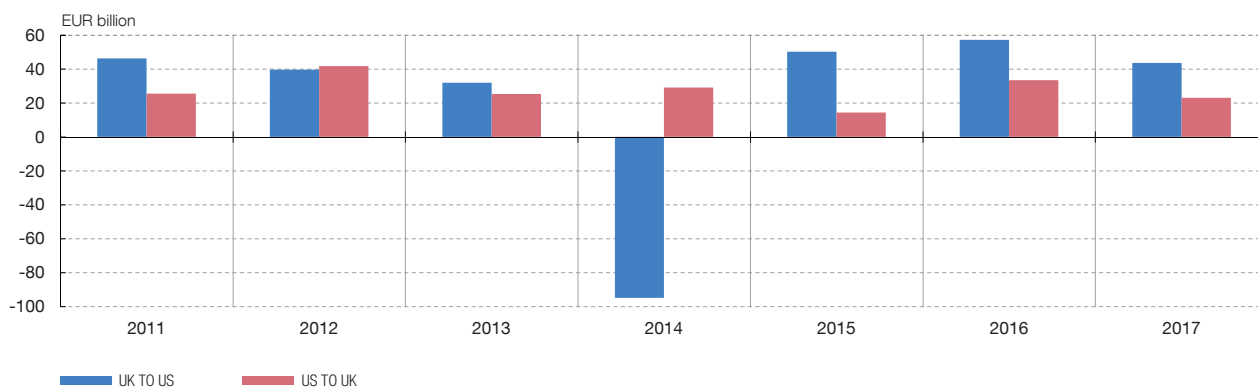
FIGURE 6



SOURCE: ECB.

FDI FLOWS BETWEEN THE UK AND THE US

FIGURE 7



SOURCE: OCDE.

b General FDI, Extra-EU⁷

We complement this exercise with an extra-EU perspective. It is possible that Brexit makes the UK a less attractive FDI destination for non-EU investors, for the reasons mentioned above (losing EU Passport and access to Single Market, disruption in value chains). We make use of OECD data on bilateral FDI flows of OECD countries vis-à-vis the UK. Data are yearly and only available by the end of year t+1. The final year of data production is 2017, therefore only one full post-referendum year is presented and thus any possible Brexit-related effects could only so far be visible for that year.

Regarding flows, it is early to distil a “referendum effect” in 2016 and 2017. Bilateral FDI flows from various other non-EU OECD countries increased in 2016 with respect to 2015, but fell again in 2017. This is evidenced for the US in Figure 7. For Japan, the other big non-EU investor in the UK, a similar pattern emerges.

⁷ Data source for this section: OECD.

c Trends in greenfield FDI

FDI increased sharply in the late 1990s, consisting mainly of mergers and acquisitions in developed countries (including privatization deals) of existing businesses as compared with greenfield investment. This type of investment has been important for the new Central European countries, but the value of such investment is small compared with the bulk of total FDI.

Amongst the different forms of FDI (mergers and acquisitions, extension of capital and financial restructuring), greenfield FDI⁸ is regarded as very favourable and likely to contribute to the destination country's economy. It is a form of FDI in which new enterprises are established by means of direct investment. Brexit might also impact this particular form of FDI as, for example, heightened uncertainty concerning the future trading relationship with the EU reduces the attractiveness of the UK to attract new operations. Although the UK has not formally exited the Single Market and the EU yet, post-referendum anticipation effects could already be visible in the data.

We make use of the FDI Markets database, a service by the Financial Times which is the leading standard regarding greenfield FDI trends.⁹ Although concerns exist pertaining to the reliability of the data,¹⁰ we have no evidence of a more timely or robust indicator regarding greenfield FDI trends.

Regarding European flows to the UK, we observe a decline in announced greenfield FDI projects and capital expenditure post-referendum. This is evidenced from Figures 8 and 9. The substantial decreases in the last part of the sample coincide with the timing of the referendum outcome mid-2016. The latter decrease is in line with previous declines, such as during the Global Financial Crisis (2008-09) and the euro crisis (2011-13). This is also the case for data on new jobs related to greenfield FDI (not shown).

This post-referendum decline is also visible in data on US greenfield FDI into the EU and UK.¹¹ The relative share of the UK as a destination of US greenfield FDI capital expenditure into the EU fell from 46% pre-referendum (2015) to 32% post-referendum (2017). In addition, a decline in the share of announced projects is documented (Figure 10). A similar decline in planned capital expenditure was observed in 2012-13 (euro crisis). One could take into account that Brexit-induced uncertainty not only led to a fall in foreign direct investment, but perhaps also hurt overseas companies (and economies) with exposure to the UK, to the extent that the strong negative effects identified on capital investment and employment decisions of UK-exposed American firms is only one of the many channels through which uncertainty is transmitted across

8 According to the current version of the OECD Benchmark Definition of FDI (BD4), these are the four types of operation that qualify as FDI.

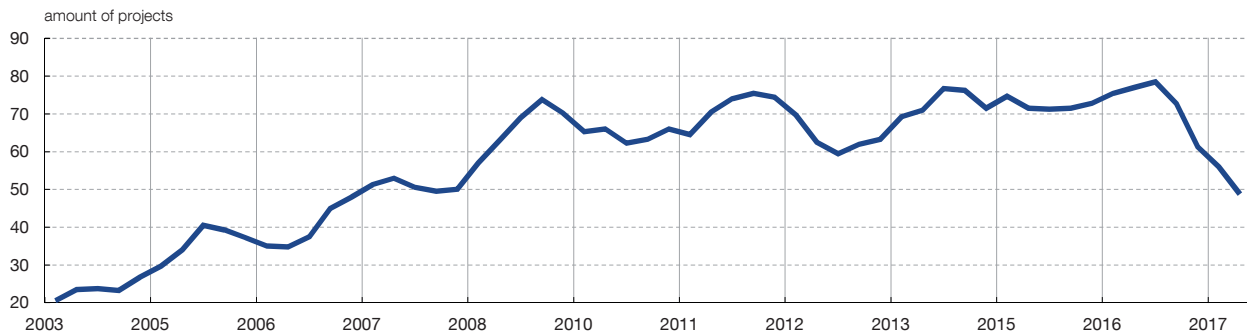
9 We follow the rationale provided by the European Political Strategy Center in the Greenfield Investment Monitor (see, for example, Issue 2 in July 2017).

10 Data collected by FDI Markets are announcements of investments by companies, a method which has been criticized by statisticians, because these are announcements, not effective FDI operations.

11 The US is the biggest (greenfield) FDI investor into the EU, responsible for 60% of inward greenfield FDI in 2017Q1.

GREENFIELD FDI PROJECTS ANNOUNCED BY OTHER EU (a) COMPANIES IN THE UK

FIGURE 8

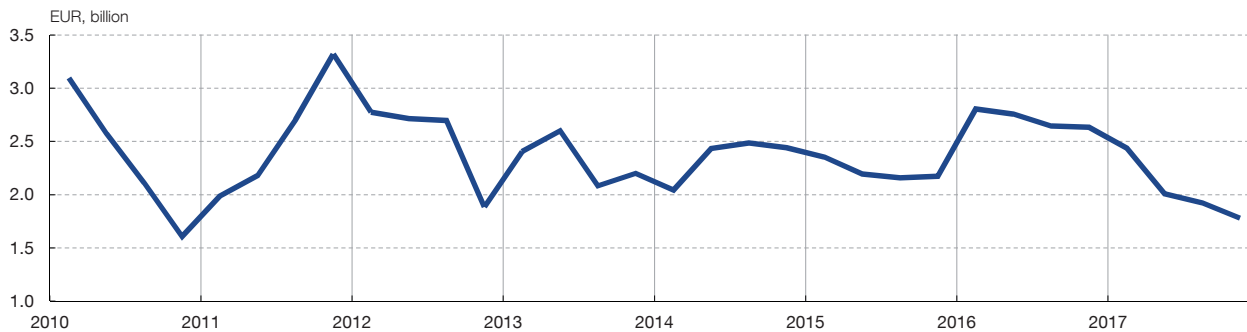


SOURCE: FDI Markets.

a Selected other EU countries are Germany, France, Ireland, Netherlands, Spain, Sweden, Italy, Belgium, Austria and Poland. Four-quarter rolling averages.

GREENFIELD FDI CAPITAL EXPENDITURE ANNOUNCED BY OTHER EU (a) COMPANIES IN THE UK

FIGURE 9

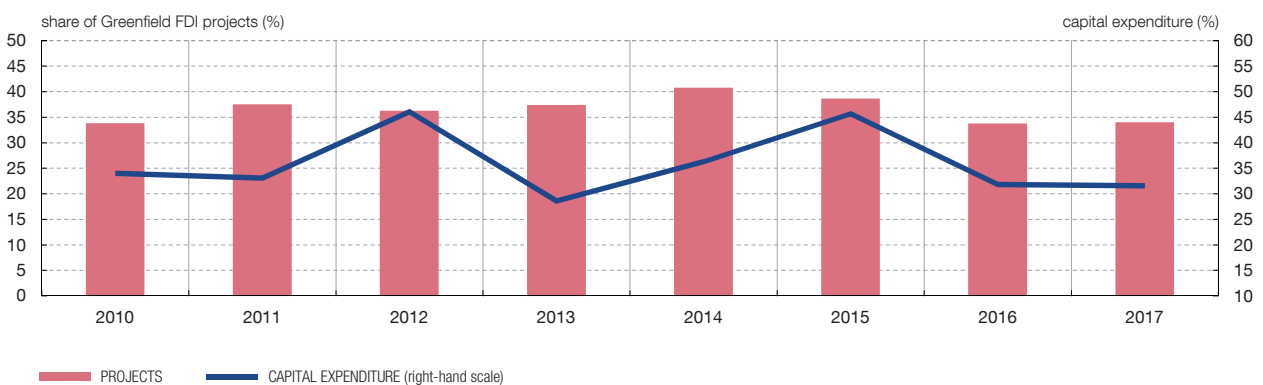


SOURCE: FDI Markets.

a Selected other EU countries are Germany, France, Ireland, Netherlands, Spain, Sweden, Italy, Belgium, Austria and Poland. Four-quarter rolling averages.

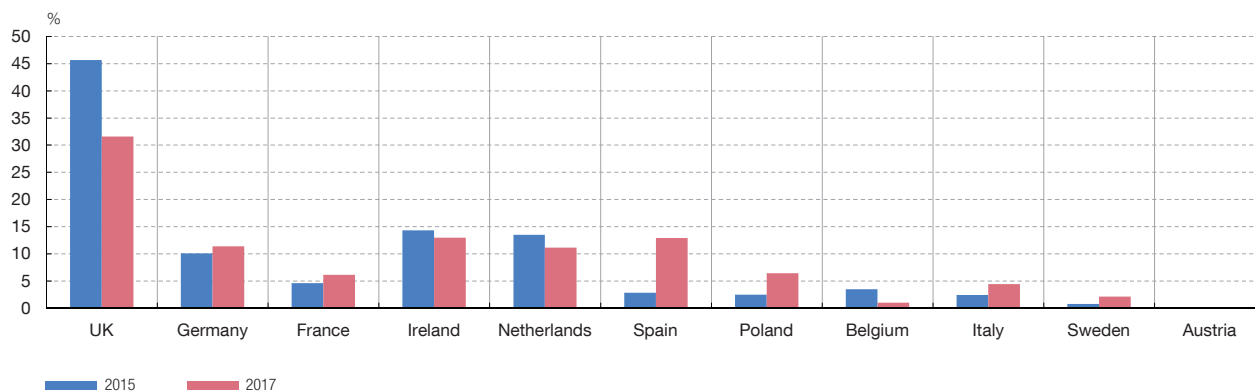
UK SHARE OF GREENFIELD FDI PROJECTS AND CAPITAL EXPENDITURE ANNOUNCED BY US COMPANIES IN THE EU (a)

FIGURE 10



SOURCE: FDI Markets.

a EU countries considered are UK, Germany, France, Ireland, Netherlands, Spain, Poland, Belgium, Italy, Sweden and Austria.



SOURCE: FDI Markets.

a EU countries considered are UK, Germany, France, Ireland, Netherlands, Spain, Poland, Belgium, Italy, Sweden and Austria.

borders. Brexit can thus be seen as a warning to the major economies of the world, to the extent that countries being ever more connected into the global economy, domestic political uncertainty becomes internationally relevant.¹² Regarding shares of other EU countries in receiving US greenfield FDI, the UK’s loss was mirrored by gains in Germany, France, Spain, Poland, Italy and Sweden (Figure 11).

3 An econometric exercise: The “Brexit effect” on foreign direct investment in the UK and the EU countries

3.1 Estimating the Brexit effect on FDI

As noted above, the formation of the EU coincided with increased FDI activity, while (the anticipation of) Brexit seems to reduce it. We complement the aforementioned “real-time” findings with an econometric gravity exercise. Indeed, Brexit effects may be viewed as the reversal of the consequences of the UK integration into the EU. Though it is far from clear that the outcome of both processes were to be symmetric, the most widely used approach to assess its effects is based on the estimated impact of EU membership since there is no previous case of a country withdrawal from the EU.

The impact of free trade agreements – or economic agreements which reduce barriers to trade – on foreign direct investment (FDI) is theoretically ambiguous since it is usually linked to the nature or motivation for this investment. According to the literature, there are mainly two different types of foreign direct investment: vertical investment takes place when multi-plants fragment production into different stages located in different areas (frequently taking advantage of differences in factor prices across countries) and horizontal investment, which is adopted by multi-plant firms that produce similar goods or services in different countries – possibly as a result of a decision to replace exports to these markets with

¹² See “Exporting Uncertainty: The Impact of Brexit on Corporate America” (Campello *et al.*, 2018).

localised production, in order to save on transport costs or remove the impact of trade barriers –. If a trade agreement leads to reduced trade costs, it may decrease the need for horizontal FDI. On the other hand, lower barriers to capital mobility and reduced transaction costs can increase vertical FDI.¹³ Nonetheless, empirical studies tend to find that EU membership and Monetary Union increased FDI inflows.¹⁴

The most common approach in international economics to estimate the effects of free trade agreements is the gravity model which explains bilateral cross-border flows based on the relative size of countries and the distance between them. A country's economic size is expected to have a positive effect on bilateral flows (trade, migration, investment...) while distance (geographical, cultural, regulatory...) is expected to have a negative effect. A free trade agreement usually implies a reduction of barriers (a distance factor) to cross-border flows. Empirical studies using this model generally follow two types of econometric methodology: the most traditional one, which includes size and distance variables, and the most recent one, based on the inclusion of fixed effects to control for unobserved heterogeneity and mitigate biased estimates due to omitted variables. To estimate the “Brexit effect” on FDI flows, we use a fixed-effect gravity model in line with Head and Mayer (2014) and UNCTAD and WTO (2016).

3.2 Empirical strategy and data

The standard gravity model specification includes indicators of country size and “distance” variables as in the following equation:

$$\ln FDI_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln Distance_{ij} + \beta_1 FTA_{ijt} + \epsilon_{ijt} \quad (1)$$

where $\ln FDI_{ijt}$ denotes FDI flows (in logs) from the country of origin “i” (i.e. capital exporter) to the country of destination “j” (i.e. capital importer) at time t; FTA is a dummy that identifies country pairs with a free trade agreement in place; $\ln Distance_{ij}$ is a set of distance variables (geographic, cultural, other) between country i and country j. These are usually time-invariant characteristics that may be correlated with the likelihood of forming an FTA and if some of them were omitted in the specification, estimates of β_1 could be biased. Therefore the most recent approaches include country-pair fixed-effects¹⁵ to absorb all these time-invariant characteristics and control for country-pair unobserved heterogeneity (η_{ij} is the country-pair fixed-effect):

$$\ln FDI_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \beta_1 FTA_{ijt} + \eta_{ij} + \epsilon_{ijt} \quad (2)$$

In some specifications the effect of time-varying origin and destination country variables (like GDP, population...) is captured through country-time fixed effects both for origin and destination countries (γ_{it} and δ_{jt}). The main purpose is to mitigate ‘omitted variable’ bias in

¹³ Horizontal FDI would also benefit from reduced transaction costs.

¹⁴ Some examples are Straathof *et al.* (2008), Petroulas (2007) and Sousa and Lochard (2011).

¹⁵ See Baier and Bergstrand (2007).

estimating β_1 in the same way as with time-invariant characteristics and, in the framework of structural gravity models, these fixed-effects also give account of multilateral resistance terms.¹⁶

Our basic specification uses this latter approach:

$$\ln FDI_{ijt} = \alpha_0 + \beta_1 FTA_{ijt} + \beta_2 EU_{ijt} + \beta_3 EU_uk_{ijt} + \gamma_{it} + \delta_{jt} + \eta_{ij} + \epsilon_{ijt} \quad (3)$$

EU variables have been added to estimate the effect of EU membership on FDI. EU_{ijt} is a dummy which takes value 1 when both countries are member states of the European Union (EU) at time t , but neither of them is the UK; EU_uk_{ijt} is also a dummy, which is equal to 1 when both countries are member states of the EU and one of them is the UK. This variable intends to capture a possible differential effect of inflows to (and outflows from) the UK due to its role as a hub for FDI and financial flows. In equation (3) origin and destination country-time fixed-effects capture the impact of time varying country-size variables. A similar fixed-effects specification is followed in several recent studies.¹⁷

The use of logs poses the problem that only positive data can be used in the estimation what may lead to a selection bias. To address this issue a Heckman selection model is estimated to give account of the likelihood of positive figures.¹⁸ The fact that many observations are zero could be dealt with by using Poisson pseudo maximum likelihood methods, as proposed by Santos, Silva and Tenreyro (2006). However, this method cannot be used if there are negative figures in the database, which is the case for FDI flows and stocks data.¹⁹ Therefore, Poisson model is less helpful for FDI data than in the cases of trade and migration gravity equations.

Data used covers 34 OECD countries between 1986 and 2013 which are the reporting countries. The counterpart countries belong to all world regions and its number is much larger (over 300 partner countries). Data sources for these FDI figures are harmonized balance of payments statistics according to the IMF Sixth Edition of the Balance of Payments and International Investment Position Manual (BPM6). Most studies use either flows or stocks separately to estimate the impact of trade agreements. In our analysis we use both because the impact of a trade agreement may be short-lived or more persistent what may give rise to different effects in flows and stocks.

3.3 Estimation results

The results of estimating equation (3) for both inward flows and stocks are presented in Table 1 (first and third columns) while second and fourth column also present the results for outward flows and stocks. In principle, both inflows and outflows may contain information about

¹⁶ See Anderson and van Wincoop (2003) and UNCTAD and WTO (2016).

¹⁷ See, for instance, Mayer *et al.* (2018).

¹⁸ Bruno *et al.* (2016) follows this approach to deal with the selection bias arising from using only positive numbers. This alternative is also suggested in UNCTAD and WTO (2016).

¹⁹ According to the OECD, FDI financial transactions may be negative if there is disinvestment, the parent borrowed money from its affiliate or reinvested earnings are negative. Negative FDI positions largely result when the loans from the affiliate to its parent exceed the loans and equity capital given by the parent to the affiliate (please see the Annex for further explanation).

Dependent Variable	OLS (log)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Inflows		Outflows		In-Stocks		Out-Stocks	
EU	0.33** (0.15)	0.30* (0.16)	0.10 (0.17)	0.04 (0.16)	0.61** (0.28)	0.64** (0.25)	0.58* (0.30)	0.56* (0.30)
EU_uk_r	0.08 (0.24)		0.34* (0.18)		-0.16 (0.25)		0.07 (0.32)	
EU_uk_p		-0.31 (0.46)		-0.17 (0.52)		0 collinear		0 collinear
FTA	0.32*** (0.10)	0.30** (0.10)	0.05 (0.13)	0.02 (0.13)	0.06 (0.17)	0.07 (0.16)	0.27 (0.18)	0.26 (0.17)
Fixed Effects	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time
Observations	20,418	20,418	24,799	24,799	6,509	6,509	9,020	9,020
Period of time	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013
Number of groups	34	34	33	33	33	33	34	34
R ² (adjusted)	0.83	0.83	0.81	0.81	0.91	0.91	0.91	0.91

EU: dummy variable which is equal to 1 if both reporting and partner countries are members of the EU, except when the UK is involved.

EU_uk_r: dummy variable which is equal to 1 if UK is the reporting country and the partner is a EU member.

EU_uk_p: dummy variable which is equal to 1 if UK is the partner country and the reporting one is a EU member.

FTA: dummy variable which is equal to 1 if both reporting and partner countries are members of a free trade agreement.

Standard errors in brackets, robust (cluster reporting country). Stars indicate statistical significance levels: *** 1%, ** 5%, * 10%.

the effect of EU membership but that information is not always consistent with each other due to statistical measurement issues.²⁰ Therefore we use both datasets to check the robustness of the results.

The coefficient of the EU dummy is positive and significant in three of the four estimates. The effect of EU membership²¹ is an average increase of (intra EU) FDI inflows close to 40% and higher on stocks (about 80%). The estimates on stocks are higher than those obtained previously²² while the impact on inflows is similar to those estimated in other studies.²³ The existence of a FTA also increases FDI inflows in a similar magnitude to EU membership but it seems to be a short lived effect since there is no significant impact on stocks. There has not been a significant impact on FDI inflows to the UK from other EU countries, but the entrance of new members have increased the outflows from the UK. This latter estimate suggests the UK plays a role as a platform for FDI flows into EU members.

The effect of a further step in the European integration process is considered in Table 2. The creation of the European Monetary Union (EMU) might have boosted FDI flows across the region by reducing exchange and liquidity risks throughout the widespread use

²⁰ They may also involve a very different number of observations because the reporting countries do not report equally inflows and outflows, flows or stocks.

²¹ Given by $(\exp \beta_1 - 1)$.

²² See Straathof *et al.* (2008).

²³ See Bruno *et al.* (2016) and UK Treasury (2016).

Dependent Variable	OLS (log)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Inflows				Outflows			
EU	0.33** (0.14)	0.32** (0.14)	0.33** (0.14)	0.32** (0.14)	0.10 (0.17)	0.03 (0.16)	0.10 (0.17)	0.03 (0.16)
EU_uk_r					0.34* (0.18)		0.37** (0.18)	
EU_uk_p						-0.16 (0.51)		-0.17 (0.50)
EMU	-0.14 (0.26)	-0.20 (0.26)	-0.28 (0.31)	-0.29 (0.27)	0.03 (0.19)	-0.01 (0.18)	-0.07 (0.20)	-0.00 (0.19)
EMU_uk_r	0.33* (0.18)		0.60*** (0.20)		0.19 (0.13)		0.25 (0.16)	
EMU_uk_p		-0.38 (0.26)		-0.33 (0.40)		-0.37 (0.32)		-0.61 (0.57)
out_EMU_r			-0.32 (0.25)				-0.36** (0.17)	
out_EMU_p				-0.24 (0.24)				0.01 (0.16)
out_EMU_uk_r			0.45** (0.20)				0.23 (0.15)	
out_EMU_uk_p				0.14 (0.43)				-0.35 (0.56)
FTA	0.32*** (0.09)	0.32*** (0.09)	0.32*** (0.09)	0.31*** (0.10)	0.05 (0.13)	0.02 (0.13)	0.05 (0.13)	0.02 (0.13)
Fixed Effects	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time	country-pair, country-time
Observations	20,418	20,418	20,418	20,418	24,799	24,799	24,799	24,799
Period of time	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013	1986-2013
Number of groups	34	34	34	34	33	33	33	33
R ² (adjusted)	0.83	0.83	0.83	0.83	0.81	0.81	0.81	0.81

EU: dummy variable which is equal to 1 if both reporting and partner countries are members of the EU, except when the UK is involved.

EU_uk_r: dummy variable equal to 1 if UK is the reporting country and the partner is a EU member.

EU_uk_p: dummy variable equal to 1 if UK is the partner country and the reporting one is a EU member.

EMU, EMU_uk_r and EMU_uk_p: similar definitions for EMU members at the launch date (1999).

out_EMU_r: dummy variable equal to 1 (since 1999) if the reporting country was an EMU member in 1999 and the partner country is out of EMU (11 countries which are the largest investors in UK).

out_EMU_p: dummy variable equal to 1 (since 1999) if the partner country was an EMU member in 1999 and the reporting country is out of EMU (in a group 11 countries).

out_EMU_uk_r: equals 1 (since 1999) if the reporting country is UK and the partner is a non-EMU country (in the group of 11 countries).

out_EMU_uk_p: equals 1 (since 1999) if the partner country is UK and the reporting one is a non-EMU country (11 countries).

FTA: dummy variable which is equal to 1 if both reporting and partner countries are members of a free trade agreement.

of a single currency in the Euro area.²⁴ The expansion of European value chains was supported by the EMU creation. The vertical integration associated to value chains boosted trade across Europe and FDI as a complement to trade (vertical FDI). This new framework might have brought FDI into the region from outside countries (extended market effect), especially from those with large multinational companies. To the extent that the Euro also increased financial integration and reduced the cost of capital, investments from countries outside the region might have also been boosted. In this process the role played by the UK as a member of the EU with very developed and deep financial markets might have been particularly relevant. Thus the UK might have worked as a kind of gateway for companies from

²⁴ See Petroulas (2007) and Sousa and Lochard (2011).

countries outside the region to enter European markets. To explore both the effects on intra-Euro FDI flows and on those with non-Euro countries, additional dummies are included in the gravity equations. One variable for Euro membership at the starting year (1999)²⁵ and two dummies for the potential impact on bilateral FDI between the UK and Euro members (one identifies observations when the UK is a reporting country and the other when the UK is a partner country) allow to capture intra-Euro effects, as well as the possible UK role as a platform for increased FDI activity around the Euro area creation. Four additional variables give account of possible extended market effects on FDI into Euro countries and into the UK from a set of countries outside the Euro area that are the largest international or global investors in the British economy.²⁶

The impact of EU membership on FDI inflows is confirmed in these new estimates (Table 2), as well as the effect of having signed a free trade agreement. The results in Table 2 do not point, however, to a particular effect on FDI flows among starting Euro members, neither with inflow nor outflow data. This is a controversial issue in the empirical literature.²⁷ As argued in several analyses, there is a considerable overlap between the countries participating in the Single Market and EU membership and those integrating the Euro. This usually gives rise to collinearity and identification problems in estimations. On the other hand, a significant positive effect on UK inflows from Euro members is found which suggests the Euro had a relevant impact on the UK even though this country was not a member of the single currency, possibly due to its deep and developed financial markets. The coefficient of outflows from the UK to Euro members is close to be significant at 10% level. Lastly, inflows from non-Euro countries (most of them out of the EU) into the UK were also increased, pointing to some kind of extended market effect on the UK from the creation of the Euro area. Interestingly, countries participating in the single currency did not seem to have benefited from this extended market effect, which is in line with findings of Sousa and Lochard (2011). A set of similar specifications was also estimated for stock data, being significant a smaller number of effects as in Table 1 estimations. The coefficients are rather similar but their standard errors are larger, possibly due to a higher persistence and a smaller number of observations in stocks data.

To give account of the likelihood of positive figures and the selection bias that might arise, the previous gravity equations were estimated by using a Heckman selection model for flows data (table 3). In the selection equation the regressors are the EU and FTA dummies, PIB *per capita* (partner country) and a proxy variable of the entry costs of investing in foreign countries – the number of time periods in the sample with FDI activity for each country-pair –, which is supposed to influence the likelihood of a country starting direct investment into a foreign country but not its intensity or magnitude. This exclusion restriction is required for the Heckman model to be properly applied.

25 In 1999 the Euro area members were: Austria, Belgium, France, Finland, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain.

26 This set of countries includes Australia, Canada, China, Hong-Kong, Korea, India, Japan, Russia, Sweden, Switzerland and the United States.

27 While Petroulas (2007) and Sousa and Lochard (2011) find a positive intra-Euro effect, Flam and Norstrom (2008) and Dinga and Dingová (2011) do not obtain evidence of a significant impact from the EMU creation.

EU AND EMU LAUNCH EFFECT ON FDI FLOWS

TABLE 3

Dependent Variable (main equation)	Heckman estimates			
	(1)	(2)	(3)	(4)
	log (Inflows)		log (Outflows)	
EU	1.45*** (0.23)	1.47*** (0.24)	1.15*** (0.17)	1.10*** (0.15)
EU_uk_r			0.23 (0.16)	
EU_uk_p				0.88** (0.38)
EMU	0.25 (0.27)	0.29 (0.25)	1.00*** (0.34)	0.86*** (0.33)
EMU_uk_r	0.65*** (0.15)		0.55*** (0.15)	
EMU_uk_p		1.33*** (0.36)		0.97** (0.50)
out_EMU_r	0.00 (0.22)		0.74*** (0.27)	
out_EMU_p		0.29 (0.21)		-0.23 (0.33)
out_EMU_uk_r	0.29** (0.12)		0.51*** (0.10)	
out_EMU_uk_p		0.49* (0.26)		0.17 (0.30)
FTA	0.65*** (0.19)	0.67*** (0.19)		
Fixed Effects	time, reporter and partner country	time, reporter and partner country	time, reporter and partner country	time, reporter and partner country
Observations	20,310	20,310	24,596	24,596
Period of time	1986-2013	1986-2013	1986-2013	1986-2013
Number of groups	34	34	34	33
Correl (two equation errors)	-0.51 (0.11)	-0.51 (0.11)	-0.73 (0.04)	-0.73 (0.04)
Wald test (p-value)	0.00	0.00	0.00	0.00
Selection equation				
EU	0.15 (0.08)	0.15 (0.08)	0.03 (0.07)	0.03 (0.07)
FTA	0.16 (0.07)	0.16 (0.07)	0.21 (0.05)	0.21 (0.05)
PIB_p	0.26 (0.04)	0.26 (0.04)	0.07 (0.02)	0.07 (0.02)
nn_FDI	0.08 (0.01)	0.08 (0.01)	0.10 (0.01)	0.10 (0.01)

EU: dummy variable which is equal to 1 if both reporting and partner countries are members of the EU, except when the UK is involved.
 EU_uk_r: dummy variable equal to 1 if UK is the reporting country and the partner is a EU member.
 EU_uk_p: dummy variable equal to 1 if UK is the partner country and the reporting one is a EU member.
 EMU, EMU_uk_r and EMU_uk_p: similar definitions for EMU members at the launch date (1999).
 out_EMU_r: dummy variable equal to 1 (since 1999) if the reporting country was an EMU member in 1999 and the partner country is out of EMU (11 countries which are the largest investors in UK).
 out_EMU_p: dummy variable equal to 1 (since 1999) if the partner country was an EMU member in 1999 and the reporting country is out of EMU (group of 11 countries).
 out_EMU_uk_r: equals 1 (since 1999) if the reporting country is UK and the partner is a non-EMU country (in the group of 11 countries).
 out_EMU_uk_p: equals 1 (since 1999) if the partner country is UK and the reporting one is a non-EMU country (11 countries).
 FTA: dummy variable which is equal to 1 if both reporting and partner countries are members of a free trade agreement.
 PIB_p: PIB per capita of partner country.
 nn_fdi: number of time periods in the sample with FDI activity for each country-pair.
 Standard errors in brackets, robust (cluster reporting country). Stars indicate statistical significance levels: *** 1%, ** 5%, * 10%.

Most of the previous estimations results are also obtained with this new procedure that, in general, yields higher values for most of the significant coefficients, thus suggesting a negative bias in the previous estimates.²⁸ The most relevant difference in the Heckman estimates presented in Table 3 refers to the relationship between the UK and the single currency members. Significant and positive coefficients are estimated both for UK inflows from and outflows into Euro area member countries. These significant effects are obtained with both the inflow and outflow databases.²⁹ The assumption that the UK has played an important role as a hub that reallocates FDI across Euro members seems to be highly supported by the data. This role of the UK as a hub has also involved FDI from the set of the largest international investors in the British economy above referred. Not only the UK acted as a gateway to enter Euro countries' markets, as detected in the coefficients in Table 2, but also significant positive effects are obtained for the UK outflows into this set of global investors. A second difference is a significant positive impact on intra-Euro FDI flows according to the outflows information, though this effect is not significant with inflows data. Finally, the launch of the EMU seems to have boosted FDI outflows from Euro members into outside the region, while there was not additional FDI brought into the Euro area.³⁰ Nonetheless, an indirect impact came up through the UK, which received increased inflows from global investors and reallocated them across Euro area members.

4 Conclusions

Countries joining the EU experience an increase in inward FDI flows, an effect found in other studies. UK leaving the EU and the Single Market will likely result in reduced FDI activity between the EU and the UK. In order to try to ascertain the potential Brexit effect on European countries, the analysis presented in this note tries to pay closer attention to the bilateral effects on flows between the UK and other EU countries as well as between the UK and Euro area members.

Post-referendum developments in FDI vis-à-vis the UK show evidence of a slowdown in gross FDI flows from the four biggest EU economies into the UK, as well as a fall in *greenfield* FDI projects announced by EU countries and the US. Estimates of the European integration effect on FDI based on historical data and gravity models suggest that EU membership increased intra-EU FDI flows, but the evidence on a significant single currency effect on Euro area countries is not robust across different estimates. The empirical results of the gravity model highly support a positive impact of the single currency launch on the inflows into the UK and its outflows vis-à-vis Euro countries. The gravity equations also point to an extended market effect which increased FDI into the UK from a set of countries outside the Euro area that are global investors. It appears

²⁸ The existence of correlation in the residuals of the gravity and selection equations (table 4) makes clear the need of their joint estimation (as in the Heckman model) to obtain consistent estimates.

²⁹ For example, the coefficient of the variable EMU_uk_r in the first column of Table 4 (0.65) points to an increase in UK inflows from the euro countries (partners) if inflows database is used. When outflows information is used, this same effect is captured by the coefficient of EMU_uk_p (0.97) which gives the impact on outflows from euro members into the UK (partner).

³⁰ Sousa and Lochard (2011) also find this result. EMU members invested more in non-EMU countries after the launch of the single currency but non-EMU countries have not invested more in the euro-zone.

that the UK has played a double role: as a gateway for those investor countries to enter European markets, on the one hand; and as a hub to reallocate these inflows and those coming from Euro countries across the Euro area itself, on the other. This makes the projection of Brexit effects fairly complex.

The empirical evidence presented in this note suggests that the disconnection of the UK from the EU may have further implications for foreign direct investment than just reverting the effect of EU membership. Larger trade barriers and lower capital mobility between the UK and the Euro area will likely have a negative impact on FDI activity in the UK and might have, in the short run, a negative effect in the Euro area.

A second element derived from this analysis is that the effect of EU and the Euro integration processes on FDI flows of European countries might have been underestimated in previous studies using the logarithmic transformation without taking into account the implicit selection of considering only positive figures. When using an estimation method adequate to deal with the possible selection bias that may arise, most effects are found to be higher than with the usual specifications in logarithms. Nonetheless, some caution would be advisable when using these estimates, given the wide range obtained in this study and in the empirical literature. A more robust and reliable feature of the FDI gravity models is the significance of specific effects.

ANNEX: Methodological and compilation issues concerning the measurement of FDI

Data on Foreign Direct Investment are compiled and statistics are made available by several international organisations, including amongst other the OECD, the IMF, the European Commission/Eurostat and the ECB. Different sources of data benefit from the existence of the 4th edition of the OECD Benchmark Definition of Foreign Direct Investment which serves as a single point of reference for all that is related to FDI and its measurement. The Benchmark is the result of the work by the international community of FDI statisticians that was undertaken at the request of the OECD and in cooperation with the IMF and other partner international organisations.

The Benchmark Definition recommends that FDI data be presented in two ways: on a straightforward asset/liability basis (i.e. under the asset/liability principle) and reflecting the direction of direct investment influence (i.e. under the directional principle). The two principles are described as follows:

FDI according to the asset/liability principle

FDI aggregates as a part of national macro-economic statistics are based on the asset/liability principle. They are consistent with monetary, financial, and other balance sheet data, balance of payments (BOP) and international investment position (IIP) statistics, as well as with the components of national accounts statistics, facilitating thus the comparison

between the several data sets. The data presented on this basis, while compiled distinguishing the nature of the relationship between the several FDI counterparts, do not incorporate any offsetting of reverse direct investment transactions or positions in equity or debt between a direct investment enterprise and its direct investor and between fellow enterprises.

FDI according to the directional principle

The typical direction of direct investment is from the direct investor to its direct investment enterprise. However, there may also be flows in the reverse direction (when the direct investment enterprise invests or lends funds to its direct investor, but owing less than 10% of its equity, which are then equivalent to the withdrawal of investment) and between fellow enterprises. Massive investment flows into and out of a country may not be of primary interest to analysts of direct investment if they reflect merely a pass-through or round-tripping of direct investment funds. Therefore, users seeking to analyse the economic impact of FDI from the perspective of the direction of influence/control would rather focus on investments recorded according to the directional principle both for transactions and positions. Under the directional principle, direct investment is shown as either direct investment abroad (outward) or direct investment in the reporting economy (inward). FDI statistics compiled according to the directional principle show outward investments and inward investments taking into account reverse investments (i.e.) as well as investment into fellow enterprises - the direction in the latter case depending on whether the ultimate controlling parent of the resident fellow enterprise is a resident or a non-resident of the compiling economy.

Data on both the asset and liability presentation and the directional principle presentation are useful for different kinds of analysis. The directional principle is a presentation of direct investment data organized according to the direction of the direct investment relationship. It can be contrasted with the asset and liability presentation of aggregates used in standard components of the 6th edition of the IMF Balance of Payments and International Investment Position Manual, which are organized according to whether the investment relates to an asset or liability. In this Manual, the directional presentation appears as supplementary items, since the standard presentation for FDI under BOP relies on the asset/liability basis. The difference between the asset-liability and the directional presentations arises from differences in the treatment of reverse investment and some investment between fellow enterprises, however the FDI total net position for both presentations should be the same.

FDI financial transactions may be negative for three reasons. First, if there is disinvestment in assets - that is, the direct investor sells its interest in a direct investment enterprise to a third party or back to the direct investment enterprise. Second, if the parent borrowed money from its affiliate or if the affiliate paid off a loan from its direct investor. Third, if reinvested earnings are negative. Reinvested earnings are negative if the affiliate loses money or if the dividends paid out to the direct investor are greater than the income recorded in that period. Negative FDI positions largely result when the loans from the affiliate to its parent exceed the loans and equity capital given by the parent to the affiliate. This is most likely to occur when FDI statistics are presented on a directional basis and by partner country.

Apart from these methodological issues, some caveats on data sources, compilation practices and periodicity and timeliness of availability of FDI time series data may be identified, illustrating the somehow uneasy task of collecting FDI bilateral statistics internationally comparable and readily available in a short period of time.

The IMF publishes data for FDI flows and stocks within the BOP/IIP framework. These are national data not broken down by counterparty country. The geographical details for FDI stocks are only collected via the IMF Coordinated Direct Investment Survey (CDIS). The CDIS is an annual exercise that collects data on FDI stocks at the end of each year (starting with data corresponding to end-2009) with counterparty information received from more than 100 economies. All participants in the CDIS report data on their inward direct investment and most participants also provide data on their outward direct investment. This is the statistical output made available by the IMF where bilateral FDI stocks figures reported by each country vis-à-vis each other specific country, may be gathered.

The ECB collects and publishes statistics of BOP/IIP, including the FDI component, for the Euro area countries as a whole, following the asset/liability principle, on a quarterly basis.

For additional information broken down by geography, the OECD collects such FDI financial items by partner country, but not on a quarterly basis, only on an annual basis. The results are typically available by the end of the following year. Bilateral OECD FDI statistics are presented on a directional basis, not on an asset/liability basis. Also bilateral FDI flows and stocks related to inward and outward FDI vis-à-vis a certain country are available on an immediate counterpart country basis, while ultimate investing country FDI positions are also available but for a few countries.

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