

Economic Analysis of Multinationals Firms in the UK after Brexit

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This paper provides an impact assessment of Brexit considering the role of foreign multinationals enterprises (MNEs) in the United Kingdom (UK). We extend our previous research, which has estimated the potential impact of Brexit focusing on migration and trade (Ortiz and Latorre; 2018a, 2018b) including the impact of a reduction in the inflow of FDI and the effect of fiscal savings once Brexit comes into force.

The incorporation of FDI and multinationals' operations in the analysis of Brexit has received scarce attention in the literature (Fernández-Pacheco et al, 2018a; Fernández-Pacheco et al, 2018b). However, it could lead to closer results to the potential effects of Brexit and therefore identify possible ways to minimize its negative impact. In this paper, we provide results not only related to FDI falls and fiscal savings but also those produced by the rest of dimensions considered in the study (tariffs, non-tariffs barriers and immigration restrictions).

To this aim, we use a recursive dynamic computable general equilibrium (CGE) model, namely, the GTAP Recursive Dynamic (GTAP-RD) model (Aguiar et al., 2019), which incorporates imperfect competition, increasing returns to scale and Melitz specification based on the parsimonious GTAP-AEKM (Armington-Ethier-Krugman-Melitz) extension.

The model will distinguish 21 sectors and five regions: UK, EU, US, China and ROW). The model allows estimating the impact on GDP, welfare, wages and capital remuneration, together with the evolution of aggregate and sectoral output, exports and imports.

Keywords: Foreign Direct Investment, FDI, Multinationals, Migration, Non-tariff Barriers, NTBs, Fiscal Savings, CGE, Brexit, European Union, United Kingdom.

JEL codes: C68, F15, F23, F62

1. Introduction.

Most of the previous studies on Brexit have analysed its impact on trade. Others have included elements such as migration and uncertainty (for more details see Busch and Matthes, 2016; Latorre et al., 2018). But, only a few have focused on the impact of Foreign Direct Investment. This is because modeling FDI is much more difficult than modeling some aspects of trade (tariffs and non-tariffs barriers). Investment is volatile and to a great extent, its performance is more difficult to be grasped than trade (Fernández-Pacheco et al., 2018).

According to the World Investment Report (UNCTAD, 2018), Foreign Direct Investment (FDI) inflows to the United Kingdom (UK) declined by 92% in 2017. This contraction was explained by the return to prior levels of FDI inflows in the UK after the large cross-border mergers and acquisitions (M&As) that it faced in 2016. The cross-border M&As in the UK accounted for US\$225 billion in 2016, a much greater value compared to the annual average of US\$45 billion registered over 2001-2015 (UNCTAD, 2018). This negative evolution is probably also related to the uncertainty generated by Brexit.

In addition, a potential emergence of restrictions on cross-border investment due to Brexit suggests that the total cost of leaving the EU is likely to be larger than what previous estimations based only on trade and migration suggest. Therefore, we extend our previous research including shocks related to FDI falls. In addition, we incorporate fiscal savings following Dhingra et al., (2017).

Although our main contribution is to estimate the impact of the reduction of FDI inflows across different micro and macroeconomic variables. Which constitutes a step ahead from the estimation of the evolution of FDI inflows themselves since we add the effects of those potential reductions. We also consider the impact of fiscal savings and restrictions on migration and trade, in order to identify which of these shocks would be the main source of the total impact of Brexit in the UK.

This study is conducted using a multi-sector, multi-regional Computable General Equilibrium (CGE) Model, which integrates several economic dimensions to provide a complete description of an economy. We disaggregate the world economy in 21 sectors, 5 economies (UK, EU, US, China, and ROW), and 4 factors (skilled and unskilled labour, land and capital).

This paper is organized as follows. Section 2 describes the evolution of FDI, the role of multinationals in the UK and future perspectives of investment agreements after Brexit. Section 3 shows a review of the empirical literature, while section 4 describes the model that we use. Data and simulations are detailed in section 5, while the aggregate and sectoral results are explained in section 6. Finally, section 8 concludes.

2. Foreign Direct Investment and Multinationals Enterprises in the UK

2.1. The role of Multinationals enterprises in the UK

There is no doubt that EU membership has reinforced UK's attractiveness as a place to invest and as an export platform for multinationals. According to HM Government (2016) "Three-quarters of foreign investors cite access to the European market as an important reason for their investment in the United Kingdom (UK)". According to the World Investment Report (UNCTAD, 2017), in 2016, the UK was ranked the fourth most attractive multinationals host economy. However, for the period from 2017 to 2019, the UK was ranked in the 7th position of the "MNE's top prospective host economy". This could be related to the uncertainty about the results of Brexit negotiations. Which will probably affect the interest of other regions to invest in the UK.

The total stock of FDI in the UK has been falling since 2014, after having experienced an increase of 8.29%. It faced a reduction of 13.95% during the period from 2014 to 2016, due to the fall in the stock of FDI holding by ROW and EU countries (See figure 1).

Figure 1.

The decline in the stock of FDI in the UK seems to be the trend if we take into account that in 2017 the inflow of FDI in the UK drops by 92%. According to the World Investment Report (UNCTAD, 2018) this contraction responds to the reduction in value of deals registered in 2017 regarding the exceptional increase of Cross-border Mergers and Acquisitions (M&As) recorded in 2016 (e.g., the largest deals in 2017 were much smaller in value than the combined valued of the four largest deals registered in 2016 – US\$224 billion-) and the fact that a greater share of transactions in 2017 were changes of ownership between foreign investors (with no net effect on FDI) or divestment (UNCTAD, 2018)¹.

In terms of multinationals enterprises, during the period from 2008 to 2014, 37.49% of the turnover in the UK was held by foreign enterprises, and 15.56% of it was accounted by multinationals controlled by EU countries (See Figure 2). As Fernandez-Pacheco et al. (2018) indicate foreign affiliates in the UK account for a much larger share in the turnover than in the average of the EU-28 (28.6%) and it also stands out versus other large economies, such as Germany (22.7%), France (20.4%), Italy (18.1%) and Spain (27.2%).

¹ According to the World Investment Report (UNCTAD, 2018), change of foreign ownership type deals accounted for 8 per cent of all deals in 2016, but 42 per cent in 2017. Divestment deals accounted for 7 per cent in 2016, but 12 per cent in 2017).

Figure 2.

Even though, the UK is much related to EU in terms of trade than in terms of multinationals operations. Foreign affiliates play an important role. In 2016, 48.30% of total exports and 49.1% of total imports were controlled by multinationals, while, in terms of total intra-EU trade, 46.5% of exports and 55.2% of imports were held by foreign affiliates (See table 1). This means, that the result of trade negotiations would have important repercussions not only in overall trade flows but also in investment decisions.

Table 1.

2.2. Brexit negotiations: The last proposal of a withdrawal deal

With less than four months to the deadline for the UK's exit from the EU (29 March 2019), the last November 25, 27 EU leaders gave the deal their blessing. However, the uncertainty of ratifying a final deal increase, due to the little support by the UK parliament to the draft proposal².

If the agreement is ratified by the UK parliament, it “will have to go back to the European Council, where a majority of countries (20 out of 27 states) will need to vote for it, and then it needs to be ratified by the European Parliament, in a vote expected to take place in early 2019” (BBC News, 2018). On the other hand, if the deal is rejected by the UK parliament, several possible outcomes must be analysed, such as, the extension of the negotiations, another referendum or leaves the EU without a withdrawal agreement. Regarding an extension of negotiations, “Some European officials say that EU leaders could be amenable to extending the withdrawal process beyond March 29 if there was a chance Brexit could be reversed”. In addition, “Some EU lawyers say the absolute limit for that extension is July 1, when a new European Parliament without UK members would take office, but others say it might be possible to extend it further” (Wall Street, 2018a).

The withdrawal agreement setting the terms of the UK's exit from the EU, such as “divorce bill”, citizens’ rights, and the Northern Ireland “backstop”. If the deal is ratified, the UK's relationship with the EU will essentially unchanged during the transition period (which ends in December 2020). That means, that the UK will remain following many of the bloc's regulations, applying its tariffs and maintain a “level playing field” for UK and EU firms. In other words, the UK will be temporarily into a customs union with the EU. However, the UK

² The document will be voted by the UK Parliament on 12 December, but its approval is far from guaranteed.

will be no direct representation in EU institutions, and, it would have to adapt its own rules if the EU changes its rules in the future (Wall Street, 2018b).

As mentioned above, the proposal, also include a way to keep the Irish border open, the named “backstop”, which would enter into force if the UK and the EU do not achieve a trade deal which guarantees close ties between the UK and EU, in such a way that customs and other checks would not be necessary on the Irish border.

In terms of the outline of the future relationship between the EU and the UK that will be present in coming negotiations, both regions are agreed to establish alternative arrangements for ensuring the absence of a hard border on the island of Ireland, create a free area combining a deep regulatory and customs cooperation, to provide market access and national treatment under host state rules, ensuring providers and investors a non-discriminatory treated manner, as well as, secure free movement of capital and payments related to transactions liberalized under the economic partnership (European Commission, 2018).

Nevertheless, the uncertainty in regard to the favourable UK parliament’ vote will continue to affect the investors' decisions. For example; Mr. Raab’s resignation on November 15, "sent the pound sharply lower and intensified the selloff in British bank shares...The yield on British government bonds fell, while the FTSE 250 index, which is made up of domestically oriented U.K. companies, ended the session down 1.3%" (Wall Street, 2018c).

2.3. Foreign Direct Investment: Future Conditions after Brexit

Leaving the EU without a withdrawal agreement would mean new checks on both sides of the border, introducing delays in supply chains, which means higher cross-border costs. In other words, trade between both economies would be conducted under the World Trade Organization (WTO) rules leading to the emergence of tariffs and non-tariff barriers. If the UK is no longer represented by the EU in the WTO, some amendments to the current lists of concessions and schedules commitments will be required. Hence, the UK will need to record its own list of concessions and commitments.

According to Molinuevo (2017) and Sacerdoti (2017), after Brexit, those Preferential Trade Agreements (PTAs) that are focused only on goods and the Generalized System of Preferences (GSP) will no longer apply to the UK. However, the applicability of those agreements that include services, investment and intellectual property (mixed agreements) remains uncertain. Because these agreements include provisions that go well beyond the competences of the EU and require the acceptance by the states that form part of the EU. On the other hand, WTO membership and Bilateral Investment Treaties (BITs) with third countries will remain in force. These agreements would remain as currently are if third countries considered that Brexit does not reduce the value of their negotiated commitments.

Regarding BITs, until the 2009 Lisbon treaty³, Member States in the EU made their own network of Bilateral Investment Treaties and their own national regulation to attract FDI (Meunier, 2014)⁴. Tax reductions, regulatory incentives, infrastructure and labour market flexibilities are some policies adopted by member states in order to attract foreign investors.

Although, the investment treaties concluded by the UK with third countries will remain valid after Brexit, some of these third countries may want to renegotiate some terms of the treaty or reject the deal, if they consider that Brexit could have a potential impact on their economic relationship with the UK or in their business with other EU member states. “Third countries may consider that the original rights and obligations set out in the BITs are not proportionate to the new conditions, and could wish to revise the terms of the investment treaty that links them to the UK” (Molinuevo, 2017). For example, Fernández-Pacheco et al. (figure 6, 2018) found in their study that the United States (US), France, Germany, Japan and China were the most important investment partner for the UK in 2014. Hence, US companies located in the UK could consider that Brexit could limit their operations in the other EU member states, affecting further investment decisions in the UK.

The exit of the UK from the EU without a deal would imply an increase in the cross-border cost and potential retards, which would negatively affect the just-in-time delivery that most companies apply. According to Anastassia Beliakova, head of trade policy at the British Chambers of Commerce the uncertainty of Brexit negotiations “has forced companies to look at their supply chains”. For example; the aerospace giant Airbus S.E., based in Toulouse, France argues that delays produced by a withdrawal from EU without a trade deal “would be so costly that it could likely close its British operations” and “even a negotiated exit would likely throw grit into the gears of the sensitive supply chains built up over decades”. (Wall Street Journal, 2018d).

As we noted above, the loss of the UK’ appeal for the entry of FDI does not affect only the flows coming from the EU investors but also from the rest of partners that are interested in the access of the European single market.

3. A review of empirical literature.

There are several studies which have assessed the impact of regional integration on FDI flows. Overall, they find that regional integration affects FDI entry positively. Daude et al. (2003) find evidence that a regional integration agreement (such as the EU membership) would increase FDI by around 27%. Fournier (2015) estimates that a reduction of 20% in regulatory differences increases FDI inflows by 15% and suggests that belonging to the EU

³ Before the 2009 Lisbon Treaty, the EU did not have formally competence over the negotiations of FDI agreements of its Member States.

⁴ “By the time of the Lisbon Treaty, member states had about 1,200 extra-EU BITs with 148 countries, accounting for almost half of the investment agreements in the world” (Meunier, 2014). For example, UK has concluded over 100 BITs since 1975, the last one with Colombia in March 2010 (Molinuevo, 2017).

single market can have an additional positive impact on FDI beyond the effects of traditional Free Trade Agreements (FTAs). This makes sense given the fact that the EU is the economic area which is most integrated (i.e., with the lowest regulatory barriers across different countries) in the world. Both studies use a gravity model. The former uses a dataset that covers FDI from 20 source countries, all of them from the OECD, while the latter uses a baseline country sample that includes OECD countries in which the share of FDI assets owned by Special Purpose Entities (SPEs) does not exceed 80%.

In addition, there are other studies that focus on the impact of the EU membership on FDI flows. Clausing and Dorobantu (2005) examine the impact of EU membership for the Central and Eastern European economies. They find that key announcements around EU accession resulted in increased FDI inflows going to the applicant countries. Bajo-Rubio and Torres (2001) found that FDI going to Spain expanded due to its EU accession and played an important role in promoting productivity growth. Bajo-Rubio and Sosvilla-Rivero (1994) and Barrell and Pain (1999) found that the inward FDI in Spain and Portugal increased significantly after their accession into the EU in 1986. Similar results were found too for the UK, Ireland, Spain and Sweden (Barrell and Pain, 1998). Baldwin et al. (1996) also confirm the increase in FDI inflows for the accession of Austria, Finland and Sweden. It seems that FDI inflows rise when a country forms part of the EU.

On the other hand, HM Government (2016), Clausing and Dorobantu (2005), Brouwer et al. (2007) and Bruno et al. (2016) have estimated the potential impact in FDI of leaving the EU.

HM Government Analysis (2016) estimates comprise different ranges of FDI reductions. It estimates the impact on total FDI inflows into the UK from EU and non-EU countries under different counterfactuals using a panel dataset constructed with FDI data for 40 countries over the period 2000 to 2012. According to its three alternative scenarios, the UK would face a fall in FDI by -10% under the EEA membership, between -15% and -20% under an FTA with the EU or a reduction between -18% and -26% under WTO. Then, these results have been used as inputs into modeling the overall macroeconomic impact of leaving the EU. According to HM Government (2016), Clausing and Dorobantu (2005) calculate that the FDI stock would decrease by -34%, while Brouwer et al. (2007) estimate that the outward stock of FDI inflow would drop around -21%. Regarding Bruno et al. (2016), they estimate the effect of EU membership on FDI inflows using bilateral FDI data from 34 OECD countries between 1985 and 2013. They predict a 22% decrease in FDI inflows in the UK after leaving the EU.

There are several estimations on the reductions of FDI inflows that the UK will experience after Brexit. According to HM Government (2016), the UK will experience a fall of -10% under an agreement similar to the European Economic Area (EEA) membership. However, this reduction will be worse in a range between -15% and -20% if the UK and the EU only achieves a Free Trade Agreement (FTA). Finally, under their worst scenario, in which the UK does not achieve a withdrawal agreement with the EU and trades with them following the WTO rules, it will face a FDI reduction between -18% and -26%. Other studies, such as Clausing and Dorobantu (2005) estimate a decrease of -34% of the FDI stock, while Brouwer

et al., (2007) and Bruno et al., (2016) estimate a reduction of -21% and 22% on FDI inflows, respectively.

As we have just seen, the empirical studies analyzing economic integration and FDI find a positive relationship. This is confirmed with economic integration in general but seems even more pronounced with EU integration and even confirmed with studies focusing in Brexit. However, unlike the HM Government (2016) analysis these studies we have summarized do not extend the analysis to evaluate the *effects* of that reduction on FDI in the whole economy, which is precisely what we do in this paper.

Among the papers who estimate the impact of a reduction on FDI in the UK after Brexit, we can find the analysis of Dhingra et al. (2016), OECD (2016), HM Government (2016), Latorre et al. (2017), Ciuriak et al. (2015) and Pain and Young (2004).

Dhingra et al. (2016) and OECD (2016) evaluate the impact of FDI reductions in the UK using the estimations of Bruno et al. (2016) and Fournier (2015), respectively. Dhingra et al. (2016) estimate that a 22% fall in the FDI would lead to lower real income in the UK by 3.4%. While, OECD (2016) runs a decline on FDI between -10% and -45%. Unlike, Dhingra et al. (2016), the OECD and HM Government (2016) approaches do not show the effects of FDI reduction in the real incomes separately from the rest of channels considered in the study (e.g., migration, tariffs and non-tariff barriers on trade, tariffs and uncertainty, among others).

Finally, to the best of our knowledge only Latorre et al. (2017), Ciuriak et al. (2015) and Pain and Young (2004) include FDI and operations of multinationals. Latorre et al. (2017) and Ciuriak et al. (2015) derive the impact of Brexit as an increase of barriers that multinationals would face to operate in foreign countries. Latorre et al. (2017) found that one third of the overall negative impact of Brexit (e.g. -0.88% of overall GDP fall in the UK under hard Brexit scenario) is because multinationals would face costs increases. However, Latorre et al. (2018) only cover the impact of Brexit on service multinationals (and not on multinationals operating in manufactures and agriculture), while this paper covers FDI throughout all sectors of the economy. By contrast, Ciuriak et al. (2015) estimate that the impact of FDI reductions on the GDP in the UK is close to zero (-0.002%). This result is hard to believe since multinationals play a very important role in the UK as was shown above. Pain and Young (2014) estimate a very significant effect from FDI in the UK's GDP (2.25% reduction). However, the mechanisms of FDI are different that in the two previous studies because lower FDI inflows result in a reduction productive efficiency. In addition, Pain and Young (2014) as well as Dhingra et al. (2016), OECD (2016) and HM Government (2016) do not provide estimates of the impact of FDI fall over the sectoral production and trade.

4. Model and simulations.

A CGE model includes both the supply and demand side of the economy in order to capture the interactions of households, firms and the government. The interactions between these economic agents are presented as a system of equations, which are derived from microeconomic optimization theory.

With respect to the demand side of the economy, there are four categories: private consumption, investment, public consumption and exports. Regarding the supply side, producers decide about the optimal combination of intermediates inputs and factors of production to produce goods and services.

All economic agents interact with one another through the markets of factors and commodities. There is a representative household and a government who consume goods and services offered by producers in the commodity markets. The income that producers receive is used to employ factors of production and buy imported or domestic intermediates in order to produce goods and services that will be allocated in the commodity market. Therefore, producers are related to one another through the demand of intermediates and are related to households through the demand of factors of production (labour and capital)⁵. In return, the representative household receives a remuneration (through wages or rents) that will be used latter to buy goods and services, in order to maximize its utility. These microeconomic optimization decisions are then comprised in a framework representing national accounts identities, which also define the equilibrium in the economy.

We use a dynamic multi-region and multi-sector CGE model, namely, the GTAP Recursive Dynamic (GTAP-RD) model. A detailed explanation of the model is available in Aguiar et al., (2019). This model incorporates imperfect competition, increasing returns to scale and Melitz specification based on the parsimonious GTAP-AEKM (Armington-Ethier-Krugman-Melitz) extension, which is describe in Bekkers and Francois (2018).The model uses the GTAP database, which homogenizes input-output information, detailed foreign trade data and a rich set of data from national accounts of different regions. This offers the possibility to analyse the impact of a shock in the inflow of FDI in the UK along each sector and economic agent in the economy, as well as, the potential impact of increases of trade cost, migration policies restrictions and fiscal savings.

We disaggregate the world economy in 21 sectors, 5 economies (UK, EU, US, China, and ROW), and 4 factors (skilled and unskilled labour, land, and capital). In the function of production land is introduced as sector specific, while labour and capital are considered fully mobile across sectors within the economy. In addition, the capital stock is fixed and evolves

⁵ In this model we assume that capital and land are specific. This means that these two factors can be used only in the production of one sector of the economy. This implies, that increases in total production in a specific sector can be achieved only through the employment of more units of labour or more capital coming from FDI inflows. Hence, producers are related with one another not only by the demand of intermediates but also through competition in attracting labour. This type of model is appropriate to simulate short-run estimations.

according to the standard capital accumulation equation $K_{t+1} = (1-\delta) K_t + I_t$ (Aguilar et al., 2019). Therefore, changes in production can be obtained not only by changes in labour demand, but also by the increase of capital due to the inflow of FDI.

We estimate the effects of two broad potential post-Brexit scenarios, a soft and a hard Brexit. In the soft Brexit we assume that the UK and the EU continue to enjoy a free trade agreement. Which imply that tariffs between both remain at zero. In this scenario we simulate three shocks, first, the emergence of NTBs with a level of $\frac{1}{4}$ of the ones that Ecorys (2009) estimate exist between the EU and the US, second, we run fiscal savings of 0.09% and a final shock which imply the reduction of 10% in the inflow of FDI.

The hard Brexit scenario involves five shocks. Due to the possibility of a “no deal” between the UK and the EU, we assume that import tariffs between the UK and the EU would increase at the Most favoured Nation (MFN) level. That means, that the UK and the EU would trade under the World Trade Organization (WTO) conditions. As second shock, we simulate the increase of NTBs, whose level is $\frac{1}{2}$ of the ones that Ecorys (2009) estimate for the EU and the US. Then, we simulate a reduction of immigration inflow of -1.45%, due to the implementation of restrictions to the migration inflow. Finally, we assume a reduction of 22% in the inflow of FDI as the fourth shock, and fiscal savings of 0.31% as the fifth and final shock.

Given the aforementioned evidence in section 3, we believe that assuming decreases in FDI inflows by 10% and 22% would be supported by most studies. To simulate the impact of a reduction in the inflow of FDI, we take into account the share of the gross capital stock controlled by multinationals. According to OECD (2018), it is 15%. If we apply this 15% to the GTAP database, we obtain that multinationals control US\$ 114,810.42 billion of capital stock in the UK. Then, we calculate the corresponding absolute values to 10% and 22% reductions of the total capital stock in the UK, which correspond to 1.55% and 3.41%, respectively.

Because UK’s withdrawal from the EU single market would discourage the inflows of FDI, we calculate the increases of 1.55% and 3.41% in the capital stock would have generated in the UK. Then we interpret the results as foregone effects due to Brexit.

Regarding the migration shock, we model a reduction of 1.45% in the stock of workers in the UK (skilled and unskilled). This percentage is disaggregated between both skills in proportion to their share in total EU immigrants that are employed in the UK. Therefore, this shock involves a reduction of 0.66% of skilled workers and 0.79% of unskilled workers (Ortiz and Latorre; 2018a, 2018 b).

In terms of fiscal savings and the increase of trade cost, we follow the previous research made by Ottaviano et al. (2014) and Dhingra et al. (2017). Table X provides a brief view of our scenarios.

5. Data

The database for micro and macroeconomic variables and the model's input-output framework come from the latest version of the GTAP 9 dataset for 2011 (Aguiar et al., 2016). Table 3 offers a complete sectoral picture of the UK economy. The first column shows the name of each sector that will be used in the model. The allocation of domestic production for intermediate demand appears in the second column, while columns 3 to 5 display the allocation of production to final demand (i.e., private consumption, public consumption and investment). On the other hand, Table 3, shows the cost structure by sector (columns 2 to 5) and the shares by sector of capital and labour (skilled and unskilled) in their total factor endowments (columns 6 to 8).

Table 3

We can see that a potential decline in private consumption would affect total production in food, textiles, other manufactures, insurance and personal services. That reduction would imply a fall of the demand for intermediates, mainly affecting total production on agriculture, other primary, wood and paper, metals, communications, finance and business services, which allocate more than 50% of their total production to intermediate demand.

Regarding foreign trade, other primary, motor vehicles, electronics, other machinery, water transport and air transports have a high dependence on the world market due to the fact that a large share of their total production is exported and a high share of their domestic demand relies on imports (columns 6 and 8).

In terms of the structure of costs by sector, other primary is the sector in which capital remuneration accounts for the largest share of a 61.30% in total production costs. Other sectors in which capital remuneration is relatively important are communications, business services, personal services and other services (see column 2, Table 4).

Other primary, construction, communications, business services, personal services and other services account for the largest shares in total capital demand and labour employment in the economy. Together they account for 82.86% of the total demand of capital in the UK. Other services and business services account the largest share (46.62% and 17.79%, respectively). The last column in part B shows that other services, water transport, air transport and construction are the sectors in which the elasticity of substitution between labour and capital is the largest, i.e., these sectors can substitute these factors easier than others sectors when wages or rents change.

Table 4

6. Empirical Results.

This section provides the previous main results that we obtain taking into account a static framework of GTAP model.

6.1 Macroeconomic results

Table 5 shows the macroeconomic impact of the FDI shock in the UK. It provides the percentage change with respect to the initial value of GDP, welfare proxied by a change in private consumption, wages, capital rent, and the aggregates of production, exports, imports and the consumer price index (CPI).

As mentioned above, we simulate our FDI shocks as an increase in the capital stock. However, we interpret the results as foregone impact because Brexit would discourage FDI inflows. We look at the impact of increases in FDI of 10%, 20% and 30% which are reasonable according to our previous review of the literature. Table 5 presents what FDI flows would have generated if they had occurred. As can be seen for most of the aggregate variables we derive foregone benefits due to Brexit.

The entry of FDI in the UK would lead to a potential fall in the rental rate of capital, due to the fact that capital would be more abundant. The accumulation of capital would increase labour productivity allowing wages to rise. More capital per worker increases workers' productivity and their wages. Our results are consistent with previous CGE models (e.g., Latorre, 2013; Latorre et al., 2009) in which a potential rise in the capital stock reduces the capital rent and increases wages. They also match the intuition that more FDI involves more competition, thus, lowering capital remuneration and increasing the demand for workers. On the other hand, as we will see in the sectoral results, the entry of FDI leads to production increases in most sectors and, therefore, the demand for both skilled and unskilled workers also rise in most sectors.

The increase in labour remuneration and in the capital stock would lead to a rise in GDP and welfare. Hence, the UK could face a foregone benefit in terms of GDP between 0.55% and 1.64%, and between 0.32% and 0.93% for welfare.

Regarding the consumer price index, it would go down by around -0.73%, reflecting the decrease in domestic prices in all sectors of the economy (see, Table 2.A in Appendix). The contraction of the rental rate of capital explains the reduction in that prices.

Table 5

6.2 Microeconomic results

Table 6 displays the evolution of production, exports and imports across sectors that the increases in FDI inflows would have produced. Again, because Brexit will block these inflows, we interpret the results as foregone impacts.

The fall of UK's prices (CPI in table 5) would imply that the UK would become more competitive and increase its exports (see column 5, 6 and 7 in Table 6) and slightly reduce its imports that have become relatively more expensive compared to domestic production. Increases in exports coupled with decreases in imports boost domestic production across the board.

Agriculture, other primary, other transport, electronics and finance are the sectors with the largest increase in their total production. As noted above, other primary, other transport and electronics are sectors, in which, an important part of the rise of total production would also be explained by the increase in exports. By contrast, the rise in production of agriculture and finance would be explained to a larger extent by the growth of intermediate demand in order to produce domestic goods.

The entry of FDI leads to a capital stock increase which directly raises national income and also improves labour productivity and wages. Higher national income implies a rise in private consumption which also boosts production in most sectors in the economy. Simultaneously, the demand for intermediates across sectors rises in order to respond to the increased private demand.

Table 6

Our results suggest that leaving the EU would imply foregone benefits in production in most sectors of the UK due to lower FDI inflows. To sum up, less capital means lower income for private consumption (welfare) and relatively larger prices in the UK. Therefore, the demand for domestic goods would be weaker than if more FDI inflows had arrived. Moreover, had the capital stock been larger wages would also have been higher without the FDI inflows. We find that the foregone benefits from not receiving some FDI inflows are larger the larger is the amount of FDI inflows involved. Since we look at the potential impact of FDI inflows increasing by 10%, 20% and 30% we can see a monotonic impact that rules out the law of diminishing returns to capital and implies that more FDI inflows would indeed generate more benefits than smaller amounts. In addition, this impact could be much worse if we take into account the emerging of barriers to trade and the restrictions on the inflow of workforce (Ortiz and Latorre, 2018a).

7. Conclusions

In this study, we analyse how potential reductions in FDI inflows going to the UK could affect production, exports and imports across different sectors, as well as, their impact on broad set of macroeconomic variables, including GDP, welfare, wages, capital rents and the CPI.

Our results suggest that losses of FDI inflows in the UK after Brexit would not have a significant impact on the rest of regions considered in the model. For example, a potential reduction of 30% in the entry of FDI in the UK would imply a negligible effect in the GDP (-0.002%) and welfare (-0.02%) in the EU. Therefore, we focus on the results for the UK.

As we have noted, the UK is an important recipient of FDI inflows in the world, and 40.51% of the FDI stock in the UK comes from investors located in other countries of the EU. In addition, 37.42% of total turnover in the UK is controlled by foreign enterprises. If one of the reasons of multinationals to allocate their plants in the UK is the easy access to the single market, UK's exit from the EU would imply a loss of its attractiveness for further investment inflows. According to UNCTAD (2018) these reductions in FDI inflows have already taken place in the UK.

In addition to the negative impact that restrictions on trade and migration will have in the UK after Brexit, we identify an additional extra source that increases it and that has received very little attention, the fall on FDI inflows. A potential reduction of 10% on the FDI inflows in the UK would imply a foregone benefit of 0.55% of GDP and 0.31% of welfare (i.e., US\$7,558.61 million). In our worst scenario (i.e., 30% decrease in the entry of FDI flows), the foregone benefits would be 1.63% of GDP and 0.91% of welfare (i.e., US\$ 22,327.86 million). Potential decreases in the inflows of FDI in the UK would reduce the labour productivity and its remuneration, leading to reductions in income. In turn, lower income would produce a decrease in domestic consumption leading to a fall in production across sectors and the increase of UK's prices. Then, UK's exports would be less competitive. Therefore, less FDI implies a reduction in exports, too.

At the microeconomic level, our results suggest that the potential losses of FDI would affect most sectors of the economy. Agriculture, other primary, electronics, other transport and finance would have experienced substantial increases in production if those inflows had arrived, because they would have increased their exports and production of intermediates to be used in other sectors. We find that FDI would have increased domestic demand and exports. This would have generated increased in production across the board. All in all, omitting the impact of FDI after Brexit reflects an important source of negative effects for the UK.

Appendix

Sensitivity analysis

Following Harrison et al. (1993) and Latorre and Hosoe (2016) we undertake an unconditional systematic sensitivity analysis. We re-run the three scenarios of capital inflows considered in the study, but change the values of three crucial elasticities. These elasticities are: substitution between factors of production (labour and capital), the Armington substitution between imports and domestic goods among regions and the Armington substitution among imports by origin. We change each elasticity one by one, keeping the rest fixed at their initial value.

Table 2.A shows the results of the sensitivity analysis focusing only on the effects on the GDP for the UK, because the impact of the shock in FDI on the rest of regions is almost negligible.

The elasticity of substitution between labour and capital reflects the feasibility with which producers can substitute these factors to produce a goods or services. On the other hand, the Armington elasticities of substitution between imports and domestic production reflect how easy it is for consumers and producers to change between imported varieties and domestic ones. The Armington elasticity substitution among imports by origin shows how easy it is to change the source of the imported varieties across different countries of origin (e.g., China vs the US).

Table 1.A

Sensitivity Analysis				
		10% Increase of FDI	20% Increase of FDI	30% Increase of FDI
GDP (Control Scenario)		0.55	1.09	1.63
A) Elasticity of substitution between labor and capital	Half	0.55	1.09	1.62
	Double	0.55	1.11	1.65
B) Elasticity of substitution between imports and domestic production (Armington)	Half	0.55	1.10	1.64
	Double	0.55	1.10	1.65
C) Elasticity of substitution between regional allocation of imports	Half	0.55	1.09	1.63
	Double	0.55	1.11	1.65

Source: Author's estimations.

As we can see GDP changes along the three scenarios are very robust to changes in elasticities, suggesting our previous results are also very robust.

Tables

Table 1.

Trade by type of ownership in 2016 (Percentage share)

Type of enterprise (United Kingdom)	Exports			Imports		
	Intra-EU	Extra-EU	Total	Intra-EU	Extra-EU	Total
Domestic	24.6	30.7	27.8	17.6	31.8	24.6
Controlled by foreign owners	46.5	49.8	48.3	55.2	42.8	49.1
Unknown	28.9	19.5	23.9	27.2	25.3	26.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Eurostat (2018)

Table 2.

Simulation details

Scenario	Shocks			
	Trade	Migration	Foreign Investment	Budget
Soft Brexit	Tariffs = zero.		Reduction of 10% inflow of FDI.	Fiscal Savings of 0.09% in the UK. Fiscal loss of 0.015% in the EU.
	NTBs with levels of 1/4 of Ecorys (2009) estimate exist between the EU and the US.			
Hard Brexit	Tariffs = MFN level.	Reduction UK workers of 1.45% (0.66% of skilled and 0.79% of unskilled).	Reduction of 22% inflow of FDI.	Fiscal Savings of 0.31 % in the UK. Fiscal loss of 0.051% in the EU.
	NTBs with levels of 1/2 of Ecorys (2009) estimate exist between the EU and the US.			

Source:

Table 3.

Sectoral information of the UK economy (percentage shares in the initial data)

Sector	Allocation of total sector production by type of consumption						Import share of domestic consumption (intermediates + final)
	Intermediate	Private Consumption	Government Spending	Investment	Exports	Total	
Agriculture	71.8	13.4	0.1	2.3	12.4	100.0	34.7
Other primary	61.9	0.1	0.0	0.0	38.0	100.0	59.6
Food	19.9	65.6	0.1	0.0	14.4	100.0	25.1
Textiles	15.4	59.7	0.4	0.4	24.2	100.0	56.1
Wood and paper	61.6	25.4	0.0	1.3	11.6	100.0	23.1
Chemicals	45.3	14.3	0.0	0.2	40.2	100.0	38.3
Metals	53.6	2.6	0.0	9.1	34.8	100.0	52.3
Motor Vehicles	9.6	28.6	0.0	11.3	50.5	100.0	60.3
Other transport	37.8	7.0	0.0	12.1	43.1	100.0	42.0
Electronics	21.8	8.7	0.0	18.5	50.9	100.0	68.1
Other machinery	24.8	7.7	0.0	19.8	47.6	100.0	51.9
Other manufactures	32.8	42.6	0.0	5.0	19.6	100.0	31.9
Construction	38.7	2.7	0.0	57.7	1.0	100.0	1.1
Water transport	9.6	1.6	0.0	0.4	88.4	100.0	53.6
Air transport	19.3	27.2	0.0	0.0	53.6	100.0	57.1
Communications	66.4	24.0	0.0	0.0	9.6	100.0	11.4
Finance	51.3	15.6	0.0	0.0	33.1	100.0	20.1
Insurance	28.9	54.2	0.0	0.0	16.9	100.0	4.7
Business services	73.9	3.0	0.0	6.2	16.8	100.0	11.6
Personal services	34.4	53.8	0.5	2.7	8.6	100.0	11.2
Other services	22.6	41.9	32.6	0.3	2.6	100.0	3.8

Source: Authors' estimations based on GTAP 9 data base.

Table 4.

Sectoral information of the economy of United Kingdom (percentage shares)

Sector	Cost Structure by sector				% of capital demand	% of labor demand		Elasticity of substitution between labor and capital
	Factor Remuneration			Intermediates		Skilled	Unskilled	
	Land	Labor	Capital					
Agriculture	5.9	30.1	11.6	52.4	0.7	0.6	1.8	0.3
Other primary	0.0	6.3	61.3	32.4	4.8	0.4	0.2	0.2
Food	0.0	21.6	12.0	66.4	2.7	2.8	2.7	1.1
Textiles	0.0	31.6	8.0	61.0	0.5	1.2	1.1	1.3
Wood and paper	0.0	30.2	12.0	57.9	1.6	2.4	2.3	1.3
Chemicals	0.0	14.3	5.6	80.1	2.0	2.9	2.8	1.3
Metals	0.0	25.9	5.3	68.8	0.7	2.1	2.0	1.3
Motor Vehicles	0.0	20.1	4.2	75.7	0.5	1.3	1.3	1.3
Other transport	0.0	26.2	8.2	65.6	0.6	1.1	1.0	1.3
Electronics	0.0	19.9	10.6	69.5	0.5	0.6	0.6	1.3
Other machinery	0.0	28.1	9.5	62.3	1.8	3.2	3.1	1.3
Other manufactures	0.0	24.8	11.3	63.9	1.0	1.3	1.3	1.3
Construction	0.0	21.6	17.8	60.6	6.5	2.7	7.4	1.4
Water transport	0.0	22.1	5.9	72.0	0.3	0.6	0.9	1.7
Air transport	0.0	11.3	8.4	80.3	0.5	0.3	0.5	1.7
Communications	0.0	32.6	24.0	43.4	3.4	2.2	3.5	1.3
Finance	0.0	19.0	11.9	69.1	2.7	2.8	1.9	1.3
Insurance	0.0	18.9	8.5	72.6	1.0	1.5	1.0	1.3
Business services	0.0	34.1	22.0	43.8	17.8	19.9	9.5	1.3
Personal services	0.0	31.4	20.4	48.2	3.7	1.7	5.8	1.3
Other services	0.0	38.7	21.3	40.0	46.6	48.5	49.3	1.4
Total					100.00	100.00	100.00	

Source: Authors' estimations based on GTAP 9 data base.

Table 5.

Foregone impact on aggregate variables (percentage change)			
	Increase in FDI inflows by:		
	10%	20%	30%
GDP			
UK	0.55	1.09	1.63
EU27	0.001	0.002	0.002
USA	0.000	0.000	0.001
China	0.001	0.003	0.004
ROW	0.000	0.001	0.001
Welfare as percentage of bechmark GDP			
UK	0.31	0.61	0.91
EU27	0.008	0.017	0.025
USA	0.004	0.009	0.013
China	0.009	0.018	0.027
ROW	0.000	-0.001	-0.001
United Kingdom			
Wages	0.06	0.11	0.16
Capital remuneration	-1.13	-2.23	-3.30
Aggregate production	0.48	0.96	1.43
Aggregate exports	1.11	2.23	3.34
Aggregate imports	-0.01	-0.02	-0.04
Consumer price index	-0.25	-0.50	-0.74

Source: Authors' estimations

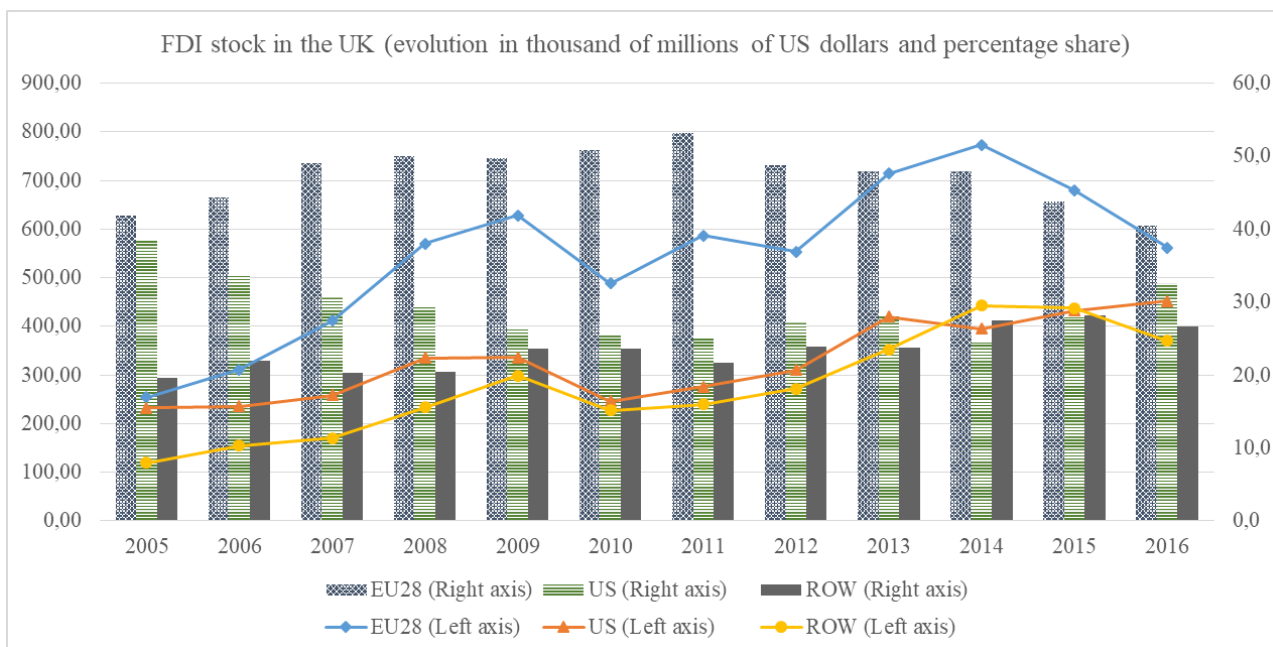
Table 6.

Foregone impact on production, exports, imports and demand of factors across sectors (percentage change)												
Sectors in the United Kingdom	Production			Exports			Imports			Domestic Demand		
	Increase In FDI inflows by			Increase In FDI inflows by			Increase In FDI inflows by			Intermediates		Private consumption
	10%	20%	30%	10%	20%	30%	10%	20%	30%	30%		
Agriculture	0.85	1.68	2.50	1.48	2.92	4.33	-0.10	-0.19	-0.26	2.37		1.52
Other primary	1.54	3.09	4.62	2.09	4.18	6.26	0.24	0.47	0.70	3.62		2.23
Food	0.67	1.33	1.99	1.49	2.98	4.47	-0.22	-0.44	-0.66	2.43		1.30
Textiles	0.75	1.50	2.25	1.22	2.44	3.67	-0.05	-0.10	-0.16	2.83		1.53
Wood and paper	0.74	1.48	2.21	1.37	2.76	4.14	-0.05	-0.11	-0.17	2.28		1.15
Chemicals	0.74	1.49	2.22	0.87	1.75	2.62	0.21	0.42	0.62	2.21		1.15
Metals	0.72	1.43	2.14	0.89	1.79	2.69	0.42	0.83	1.23	1.88		0.94
Motor vehicles	0.49	0.99	1.47	0.70	1.41	2.12	-0.08	-0.16	-0.26	0.40		1.12
Other transport	0.91	1.83	2.74	1.29	2.59	3.89	-0.06	-0.12	-0.20	1.93		1.38
Electronics	1.03	2.05	3.07	1.43	2.87	4.32	-0.16	-0.33	-0.52	1.76		1.89
Other machinery	0.81	1.61	2.41	1.23	2.48	3.73	-0.23	-0.47	-0.72	1.16		1.49
Other manufactures	0.62	1.24	1.85	1.55	3.11	4.68	-0.34	-0.69	-1.04	0.75		1.52
Construction	-0.21	-0.45	-0.71	2.47	5.02	7.63	-1.47	-2.94	-4.42	-0.87		1.89
Water transport	0.29	0.58	0.87	0.25	0.50	0.75	0.20	0.39	0.58	1.88		1.09
Air transport	0.69	1.38	2.06	0.74	1.49	2.23	0.21	0.41	0.60	2.66		1.30
Communications	0.73	1.46	2.18	1.41	2.82	4.23	-0.08	-0.16	-0.24	2.16		1.39
Finance	0.82	1.64	2.45	0.97	1.95	2.92	0.20	0.39	0.58	2.52		1.24
Insurance	0.59	1.17	1.75	1.13	2.27	3.41	-0.10	-0.20	-0.31	1.94		1.14
Business services	0.68	1.36	2.03	1.30	2.61	3.91	-0.13	-0.27	-0.41	1.65		1.69
Personal services	0.63	1.25	1.87	1.49	2.99	4.49	-0.22	-0.45	-0.67	1.85		1.47
Other services	0.48	0.95	1.42	1.26	2.54	3.82	-0.21	-0.42	-0.64	1.76		1.23

Source: Authors' estimations

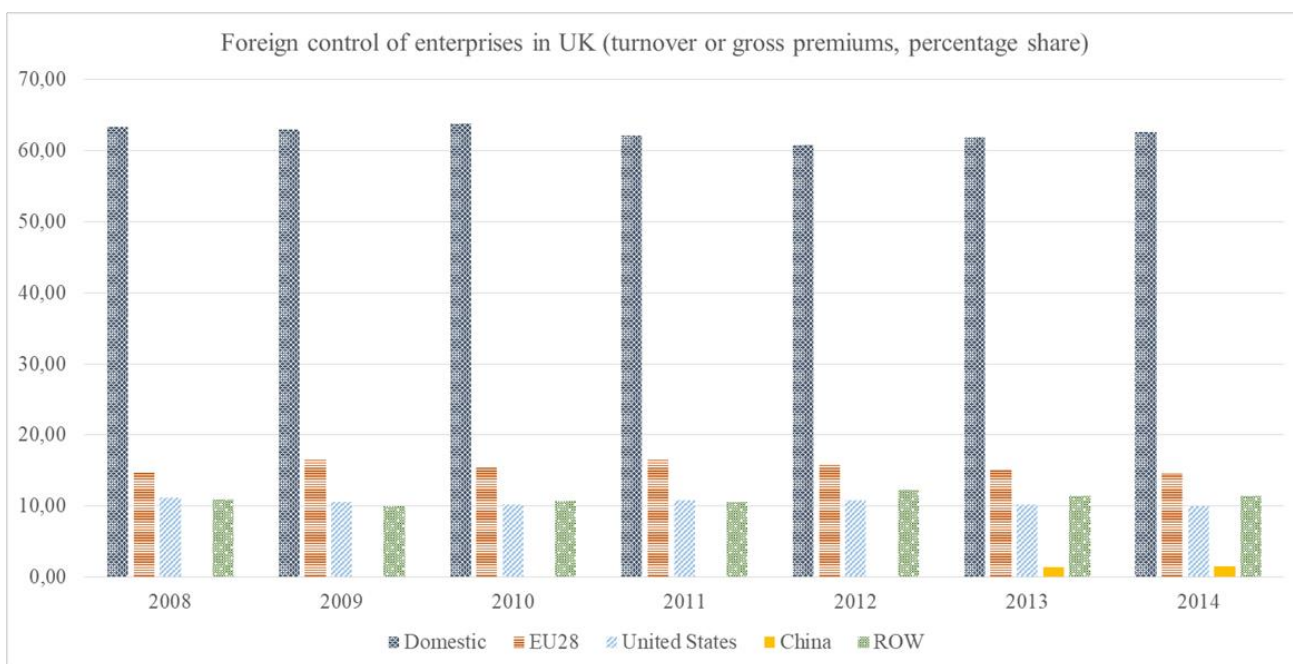
Figures

Figure 1.



Source: OECD (2018).

Figure 2.



Source: OECD (2018).

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