

Brexit consequences for the United Kingdom: The role of multinationals

1. Introduction.

Several economic studies conclude that Brexit will affect the UK and the Rest of EU members, negatively. However, most of them derive the impact of Brexit focusing only on trade restrictions. On the other hand, the few studies that focus on migration and capital movements, do not include trade (see Busch and Matthes, 2016; Latorre et al., 2018; for reviews).

In our previous research we analyzed the simultaneous impact of trade and migration effects on the UK (see, Ortiz and Latorre, 2017; Ortiz and Latorre, 2018). However, we did not take into account the effects of Brexit in the FDI inflow in the UK.

According to HM Treasury (2016) “three-quarters of foreign investors cite access to the European market as a reason for their investment in the UK”, therefore, Brexit will probably affect the interest of other regions to invest in the UK. Due to, leaving the EU would reduce access to the Single market. The potential emergence of restriction on cross-border investment suggest that the total cost of leaving the EU is likely to be larger than what our previous estimations based on trade and migration suggest.

According to the literature, FDI to the UK could experience reductions between -10% and -26% (HM treasury, 2016) or of -34% (Clausing and Dorobantu, 2005). We consider these reductions in the entry of FDI in the UK. We simulate the impact of foreign direct investment inflows and interpret them as the forgone effects from FDI. In other words, we model FDI as increasing the capital stock available for production across different sectors of the economy. We then interpret the results as the forgone impact due to reductions in FDI inflows.

This study is conducted using a multi-sector, multi-regional Computable General Equilibrium (CGE) Model, which integrates a number of different 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 labor, land, and capital). We assume that factor endowments are fixed. Capital is introduced as sector specific, while labor is considered fully mobile across sectors within the economy.

According to Fernández-Pacheco et al. (2018), foreign affiliates play a quite important role in the UK. They account for 38.80% of total sales, which is larger than average in the EU and also larger than the share of foreign affiliates in other large economies such as Germany, France, Italy, and Spain.

Modeling the impact of FDI and the dynamic of MNEs is harder than modeling restrictions on trade. Our main contribution is estimate the impact of the reduction of FDI inflows across micro and macroeconomic variables. This constitutes a step ahead from the estimation of FDI inflows themselves since we add the effects of those reductions.

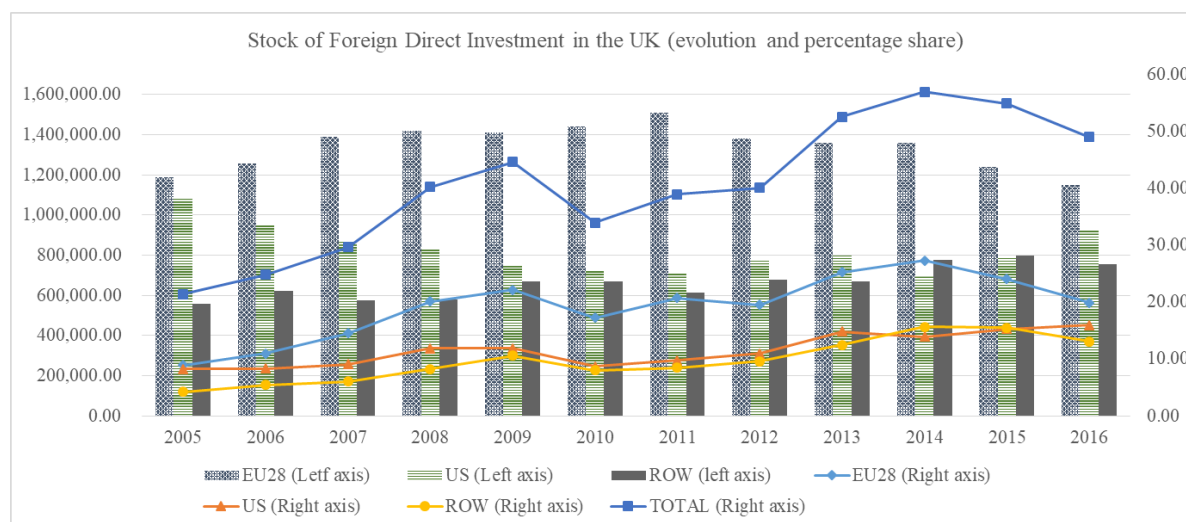
This paper is organized as follows. Section 2 describe the evolution of FDI in the UK. Section 3 shows a review of the empirical literature, while section 4 describes the model that we use. Data and simulations are labelled in section 5. The aggregate and sectoral results are explained in section 6. Section 7 concludes.

2. FDI in the UK-MNEs.

There is no doubt that EU membership has reinforced the UK attraction as a place to invest and as an export platform for multinationals. In 2014 the UK was ranked the fourth most attractive MNEs host economy (World Investment Report, 2017). In addition, during the period of 1995-2014, unlike other European countries (e.g., Ireland, Belgium, France, and Spain) the UK experienced an increase of the FDI inflows. However, for the period from 2017 to 2019, the UK is ranked in the 7th position of the "MNE's top prospective host economy" (World Investment Report, 2017). This could be due to uncertainty related to Brexit.

As we noted above, the loss of the UK' attractiveness 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. In 2016, 40.51% of the total stock of FDI in the UK was held by EU countries, followed by the US with a share of 32.49% (after a remarkable fall during the period from 2008 to 2011). On the other hand, other partners (ROW) has been increasing their participation passing from 19.67% in 2005 to 26.70% in 2016, although their share has been falling in the last three years (see Figure 1).

Figure 1

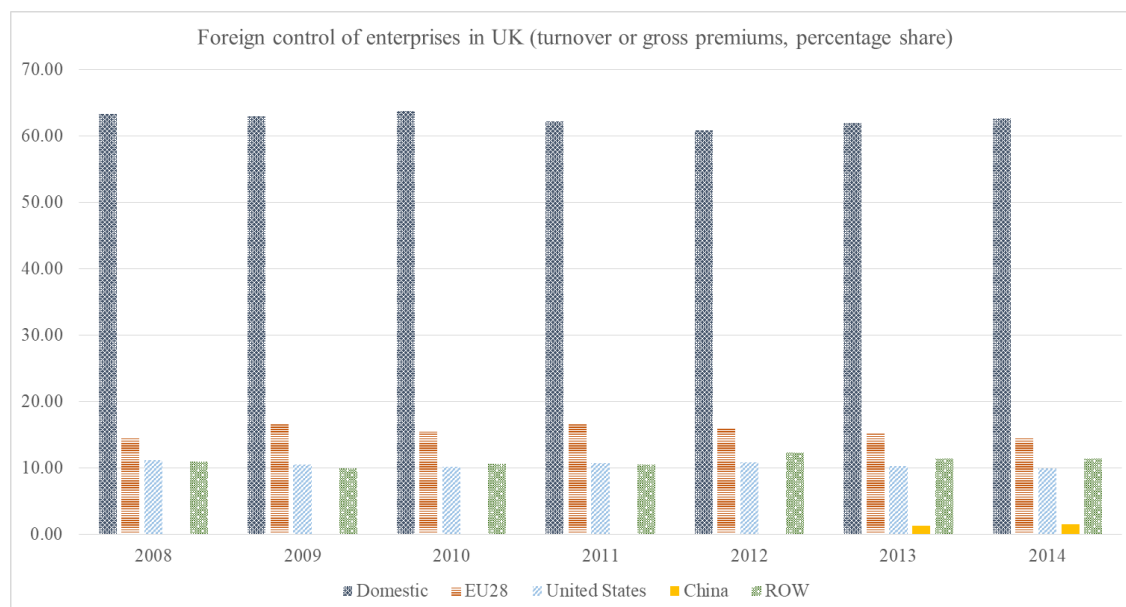


Source: OECD (2018).

On the other hand, the stock of FDI in the UK has been falling since 2014, due to the fall of FDI coming from EU and ROW.

Regarding the foreign control of enterprises in the UK. During the period from 2008 to 2014, those MNEs controlled by EU countries have accounted on average for 15.56% of the turnover in the UK. Followed by other partners (11.02%) and the US (10.51%). Overall, in 2016 the 37.41% of the turnover in the UK is held by foreign enterprises (see Figure 2).

Figure 2,



Source: OECD (2018).

3. A review of empirical literature.

There are several studies which have assessed the impact of regional integration on FDI flows. Daude et al. (2003) find evidence that a regional integration agreement (such as the EU membership) would increase FDI by around 27%. They use a gravity model and a dataset that covers FDI from 20 source countries, all of them from the OECD, to 60 host countries from 1982 through 1999. Fournier (2005) uses a gravity equation to study the determinants of FDI in the OECD countries. He estimates that a reduction of 20% in regulatory differences increase FDI inflows by 15%. Hence belonging to the EU single market can have an additional positive effect on FDI than the traditional FTA.

With respect to those studies that estimate the benefits from the EU membership. It seems that FDI inflows increase when a country form part of the EU. 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 had a positive impact in applicant countries. Bajo-Rubio and Torres (2001) estimate the entry of FDI for Spain, they found that FDI played an important role in promoting productivity growth. Baldwin et al. (1996) do it for the accession of Austria, Finland and Sweden.

On the other hand, there are several studies that had estimate the potential impact of leaving the EU. Clausing and Dorobantu (2005) estimate that the FDI stock would fall by -34%, while Brouwer et al. (2007) esteem that the outward stock of FDI inflow would fall around -21%. Bruno et al. (2016) 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% fall in FDI inflows in the UK after leaving the EU. This estimation was later used by Dhingra et al. (2016) which esteem that a 22% fall in the FDI would lead to lower real incomes in the UK by 3.4%. OECD (2016) runs a reduction on FDI between -10% and -4% following the Fournier (2015) approach.

Compared to Dhingra et al. (2016), the study of PWC (2016) obtains that the level of investment by 2020 in the UK would fall between 17% and 27%. This impact on investment is captured endogenously within its CGE model via trade impacts, the response of the cost of capital to higher uncertainty and the impact of reduced GDP on the overall level of business revenues.

Unlike the rest of studies, HM Treasury Analysis (2016) estimates comprise different ranges of FDI reduction. 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. Then, these results have been used as inputs into modeling the overall macroeconomic impact of leaving the EU. 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.

Finally, to the best of our knowledge only Pain and Young (2004), Latorre et al. (2017) and Ciuriak et al. (2015) have simulated FDI effects from other forces present in their models. In the case of Pain and Young (2004) simulate a reduction in productive efficiency as a result of lower inward FDI, while Latorre et al. (2017) and Ciuriak et al. (2015) include non-tariff barriers to FDI. On the other hand, while the two former studies obtain a very significant effect from FDI, the latter obtains a nearly negligible impact from it.

4. Model and simulations.

A CGE model allows the combination of the supply and demand sides of the economy. In other words, CGE models cover the behavior of households, firms and the government in the economy, taking into account the interactions among them and with foreign trade.

On the demand side of the economy, there are four categories of demand, private households, investment, government and exports. Which look for maximizing their benefits of consumption. On the other hand, in the supply side of the economy, producers decide about the optimal combination of intermediates inputs and factors of productions to produce goods and services. All economic agents interact with one another through the markets of factors and commodities. Producers are related to one another through demand of intermediates and because capital is specific in our model through competition in attracting labor. Households and government demand those goods and services imported or produced domestically. At the

same time households offer their factors of production, which are demanded by domestic producers. On the other hand, production sectors across border are linked through intermediates and final goods trade.

The interactions between these economic agents are presented as a system of equations, which are derived from microeconomic optimization theory. These microeconomic optimization decisions are then comprised in a framework representing national accounts identities, which define the equilibrium in the economy. This equilibrium defined by three types of equations: market clearance (i.e., supply equals demand for all goods and factors), income balance (i.e. net income equals net expenditure) and zero profits (i.e. cost of inputs equals the value of outputs).

Therefore, the ability of CGEs to yield macroeconomic predictions from its microeconomic aggregation make them suitable methodology to measure and analyze the impact of a change in a particular sector, factor or policy measure in the economy as a whole.

We use a standard multi-region and multi-sector Computable General Equilibrium (CGE) model, namely, The Global Trade Analysis Project (GTAP). This 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. What it offers possibilities to analyze the impact of a shock in the inflow of FDI in the UK along each sector and economic agent in the economy.

The GTAP model is a static CGE model of the world making it an appropriate model for short-run estimations. Moreover, due to several authors obtain that the impact of FDI would not vary much depending on the climate of competition (e.g., Dee et al., 2003; and Verikios and Zhang, 2001)¹. A detailed explanation of the model is available in the book of Hertel (1997) and has been updated in McDougall (2000). In addition, Zhou and Latorre (2014a; 2014b) offer a more concise explanation which include model equations.

We disaggregate the data in 21 sectors, 5 economies (UK, EU, US, China, and ROW), and 4 factors (skilled and unskilled labor, land, and capital). In the function of production land and capital are introduced as sector specific, while labor is considered fully mobile across sectors within the economy. Therefore, changes in production can be obtained not only by changes in labor demand, but also by the increase of capital.

Given the aforementioned evidence in section 3, we believe that assuming a decrease in FDI inflows by 10%, 20% and 30% would be supported by most studies.

To simulate the impact of a FDI fall in the UK, we take into account that 15% of the Goss capital stock in the UK is controlled by MNEs (OECD, 2018). Therefore, we calculate the 15% of the total capital stock in the UK according to the GTAP database. This means that US\$ 114,810.42 billion of that capital stock is controlled by multinationals. We then calculate 10%, 20% and 30% of US\$ 114,810.42 billion and apply the equivalence absolute value as

¹ Although, Rutherford and Tarr (2008) suggest the use of imperfect competition in some sectors of the economy.

a reduction of the total capital stock in the UK. That means that we simulate an increase of 1.55%, 3.10% and 4.64% of the capital stock controlled by MNEs in the UK, respectively. Finally, we interpret the results as the forgone impact due to reductions in FDI inflows.

5. Data

The data base 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., 2015). Table 1 offers a complete sectoral picture of the UK's economy. The first column shows the name of each sector that will be used in the model. Column 2 shows the structure of private consumption, in which food, chemicals, and other services account the largest shares in total private consumption (for 10.62%, 6.47% and 45.79%, respectively). On the other hand, columns 3 and 4 display the trade structure. We can see that chemicals, other machinery, business services and finance accounts the largest shares of exports and imports in the UK. However, other primary, motor vehicles, electronics, water transport, air transport, other machinery, metals and other transport 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 (column 5 and 6). Although these sectors are more trade-oriented they are not the most important in terms of total production in the UK, because other services, business services, chemicals and construction accounts the larger shares of total production in the UK, with a shares of 43.94%, 14.65% , 5.62% and 4.81%, respectively. In terms of factors demand, these sectors employ the largest shares of labor and capital.

Table 1

Sectoral information of the economy of United Kingdom in percentage											
Sector	Commodity % in				Import share of domestic consumption (intermediates + final)	Export share of domestic production	% of Production	% of capital	% of labor employment		
	Domestic demand	Trade									
		Private consumption	Exports	Imports							
Agriculture	0.89	0.66	2.02	34.75	12.44	0.75	0.69	0.58	1.81		
Other primary	0.01	3.29	6.46	59.56	37.99	1.93	4.84	0.36	0.17		
Food	10.62	3.48	5.71	25.07	14.36	4.01	2.66	2.80	2.70		
Textiles	4.71	1.65	5.36	56.13	24.20	1.56	0.50	1.15	1.11		
Wood and paper	2.17	1.72	3.26	23.15	11.62	2.07	1.62	2.38	2.30		
Chemicals	6.47	15.48	13.76	38.31	40.21	5.62	1.95	2.93	2.83		
Metals	0.29	5.24	8.90	52.35	34.76	1.55	0.73	2.08	2.01		
Motor Vehicles	4.24	6.35	7.69	60.35	50.51	1.35	0.48	1.35	1.30		
Other transport	0.52	3.36	2.62	42.02	43.06	0.92	0.59	1.09	1.05		
Electronics	0.74	2.74	4.58	68.13	50.95	0.77	0.52	0.57	0.55		
Other machinery	1.85	10.13	9.72	51.87	47.64	2.86	1.85	3.19	3.08		
Other manufactures	3.30	2.00	3.09	31.89	19.60	1.54	1.05	1.35	1.30		
Construction	0.62	0.40	0.34	1.07	1.01	4.81	6.51	2.72	7.44		
Water transport	0.08	5.41	0.68	53.64	88.40	0.61	0.33	0.58	0.92		
Air transport	1.95	3.50	3.31	57.14	53.56	0.86	0.50	0.32	0.50		
Communications	2.16	1.50	1.50	11.39	9.59	2.85	3.43	2.18	3.48		
Finance	2.51	8.12	3.41	20.12	33.07	2.61	2.66	2.82	1.86		
Insurance	3.36	2.20	0.43	4.66	16.92	1.23	1.01	1.48	0.98		
Business services	2.03	14.91	7.81	11.62	16.84	14.65	17.79	19.91	9.46		
Personal services	5.71	1.70	1.87	11.21	8.60	3.48	3.67	1.66	5.80		
Other services	45.79	6.15	7.51	3.77	2.56	43.94	46.62	48.51	49.33		
Total	100.00	100.00	100.00			100.00	100.00	100.00	100.00		

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

6. Empirical Results.

6.1 Macroeconomic results

Table 2 shows the macroeconomic impact of the FDI shock in the UK. It provides the percentage change with respect to the benchmark value of the aggregate variables: GDP, welfare (measured as Hicks equivalent variation), wages, the capital rent, and the aggregates of production, exports and imports.

The increase 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. However, capital accumulation would increase labor productivity allowing that wages to rise, this behavior is an expected outcome in the theory of trade models in which capital is specific. Our results are consistent with previous CGE models (e.g., Latorre, 2013; Latorre et al., 2009) in which a potential increase in the capital stock produce a reduction of the capital rent and the increase of wages. On the other hand, as we can see in the sectoral results, the entry of FDI leads to production increase in most sectors and, therefore, the demand for both skilled and unskilled workers also increase.

The increase in labor remuneration and the capital stock would lead to an increase of GDP and welfare. However, the exit of UK from the EU could lead to a fall in the entry of FDI in the UK. Hence, the UK could face a foregone benefit of GDP between 0.55% and 1.64%, and a welfare loss between 0.32% and 0.93%.

Regarding the price index for disposition of income, it would go down by around -0.73%, reflecting the decrease in domestic prices in all sectors of the economy (see, Table 1.A in Appendix). Especially in those sectors that reflect high weight in total private consumption (e.g., other services, food, chemicals and personal services, that together reflect a share of 68.59% of private consumption, see Table 1).

Table 2

Foregone impact on aggregate variables (percentage change)			
United Kingdom	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (30%)
GDP	0.55	1.10	1.64
Welfare as percentage of bechmark GDP	0.32	0.63	0.93
Wages of skilled workers	0.08	0.16	0.23
Wages of unskilled workers	0.02	0.04	0.05
Capital remuneration	-1.07	-2.12	-3.14
Aggregate Production	0.48	0.95	1.41
Aggregate Exports	1.13	2.26	3.40
to EU27	1.21	2.42	3.64
to Others	1.16	2.33	3.50
Aggregate Imports	-0.01	-0.02	-0.04
to EU27	-0.01	-0.02	-0.04
to Others	-0.01	-0.02	-0.04
Price index for disposition of income			
UK	-0.25	-0.49	-0.73
EU27	0.00	0.01	0.01
USA	0.01	0.03	0.04
China	0.01	0.02	0.03
ROW	0.01	0.02	0.02

Source: Authors' estimations

6.2 Microeconomic results

Table 3 shows the evolution of production, exports, imports and factors demand across sectors after the shock.

As we noted above, the entry of FDI leads to a capital stock increase which improves labor productivity and therefore labor remuneration. Higher wages imply a potential increase in private consumption leading to an increase of production in most of sectors in the economy.

On the other hand, the fall of UK' prices comparing to the rest of regions² (see Table 2) would imply that the UK would become more competitive and would face an increase of its exports (see column 5, 6 and 7 in Table 3) and slightly reduce its imports that have become relatively more expensive.

Table 3

² Prices in the rest of regions would remain practically the same, this means prices increase would be almost negligible.

Foregone impact on production, exports, imports and demand of factors across sectors (percentage change)

Sectors in the United Kingdom	Production			Exports			Imports			Factors' demand		
	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (30%)	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (30%)	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (30%)	Scenario 3 (30%)		
										Skilled	Unskilled	Capital
Agriculture	0.61	1.21	1.80	0.73	1.48	2.19	0.07	0.15	0.23	1.70	1.74	3.00
Other primary	2.27	4.56	6.85	3.39	6.84	10.32	0.04	0.08	0.11	6.58	6.63	6.87
Food	0.61	1.22	1.82	1.29	2.59	3.89	-0.16	-0.31	-0.47	0.31	0.51	4.45
Textiles	0.75	1.51	2.26	1.20	2.39	3.60	-0.02	-0.05	-0.08	1.44	1.68	5.19
Wood and paper	0.73	1.46	2.18	1.36	2.72	4.09	-0.06	-0.12	-0.19	1.00	1.22	4.99
Chemicals	0.79	1.57	2.36	0.94	1.89	2.84	0.20	0.40	0.59	1.22	1.44	5.09
Metals	0.69	1.38	2.06	0.87	1.75	2.62	0.40	0.80	1.19	1.35	1.57	5.16
Motor vehicles	0.46	0.92	1.36	0.65	1.31	1.96	-0.07	-0.15	-0.24	0.58	0.80	4.81
Other transport	0.93	1.87	2.80	1.33	2.68	4.03	-0.08	-0.16	-0.26	1.90	2.13	5.42
Electronics	1.10	2.20	3.29	1.54	3.11	4.67	-0.19	-0.40	-0.63	2.05	2.26	5.47
Other machinery	0.80	1.60	2.40	1.24	2.50	3.77	-0.25	-0.52	-0.80	1.39	1.62	5.17
Other manufactures	0.59	1.18	1.76	1.48	2.98	4.48	-0.32	-0.64	-0.97	0.36	0.58	4.70
Construction	-0.28	-0.58	-0.91	1.82	3.67	5.52	-1.17	-2.41	-3.62	4.14	3.91	2.92
Water transport	0.27	0.55	0.83	0.23	0.47	0.71	0.20	0.39	0.58	0.40	0.10	4.96
Air transport	0.70	1.40	2.09	0.75	1.49	2.24	0.22	0.44	0.65	0.23	0.09	5.03
Communications	0.71	1.42	2.13	1.32	2.65	3.98	-0.09	-0.14	-0.14	0.21	0.42	4.63
Finance	0.82	1.64	2.46	0.96	1.93	2.89	0.21	0.42	0.62	0.86	1.09	4.93
Insurance	0.58	1.15	1.72	1.05	2.11	3.17	-0.05	-0.11	-0.19	0.34	0.56	4.70
Business services	0.66	1.31	1.95	1.24	2.48	3.73	-0.11	-0.23	-0.35	0.20	0.43	4.63
Personal services	0.60	1.21	1.80	1.35	2.72	4.09	-0.17	-0.33	-0.51	0.08	0.14	4.50
Other services	0.48	0.95	1.41	1.15	2.31	3.47	-0.15	-0.30	-0.46	0.40	0.15	4.58

Source: Authors' estimations

The increase of UK' sales abroad would push up production in those sectors that are more export-oriented, such as, chemicals, other machinery, finance and business services (see column 2 in table 1).

The right side of Table 4 displays the percentage share of domestic goods that is allocated to private demand, public consumption, intermediates and gross capital formation and exports.

The share of total production that is allocated to private consumption and the share that is devoted to exports are clearly high in those sectors that would face the major increase of production. These sectors are other primary, electronics, other transport, and finance. These sectors are those that would face significant increases in domestic demand and exports (see, columns 7-10 in the left side of Table 4). By contrast, construction would face a fall of its domestic demand, the demand for construction output to be used as intermediates or to be devoted to gross capital formation would fall, leading to an overall production decrease in the sector.

Regarding labor demand, it would follow the evolution of production. Under a capital' specific setting, sectors increase their production employing more labor. In this case, production increase would be explained by both, the rise of the capital stock (due to more FDI inflows) and the employment of those workers that are substituted by capital in other sectors. In addition, those sectors that would face a significant fall of the rental rate of return could replace labor with capital, this is the case of construction and other services, which are sectors that account for an important share of capital use (see column 8 in Table 1) and would face important reductions in the rental rate of capital (see columns 5, 6 and 7 in Table A1, in Appendix) due to the entry of FDI.

As we can see, the percentage change in the employment of unskilled workers would be higher than in skilled ones. This is because our measure within the CGE model is based on labor remuneration³, which is lower for unskilled workers.

³ Which is calculated multiplying the number of workers by their wages.

As we can see, more capital means higher disposable income for private consumption (welfare) and reductions on the UK's prices, therefore, the demand for domestic goods would increase. Our results suggest that leaving the EU could negatively affect production in most sectors of the UK. This impact could be much greater if we take into account the emerging of barriers to trade and the restrictions on the inflow of workforce (Ortiz and Latorre, 2018).

Table 4

Bechmark use of domestic goods and forgone impact on use of domestic goods in the UK after the entry of FDI (Increase of 30%)										
Sector	Disposition (percentage shares)					Foregone impact in demand of domestic goods				
	Intermediates + Gross capital formation	Private consumption	Public consumption	Exports	Total	Intermediates + Gross capital formation	Private consumption	Public consumption	Exports	Total
Agriculture	74.18	13.28	0.06	12.49	100	1.45	0.36	5.00	1.72	1.35
Other primary	60.65	0.12	0.00	39.22	100	3.79	2.53	0.00	9.34	5.89
Food	19.94	65.15	0.14	14.79	100	1.45	0.46	0.00	3.09	1.04
Textiles	15.82	59.32	0.46	24.51	100	2.32	1.12	0.00	3.13	1.80
Wood and paper	62.97	25.20	0.00	11.83	100	1.56	0.57	0.00	3.42	1.53
Chemicals	45.38	14.18	0.06	40.40	100	1.76	0.75	0.98	2.32	1.84
Metals	62.51	2.53	0.00	34.96	100	1.45	0.66	0.00	2.28	1.72
Motor vehicles	20.68	28.51	0.00	50.81	100	-0.12	0.81	0.00	1.62	1.03
Other transport	49.47	6.95	0.00	43.58	100	1.45	1.03	0.00	3.56	2.33
Electronics	39.74	8.62	0.04	51.63	100	1.28	1.59	0.00	4.15	2.77
Other machinery	44.04	7.69	0.00	48.27	100	0.63	1.15	0.00	3.31	1.95
Other manufactures	37.32	42.56	0.00	20.12	100	-0.05	0.91	0.00	3.83	1.12
Construction	96.19	2.73	0.00	1.07	100	-2.39	0.17	0.00	4.09	-2.26
Water transport	10.11	1.59	0.10	88.29	100	1.27	0.58	0.00	0.14	0.26
Air transport	19.39	26.98	0.00	53.64	100	2.03	0.72	0.00	1.58	1.43
Communications	66.42	23.82	0.00	9.76	100	1.03	0.33	0.00	2.87	1.04
Finance	51.38	15.40	0.01	33.21	100	1.66	0.47	0.00	2.03	1.60
Insurance	28.91	53.92	0.00	17.16	100	1.03	0.31	0.00	2.28	0.85
Business services	79.83	3.02	0.01	17.13	100	0.57	0.69	0.00	2.68	0.93
Personal services	37.13	53.62	0.50	8.80	100	0.69	0.38	0.31	2.98	0.72
Other services	23.02	41.84	33.39	2.61	101	0.80	0.31	0.32	2.52	0.48

Source: Authors' estimations

7. Conclusions

In this study, we analyze, how the fall in FDI inflows in the UK could affect production, exports, imports and labor demand across different sectors, as well as, its impact on several macroeconomic variables, such as GDP, welfare and factor remunerations.

Our results suggest that a potential loss of the FDI inflows in the UK after Brexit would do not have a significant impact in the rest of regions considered in the model. Therefore, we focus on the results for the UK.

As we 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 the rest of countries of the EU. On the other hand, an important percentage of MNEs consider the UK as a potential host for their operations. If one of the reasons of MNEs to allocate their plants in the UK is the easy access to the single market, the exit from the EU would imply a loss of UK attractiveness for further investment inflows.

The loss of further FDI inflows would imply the following foregone benefits. A potential increase in the capital stock in the UK would lead to an increase in the labor productivity and increase in its remuneration. Larger income would produce an increase in domestic consumption leading to a rise in national production.

A reduction of FDI inflow of 10% would imply a forgone benefit of 0.55% of GDP and a loss of 0.32% of welfare which is equivalent to US\$7,775.00 million loss. While in our worst scenario, estimates of the foregone benefits from the FDI would be of 1.64% of GDP and a welfare loss of 0.93% (i.e., US\$ 22,790.00 million).

The potential loss of the benefits that derive from the FDI inflows would worsen the negative impact for the UK.

At the microeconomic level, our results suggest that the potential fall of FDI would affect most sectors of the economy. Other primary, electronics, other transport and finance would be those sectors that would face the major decline in terms of total production. Due to their important share in exports and the domestic demand. Production fall would lead to lower labor demand and therefore loss of better wages.

The present analysis can be extended by differentiating the impact of FDI by sector, as well as, introducing imperfect competition as suggested by Rutherford and Tarr (2008).

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Appendix

Table 1.A

Foregone impact on market prices (percentage change)

Sectors	Market prices of commodities in the UK			Rental rate of capital across sectors in the UK		
	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (30%)	Scenario 1 (10%)	Scenario 2 (20%)	Scenario 3 (30%)
Agriculture	-0.16	-0.31	-0.45	-1.6	-3.16	-4.66
Other primary	-0.30	-0.60	-0.89	-0.37	-0.72	-1.07
Food	-0.26	-0.52	-0.77	-1.14	-2.24	-3.32
Textiles	-0.15	-0.31	-0.46	-0.9	-1.77	-2.62
Wood and paper	-0.22	-0.43	-0.65	-0.96	-1.9	-2.81
Chemicals	-0.17	-0.34	-0.50	-0.93	-1.84	-2.72
Metals	-0.11	-0.22	-0.34	-0.91	-1.8	-2.66
Motor vehicles	-0.11	-0.22	-0.34	-1.02	-2.02	-2.99
Other transport	-0.15	-0.30	-0.45	-0.83	-1.64	-2.43
Electronics	-0.17	-0.34	-0.50	-0.81	-1.6	-2.37
Other machinery	-0.15	-0.30	-0.44	-0.9	-1.79	-2.64
Other manufactures	-0.21	-0.42	-0.63	-1.05	-2.08	-3.08
Construction	-0.46	-0.91	-1.36	-1.61	-3.19	-4.73
Water transport	-0.19	-0.37	-0.56	-0.97	-1.92	-2.85
Air transport	-0.22	-0.43	-0.64	-0.95	-1.88	-2.78
Communications	-0.36	-0.71	-1.06	-1.08	-2.13	-3.15
Finance	-0.28	-0.56	-0.84	-0.98	-1.94	-2.87
Insurance	-0.29	-0.57	-0.85	-1.06	-2.09	-3.09
Business services	-0.34	-0.68	-1.01	-1.08	-2.13	-3.15
Personal services	-0.36	-0.71	-1.06	-1.12	-2.21	-3.27
Other services	-0.31	-0.62	-0.92	-1.09	-2.16	-3.19

Source: Authors' estimations

Sensitivity analysis

Following Harrison et al. (1993) and Latorre and Hosoe (2016) we run an unconditional systematic sensitivity analysis, in which we re-running the three scenarios considered in the study, but changing the values of three crucial elasticities: the elasticity of substitution between factors of production (labor 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 labor and capital reflects the feasibility with which producers can substitute these factors to produce a good or services. On the other hand, the Armington elasticities of substitution between imports and domestic production, this elasticity reflects how easy consumers and producers can change between imported varieties and domestic ones. While the Armington elasticity substitution among imports by origin shows how easy it is to change the source of the imported varieties.

As we can see, the results for the 10% scenario are robust along the changes in the three elasticities. On the other hand, the changes in the 20% scenario and the 30% scenario are very small. The lower the values of the three elasticities, the lower the values of GDP in both

scenarios. Even, the results in both scenarios is the same at the benchmark value when we reduce the elasticity of substitution between imports and domestic products.

Table 2.A Sensitivity Analysis				
		10% Increase of FDI	20% Increase of FDI	30% Increase of FDI
GDP (Bechmark value)		0.55	1.10	1.64
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.