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The UK's Banking FDI Flows and Total British FDI: A Dynamic BREXIT Analysis

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Summary

The City of London has been the global leader for the provision of international banking services since the 1980s when Thatcher-era deregulation, followed by the EU single market program, stimulated big international FDI inflows – mainly of US banks – into the UK. The "single passport" rule allowed international banks in the UK to serve the whole of the EU28 market from London whose supply-side dynamics contributed to economic growth in the UK and a rising output share of the UK banking system in British GDP. With the expected BREXIT, there are serious challenges for the City since the passporting of banks will end and the regulatory framework will be adjusted; EU equivalence rules for UK banks that might be valid after the implementation of BREXIT cannot be a substitute for passporting so that lower FDI inflows and higher FDI outflows in the banking sector should be expected; inflow dynamics should also be shaped by international M&A dynamics influenced by the real Pound depreciation in 2016, while the prospects of reduced EU market access post-BREXIT also became relevant in 2017/18 and should influence the FDI dynamics of the UK – a similar pattern might occur in the BREXIT implementation year (i.e. 2019) and the following adjustment period where the change in City banks' access to the single market will matter; as regards the latter, quasi-tariff-jumping FDI outflows from the UK can be expected where the FDI of City of London banks could go primarily to the EU27/Eurozone or the US. The empirical findings confirm the expected FDI pattern for the UK banking sector – overall FDI inflows in the wake of the BREXIT referendum have increased, in line with the Froot-Stein effect, while FDI inflows to the UK banking sector have declined.

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List of Abbreviations

US	United States
FDI	Foreign Direct Investment
UK	United Kingdom
GDP	Gross Domestic Product
EU	European Union
M&A	Mergers & Acquisitions
ESRB	European Systemic Risk Board
EBA	European Banking Authority
AIIB	Asian Infrastructure Investment Bank
ESMA	European Securities and Market Authority
OECD	Organisation for Economic Co-operation and Development
ECB	European Central Bank
BIS	Bank for International Settlements
UNCTAD	United Nations Conference on Trade and Development
LBS	Locational Banking Statistics
CPIS	Coordinated Portfolio Investment Surveys
IMF	International Monetary Fund
BSI	Balance Sheet Items Statistics
PPML	Pseudo Poisson Maximum Likelihood
LTV	Loan to Value

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1. Introduction

The Thatcher-era banking deregulation of the 1980s resulted in banking FDI flowing into London over a number of decades fuelling the subsequent expansion of the UK financial services sector which increasingly has been able to successfully serve EU27 (EU28 without the UK) clients from London's financial center. In this context, exploiting economies of scope – locational advantages of the City of London – as well as economies of scale for specific banking transactions has contributed to the growth of the London banking center which, of course, has benefitted from the EU single market implemented in 1993 (with some years of delay for all financial services, including insurance). EU regulations have contributed to creating and restoring confidence in the London financial center with its many foreign banks, among them subsidiaries or branches of all leading banks from the US, Europe, Japan; and after 2000, also from China. The UK even quickly became a founding country of the multilateral Asian Infrastructure Investment Bank (AIIB) once China had agreed to set up the European AIIB subsidiary in London.

With BREXIT, the UK will face a serious challenge to the London banking system which is a global financial center and also the leading banking center in the EU28 (COEURÉ, 2017; DONNERY, 2017). The estimate for the market share of London, i.e. "City", banks in the EU27 wholesale market has been close to 90% (SAPIR/SCHOENMAKER/VERON, 2017). The UK has had a competitive banking services supply side; with some notable exceptions - as has emerged after the Transatlantic Banking Crisis where investigations have revealed that the Libor interest rate was rigged by the group of banks involved in calculating this important reference interest rate. Foreign direct investment (FDI) into the UK has contributed to making the City, London's financial center, the biggest such center in the world and for decades the UK has been involved in the designing and implementation of EU financial services and banking regulations. These were revised and the relevant institutions modernized – including the creation of the European Systemic Risk Board (ESRB) in 2010 – after the banking crisis. EU institutions, including the European Commission and the European Banking Authority (EBA) have been part of the institutional setting under which foreign banks could be active in the UK, while national regulations have been complementary to the EU framework after the Transatlantic Banking Crisis of 2008/09, which affected many UK banks with activities in real estate in the US (the write-down of asset values in the US thus affected both US and British banks in London and contributed to higher spreads; see BORN/ENDERS, 2018).

While the government of Prime Minister May wishes to retain access to goods markets in the EU through an UK-EU free trade agreement, the policy stance in the field of financial services is to stay out of the EU single market and to rather rely on a new equivalence regime that could partly be a substitute for the current passporting of banks which is a system that allows any EU bank with a banking licence in one EU country to offer banking services in all EU countries, namely through a branch or through a subsidiary. For many financial services offered in the EU27, the ECB expects that City banks will set up a subsidiary in the EU27 if current business is to be carried on in full, while the ESMA (European Securities and Market Authority) could also require that specific activities have to be set up with adequate capitalization, banking infrastructure and staff in the EU27. Against this background, one may anticipate that there will be reduced banking FDI inflows to the UK

in the context of BREXIT and more banking FDI inflows to the EU27. Gravity modeling on overall FDI in OECD countries has shown that EU membership as well as participation in the EU single market is a significant variable in terms of raised FDI inflows so that leaving the EU will reduce the inward FDI of the UK in the context of BREXIT (WELFENS/BAIER, 2018). Lower overall UK FDI inflows and, in particular, lower banking FDI inflows into the UK could have an effect on the UK's overall portfolio capital inflows. EICHENGREEN (2018) has shown that the inward stock of portfolio investment is reduced by 12 percent for the UK post-BREXIT. This implies that London, as a financial center, could face lower liquidity and profits after BREXIT and foreign investors from the banking sector will anticipate these developments; other aspects could also affect inward banking FDI as well as overall FDI. However, in the subsequent analysis the key aspect is not so much true banking FDI, for which data are unavailable, but rather outward and inward deposits assets of banks in banking and non-banking sectors, respectively. The following analysis takes a closer look at the question of how outward banking activities are affected by BREXIT and also how inward banking activities can be expected to react with respect to BREXIT.

Looking effectively at the prospect for the UK banks' outward FDI in the banking sector and the non-banking sector, one would have to anticipate the post-BREXIT trade and regulatory regime for the UK and the EU27. It seems clear that the worsening of the London City banks' access to EU27 markets is a realistic case even if some equivalence rules will be implemented. Since the overall investment of UK banks in non-banking is somewhat smaller than in banking (in terms of foreign assets), the BREXIT will affect the relative international asset position of the banking sector to non-banking and thus the international risk exposure of UK banks; and this normally should lead to regulatory adjustments in the UK and in the EU27.

Based on a theoretical analysis one can analyze the UK's banking FDI outward prospects to EU27 and other countries in an empirical framework and then also draw policy conclusions for the UK, the EU27 and other countries. The key insights will be the asymmetric FDI dynamics in the UK's banking and non-banking FDI – and, more broadly speaking, the internationalization of banks' assets and of non-banking firms' assets.

2. Theoretical Aspects

As regards the economic logic of banking FDI, the general approach of combining ownership-specific advantages, locational advantages and internalization advantages has played a role with regard to the cumulated FDI inflows (DUNNING, 1998; 2001). Economies of scale/density and networking effects also played a particular role for London as a banking center (GEHRIG, 1998). As regards international mergers & acquisitions (M&As) one can clearly point to the role of the real exchange rate as emphasized by FROOT/STEIN (1991): A real devaluation will lead to higher overall FDI inflows. One may, however, consider sector-specific aspects and to the extent that the focus is on banking FDI, the changes in post-BREXIT City of London access to the EU single market suggests a strongly declining attractiveness of the UK for banking FDI; hence FDI banking inflows to the UK should decline. To the extent that US banks in the City would relocate to New York,

in doing so they would benefit from existing equivalence agreements between the US and the EU which largely maintains that the regulatory quality in the US is equivalent to that in the EU so that banks located in the US could offer services from the US to EU27 clients within the level playing field of a transatlantic financial market.

As regards the role of rather low corporate tax rates, one can also argue that there is a positive link to FDI inflows in OECD countries as the empirical gravity equation of WELFENS/BAIER (2018) has shown. The Bank for International Settlements has looked into some of the key aspects of the internationalization of the banking sector (BREI/VON PETER 2017).

To the extent that British banks could develop specific ownership advantages, this would contribute to the UK's financial services current account surplus on the one hand, on the other hand such banks also gain an improved basis for becoming successful with outward FDI. Until the pro-BREXIT majority in the EU referendum of 2016, there was, however, no big incentive for UK-based banks to set up major activities in the EU27. This has broadly changed after 2016 since the European Central Bank (ECB) and European Banking Authority (EBA) have signaled that London banks interested in offering the full range of standard banking activities would have to create subsidiaries in the Eurozone so that branches of primarily London-based banks would have to become subsidiaries with a distinct source capitalization.

Overall, foreign direct investment inflows into the UK have increased in the British EU referendum year of 2016, but FDI inflows to the banking sector and the financial services sector should generally fall if banks are not anticipating that the EU passport solution for banks would hold after the UK's leaving of the European Union; and also not anticipating that equivalence rules would be broad enough to be an effective substitute for British and non-British banks in London to continue their pre-BREXIT level of banking and financial services provided to EU27 clients from the UK. To the extent that neither continued passporting nor broad equivalence is possible from a UK perspective, BREXIT brings the following analytical outlooks:

- The short-term impact of BREXIT will be a strong nominal Pound depreciation which will facilitate international M&As in all sectors initiated by foreign investors in the UK; this is an argument, based on FROOT/STEIN (1991), to expect an expansion of UK FDI inflows, namely in a world of imperfect capital markets;

- as most simulations for BREXIT imply a long-run reduction of economic growth in the UK, this dynamic negative market size effect will dampen the appetite of foreign investors to invest strongly in the UK. The net impact of the above real exchange rate effect and the market size-dampening effect of BREXIT should be additional FDI inflows. One should note, however, that uncertainty about the reduction of medium-term UK economic growth will depend on the outcome of the UK-EU negotiations in 2019 – the broader the future British market access to the EU27 single market, the smaller the growth-dampening effect of BREXIT will be. Only in the worst case scenario of a No-deal BREXIT could one expect that the market size effect would quickly dominate the real exchange rate effect;

- as regards the sectoral banking perspective, there are two impulses for relocating UK banking activities abroad, namely partly to the EU27 and partly to the US (New York or other US financial centers). US banks with London subsidiaries will often have a

tendency to relocate activities back to New York which for certain financial transactions would represent a second-best economies-of-scale solution;

- one particular aspect of banking FDI in some fields could be oligopolistic interdependency which has been emphasized from a theoretical perspective – and with a focus on many sectors with oligopolistic structures – by KNICKERBOCKER (1973). This could imply that once a major US investment bank in London decides to relocate activities *i* back to the US and relocate banking activities *j* to the EU27, other US banks would follow suit. Moreover, as soon as one big British bank relocates to the EU27, other big UK banks will likely follow.

The subsequent empirical analysis will focus on the key issue of to what extent BREXIT has affected FDI – or rather general total investment flows into banking in the UK, on the one hand, and British outflows on the other. The analysis naturally considers the development of the nominal exchange rate for the British Pound over the period 1977-2018, while the nominal interest rate vis-à-vis the US$ will be of particular relevance.

3. Empirical Analysis

The first problem we face when analyzing the structure of foreign investments and assets in the UK banking and non-banking sectors is that a broader databank for bilateral sectoral FDI data does not exist; while the UNCTAD and OECD databanks provide bilateral FDI data, they do not do so on a sectoral level. Although both provide sectoral data, this data is not on a bilateral but rather an aggregated level. Therefore, our first challenge is to find alternative data which describes investment patterns in the UK banking sector and the UK non-banking sector, which is our primary contribution to economic science.

On a national level, some countries do collect micro-data on their firms, including banks, and their investments abroad, such as the MiDi databank of the Deutsche Bundesbank. However, this is done on an individual country level and consolidated statistics or databanks do not exist up to this point. Data on international banking activity (structured with loans/assets/deposits) is also collected on a country level, and then reported to the Bank for International Settlements (BIS). The BIS collects this information relating to the banks of 44 reporting countries and publishes a quarter-wise dataset, the "Locational Banking Statistics" (LBS). Following the bilateral and sectoral structure of the dataset, it becomes evident that this can be analyzed using gravity models quite well.

3.1 Gravity Models for FDI and Banking

The term gravity model is used in general to describe models in which the economic size of two trading countries, measured in terms of GDP, is a trade stimulating factor, whereas the distance between those two countries restricts or dampens trade between them (TINBERGEN, 1962). A solid theory evolved around this, at first purely intuitive, model with ANDERSON/VAN WINCOOP (2003), who provided a solid econometrical basis considering the consumption- and production-side of countries and transportation costs. In

order to capture multilateral in- and outward resistance[1], the fixed effects panel data estimation method has established itself as useful, see ANDERSON (2011) and HEAD/MAYER (2014). Those models were extended with dyadic fixed effects by BRUNO ET AL. (2016) for FDI BREXIT analyses, and refined by WELFENS/BAIER (2018) with respect to zero and negative FDI flows and missing values, getting an even more precise model. The latter is considered as the current state-of-the-art model when analyzing multilateral panel (dyadic) fixed effects gravity FDI.

BREI/VON PETER (2017) use the locational banking statistics (LBS) data of the BIS to measure the distance effect in banking, and base their methodology on HEAD/MAYER (2014). They provide a rather short, but up-to-date literature review on gravity models in international banking and finance focusing on transaction and monitoring costs, which seem to be linear with respect to the distance between an investing bank in country *i* and the subject of the investment in country *j*. This proxies relative frictions limiting the volume of transactions between countries. Frictions in international banking can arise due to issues such as risk assessment[2], information frictions and asymmetries[3], including search costs. LANE/MILESI-FERRETTI (2008) analyze bilateral factors driving portfolio equity holdings across countries, using the Coordinated Portfolio Investment Surveys (CPIS) of the IMF. This dataset was also used by OKAWA/VAN WINCOOP (2012) to examine asset trade and the cross-border financial frictions which underlie them. The authors also provide a broad literature review on papers which use BIS data in a gravity framework in order to analyze external claims by banks.[4] This confirms the structural convenience of the dataset for gravity estimations with particular respect to precision and quality of the data it contains. The dataset will be described in more detail below.

As identified above, it is not only distance-related frictions which arise in the field of international investment and banking, where traditionally we do not have transportation costs or other similar costs. In analyzing significant structural policy changes, such as BREXIT, where the distance between partners does not change in terms of the number of miles or kilometers between them, we rather focus on frictions such as the ending of the "single passport" rule, possible exclusion from the EU single market and exchange rate dynamics, all of which are important for M&A, but also greenfield investment decisions.

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[1] Exports from country i to country j depend on trade costs across all possible export markets (outward resistance); imports into country i from country j depend on trade costs across all possible import markets (inward resistance).

[2] The farther away an investment is, the more difficult it is to anticipate correctly changes and developments in investments; this might be linked to economic and cultural differences, but also, for example, to something as seemingly innocuous as different time zones.

[3] Collecting information about clients and customers is increasingly costly over greater distances.

[4] A substantial number of papers also use data on external claims by banks from the BIS. Some recent papers that have estimated empirical gravity equations for equity, bond and bank holdings include Ahearne et al. (2004), Aviat and Coeurdacier (2007), Balli (2008), Balli et al. (2008), Balta and Delgado (2008), Berkel (2007), Bertaut and Kole (2004), Buch (2000, 2002), Chan et al. (2005), Coeurdacier and Martin (2009), Coeurdacier and Guibaud (2005), Daude and Fratzscher (2008), de Santis and Gerard (2009), Eichengreen and Luengnaruemitchai (2006), Faruqee et al. (2004), Forbes (2008), Gande et al. (2009), Garcia-Herrero et al. (2009), Gelos and Wei (2005), Ghosh and Wolf (2000), Hahm and Shin (2009), Jeanneau and Micu (2002), Kim et al. (2006), Kim et al. (2007), Lane and Milesi-Ferretti (2005, 2008), Lane (2005), Martin and Rey (2004), Pendle (2007), Portes and Rey (2005), Portes et al. (2001), Rose and Spiegel (2004), Salins and Benassy-Quere (2006), Vlachos (2004) and Yu (2009).

3.2 BREXIT and the Effect on Investments in Banking and Industry

On the one hand, global investment bankers face higher risks when investing in UK banks, as there has been no structured BREXIT plan delivered up to this point and investors have been left in uncertainty for the past two years (i.e., from 23 June 2016 to December 2018). While there have been discussions with the EU27 on maintaining free trade in goods, but not in services, aspects such as FDI restrictions have been quite neglected in the negotiation process, the omission of the "single passport" rule, which allows international banks in the UK to serve the EU27 market from London, increases uncertainty about future investment in the UK banking sector. The risk of a No-deal BREXIT followed by considerably increasing transaction barriers exists. Even in the event of a soft BREXIT, the international market share of UK banking services will decrease. Decreasing growth in the UK economy is dampening the appetite of investors to decide to invest in the UK banking sector. Business is currently being transferred to New York, Dublin, Amsterdam and Paris, not only due to increasing cross-border frictions but also for reasons of oligopolistic interdependencies.

On the other hand, the Pound depreciation in the last two years can lead to increasing brownfield investment, as international investors can "buy out" UK plants more easily and more cheaply. Increasing trade barriers can also be an additional reason for increasing investments in the producing sector: Following DUNNING's (1979) eclectic paradigm, especially location-specific advantages such as production-to-market and supply-chain maintenance for UK industry are arguments for increasing investments especially during the run-up to the implementation of BREXIT. Considering the effects of corporate tax rates on FDI inflows (WELFENS/BAIER, 2018), the announcements in September 2018 of Prime Minister Theresa May with regard to cutting the UK's corporate tax rate to the lowest in G20 is likely to foster foreign investments in the UK's industrial sector.

Vice versa, when we look at UK investments in the EU and the world, one expects that especially investments in the banking sector are spreading, while investments in the industry are stagnating.

3.3 Data and Model Specification

We use data on the assets, loans and deposits of global banks in the UK, and of UK banks in the world, respectively, provided by the CBS from the BIS, which describe cross-border banking. In order to understand how this data is compiled in detail, we look at the raw data format which is reported to the BIS by individual countries:

- Data is delivered to the BIS on a monthly basis, on the external positions recorded on the balance sheets of domestic banks.

- The format of the data is prescribed by the ECB's Balance Sheet Items Statistics (BSI); all domestic banks (including the domestic offices of foreign banks) are required to report the aforementioned data according to the ECB format.

- The data is used to observe the global activities of domestic banks; they serve as an input for monetary and balance-sheet statistic aggregates and are the basis for the LBS

- Assets and liabilities include indebtedness certificates, bonds and securities, investment asset pools, special purpose entities used for the purposes of asset securitization, firm derivatives, banknotes and coins.[5]

Therefore, in the present analysis we rather look at bilateral financial positions, and not at fixed assets or real FDI. The currently available data ranges from 1977 to the first quarter of 2018, reported on a quarterly basis (as of September 23, 2018). In general, the CBS has global data, but availability can depend on the willingness of countries' central banks to report.[6] We use that data in a country-to-country format where we match data reported by the UK with the data of the counterpart country, following BREI/VON PETER (2017), and find that the bilateral data is of an overall good quality compared to bilateral FDI data from OECD or UNCTAD (with few differences in counterparty data, where deviation does occur these are relatively small in dimension). We always use the highest number reported. The UK reports data for only 30 counterpart countries (and offshore centers) who are investing in UK banks and industries, resulting in 4,860 observations.[7] The most important partners, including the US, France, Germany, Netherlands, Japan etc., are covered, also covered are many countries often regarded as tax havens such as Switzerland, Hong Kong, and Luxembourg. We are therefore confident that our dataset presents a representative and meaningful sample size.

Figures 1 and 2 show the financial claims of global banks in the UK and vice versa. It cannot be determined definitively what effect the BREXIT vote in particular has had, as many factors, which would need to be controlled for in an extended statistical analysis, influence (especially short-term) investment positions. The generally increasing interdependence of global investments from the 1980s on and the 2008 financial and banking crisis, which started with the collapse of the Lehman Brothers investment bank in New York in September of that year, can be seen quite clearly.

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[5] A detailed listing and definition of assets/liabilities/claims can be found on the website of the Deutsche Bundesbank:
https://www.bundesbank.de/resource/blob/611438/f16d975bfe10fc0baba76e984b1cdac4/mL/statso-1-05-auslandstatus-banken-data.pdf pp. 263-268

[6] Some central banks are reticent for reasons of banking secrecy; mainly due to tax avoidance strategies and competitive advantages between countries and their banking sectors. The Bank of England, for example, is one of the central banks who do not report their total linkages to all foreign countries and banks.

[7] Country list of UK partners: Austria, Australia, Belgium, Brazil, Canada, Switzerland, Chile, Germany, Denmark, Spain, Finland, France, Guernsey, Greece, Hong Kong SAR, Ireland, Isle of Man, Italy, Jersey, Japan, Korea, Luxembourg, Macao SAR, Mexico, Netherlands, Philippines, Sweden, Chinese Taipei, United States, South Africa.

Figure 1:   Financial Claims of Global Banks in UK, by Sector
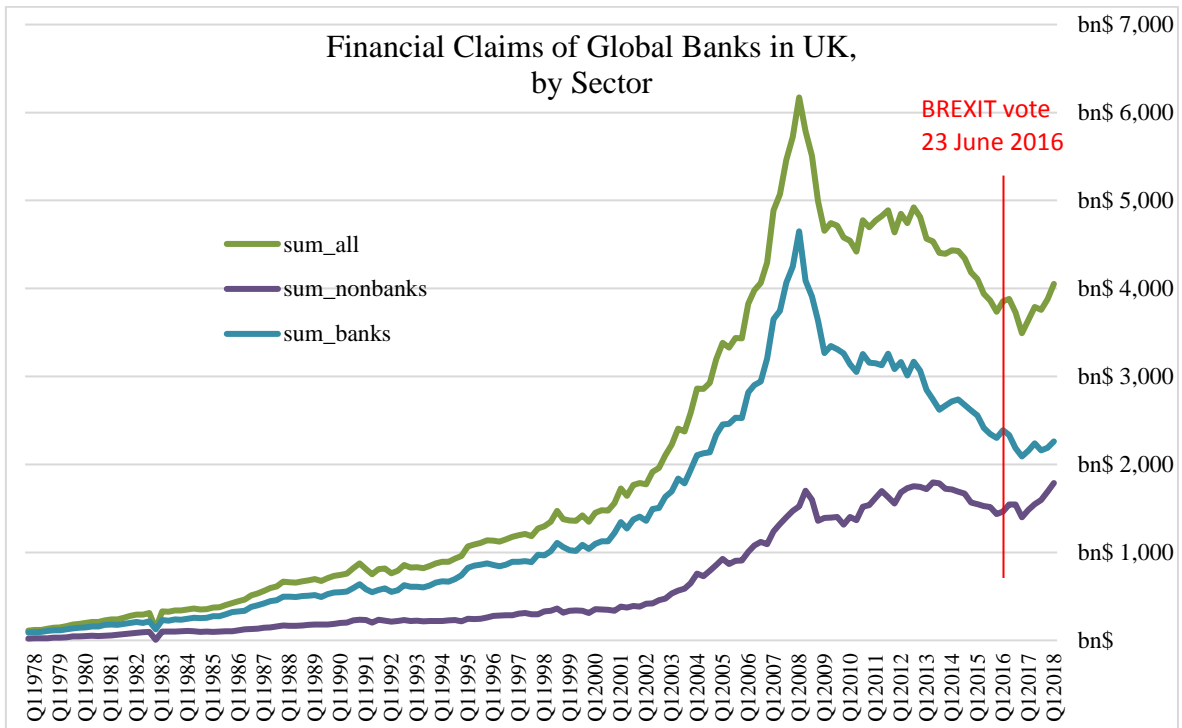
Source: Own calculations; combining the assets/liabilities of UK partner countries, based on data reported by BIS (timeframe 1977-2018)

Figure 2: Financial Claims of UK Banks in the World, by Sector
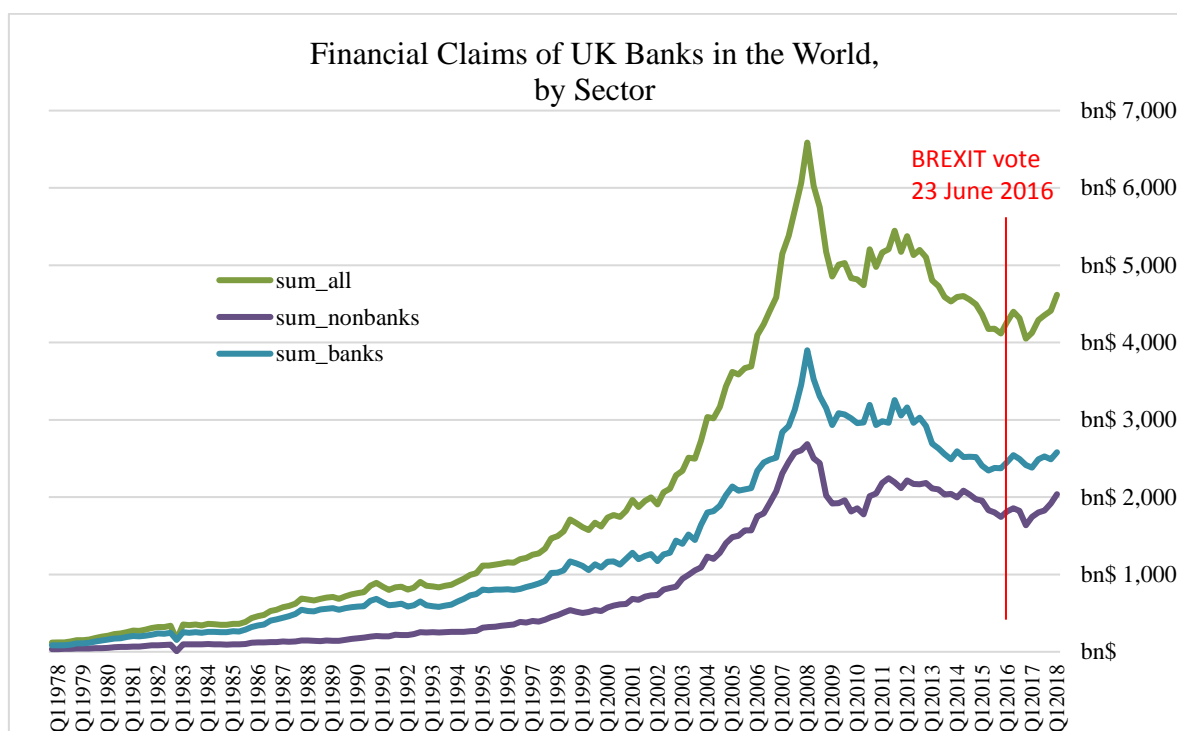
Source: Own calculations; combining the assets/liabilities of UK partner countries, based on data reported by BIS (timeframe 1977-2018)

Note that while all claims (and assets as counterpart) are reported in current USD, they have originally been recorded in countries' own currencies and British Pounds, respectively, and therefore are affected by a different set of exchange rates to USD. When controlling for exchange rates to USD later, via time fixed effects and a control variable, this negatively affects the integrity our data to a small extent, as the consolidated data relates to many different exchange rates and not only those relating to the USD. Particularly affected in this regard are holdings of coins and banknotes as direct cash reserves, which might lead to a distortion of our results. Therefore it is of interest to determine what magnitude holdings of coins and banknotes are included; as we have no access to internal Bank of England data, we check data on German cash reserves in foreign currencies total (as only aggregates are accessible) and find that they account for only a marginal fraction of total foreign assets (about 0.01%).[8] Taking this as a benchmark and even assuming that UK banks would hold more foreign coins and cash due to dimensional differences (significance of Euro(zone)-Pound transactions), we feel confident in neglecting this aspect in our further analyses.

It should be noted that asset position changes could reflect both FDI flows as well as portfolio flows. FDI stocks are expected to play a rather strong role in the financial sector – on obvious reputational grounds which require a strategic investor and often strong control from the equity side; FDI stocks are also expected to play a strong role in technology-intensive sectors where foreign investors would typically seek 100% ownership in high-technology sectors

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[8] In September 2018, German banks reported holding €233 million in foreign coins and banknotes in contrast to €1,855,669 million in other assets. Source: Balance sheet statistics of German banks, September 2018, Deutsche Bundesbank.

(JUNGMITTAG/WELFENS, 2016). The available database does not allow to make a distinction in terms of FDI versus portfolio capital flows in the respective sectors considered in the case of the UK.

In addition, as we see no possibility to control for exchange rate splits (Euro, USD, Yen etc.) described above, due to the nature of the collected data, and considering that previous studies using said data neglected this effect completely, we see the need to point this aspect out but do not correct for it in our analysis. To show that this effect should be quite small, consider the main currencies' exchange rates individually.

Figure 3 and Table 1 show the split of investments in the UK of the seven biggest investors in the UK; one can see that the US is traditionally the biggest partner of the UK, followed by France which started catching up with Germany after the financial crisis of 2008. Switzerland traditionally had a very large share of total investments in the UK in relative terms, but did not experience a rise of investment as for example the US did, especially since the turn of the millennium, as we can see from the absolute numbers in Table 1.

Figure 3:   Financial Claims in the UK of the UK's Top Seven Partners
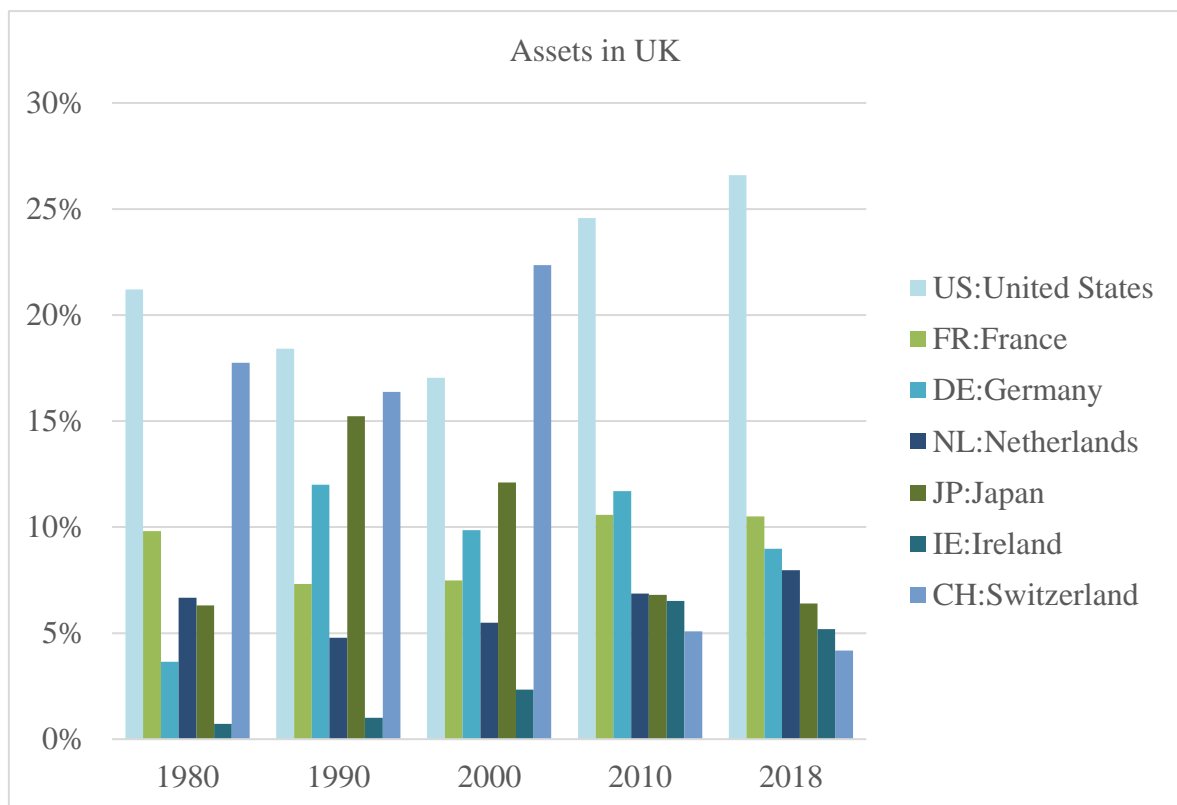
Source: Own calculations; combining assets/liabilities of UK partner countries, data reported by BIS reported data (timeframe 1977-2018)

Table 1:   **Financial Claims in the UK of the UK's Top Seven Partners, in bn USD**

	1980	1990	2000	2010	2018
US:United States	42	137	247	1,116	1,077
FR:France	19	54	109	481	425
DE:Germany	7	89	143	531	364
NL:Netherlands	13	36	80	312	323
JP:Japan	12	113	175	309	259
IE:Ireland	1	7	34	296	210
CH:Switzerland	35	122	324	231	169

Source: Own calculations; combining assets/liabilities of UK partner countries, data reported by BIS (timeframe 1977-2018)

Our study uses these data as dependent variables in a gravity setting, resulting in six different models. Models (1)-(3) use global investments in the UK in total and by sector (banking and non-banking), while models (10)-(12) use global UK investments (total, by sector).[9] The GDPs of countries traditionally serve as control variables for the economic size of the respective countries and sectors, while we control via country fixed effects for a broad range of individual unobservable factors which are time-invariant (such as language, culture, history, whether countries share a border or have access to the sea, but also for example the World Bank's "doing business" indicator which is time non-varying for many countries). The panel structure controls for years and quarters, and therefore also for time-variant USD exchange rates, assumed it evolves relatively constant.[10] We therefore compile the following model:

(1) $\ln POSITION_d = \alpha_0 + \alpha_1 lnGDP_{ot} + \alpha_2 lnGDP_{dt} + v_d + \delta_o + \tau_t + e_{odt}$

with

     α_0 – regression constant,

     GDP_{ot} – time-variant characteristics of the origin country such as GDP,

     GDP_{dt} – time-variant characteristics of the destiny country such as GDP,

     v_d – destination event BREXIT vote,

     δ_o – country fixed effects for the origin country,

     τ_t – time fixed effects,

     e_{odt} – error term.

We additionally control in models (10)-(12) for whether the origin/destination country is an EU27 member, in order to check whether EU27 countries have different investment patterns when it comes to their decision to invest in the UK. We capture the BREXIT effect with a dummy variable which switches from 0 to 1 as of the third quarter of 2016, i.e. 8 days after

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[9] Note that models (4)-(9) represent robustness checks for asset inflow to the UK, including exchange rates and controlling for the Euro Area instead of EU membership

[10] For robustness, we check the model with exchange rates on an annual (not quarterly) basis in order not to interfere with time FE; we use annual data for the period 1977-2016 from the Federal Reserve Bank of St. Louis, for 2017/2018 averaged daily data from the Bank of England, where for 2018 we average the first quarter only; see Table 3 (in Appendix).

UK citizens voted to leave the EU, following FRIEWALD's (2012) methodology. A poisson pseudo maximum likelihood (PPML) setting is utilized (see WELFENS/BAIER 2018 for a review).

Compared to traditional gravity modeling, we therefore use a single-country model and deviate from ANDERSON/VAN WINCOOP (2003) regarding multilateral resistance, losing out on the explanatory power of for example 'how do German investments in UK change if the US-German investment relationship changes' to use an example of two very important partners of the UK. However, via country and time fixed effects, we control for a broad part of this. What we gain by using this design is that we can measure UK-specific effects, as we only look at inflows and investment into the UK as well as UK outflows. With a general gravity model, country specific measurements become more difficult, usually quantitative results have to be applied with qualitative arguments to mask certain countries of interest. Moreover, predictions are somewhat hard to discern and defend with this model; our goal is to show whether and how investment patterns have changed due to the BREXIT vote. We want to find answers to our main hypotheses:

- Hypothesis 1: Mid- and long-term banking investments in the UK (total) will drop due to increasing frictions and less economic growth. UK investments abroad will drop for the same reasons.

- Hypothesis 2: The depreciation of the Pound after the BREXIT vote fosters brownfield investment and therefore international financial claims will rise particularly in the non-banking sector. Mirror effect: The UK is more likely to invest less in the non-banking sector abroad.

- Hypothesis 3: EU27 regulatory pressure on London City banks to relocate EU wholesale banking activities to the EU/Eurozone; increasing risks and frictions, a smaller market share of the UK banking industry (in the UK as an EU27 wholesale market) and oligopolistic interdependencies in the banking sector will reduce international financial claims in the banking sector. The mirror effect will be that the UK is more likely to invest more in the banking sector abroad.

The subsequent analysis presents empirical evidence on these hypotheses – with the already mentioned caveat in terms of available data.

3.4 Empirical Findings

The findings for models (1)-(3), which analyze monetary inflow, investments and claims of foreign banks in the UK, are presented in Table 2. All dependent variables were first tested for stationarity.[11]

Table 2:   Claims of Foreign Banks in the UK, in all sectors (Non-banking and Banking), 1977-2018

VARIABLES	(1) asset_all	(2) asset_nonbanks	(3) asset_banks
partner_eu	0.0324	0.204***	0.0287
	(0.0543)	(0.0548)	(0.0659)
brexitvote	-0.135	0.207**	-0.521***
	(0.0926)	(0.0935)	(0.112)
ln_partner_gdp	0.513***	0.500***	0.500***
	(0.0420)	(0.0606)	(0.0515)
ln_uk_gdp	1.132***	1.316***	1.163***
	(0.0723)	(0.0746)	(0.0831)
Constant	-26.27***	-32.93***	-28.45***
	(1.813)	(1.663)	(2.085)
Observations	4,270	4,270	4,270
R-squared	0.943	0.968	0.907

*Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

The *partner_eu* variable indicates whether the home country of the investing bank is an EU27 member, *brexitvote* is a dummy variable which switches to 1 at the third quarter of 2016. Time fixed effects and country fixed effects were applied in all models, but not displayed for ease of interpretation of the results. The relatively high R-squared in all models show that our multiple fixed effects models have good explanatory power. Model (1) shows the total claims of foreign banks in the UK in all sectors, while model (2) and model (3) distinguish between the non-banking sector (2) and the banking sector (3). Countries' GDPs are positive and significant in all models, which is in line with the usual gravity theory.

For overall investments in the UK, we find a negative coefficient for the BREXIT vote which is not significant. This indicates that total investments in the UK did not decrease significantly since mid-2016. However, when splitting investments into sectors, we find a positive and significant effect of *brexitvote* in the non-banking sector model (2) (0.207**, standard error 0.094), while we find a negative significant effect for the banking sector model (3) (-0.521***, standard error 0.112), indicating that since the BREXIT referendum, banks have increased their investments in non-banking operations, but decreased investments in the banking sector. For robustness, we estimated the same model including annual average

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[11] The Breitung unit root test, Hadri Lagrange multiplier stationarity test, and Im-Pesaran-Shin unit root test show significant P-values indicating stationarity, while Levin-Lin-Chu and Fisher unit root tests show insignificant values; we follow Fidrmuc (2009) and transfer his findings on OLS to PPML stating that our fixed effects take into account potential non-stationarity.

nominal exchange rates for the USD to British pound in Table 4 (see Appendix)[12], where we find that we lose out on the significance of the BREXIT vote with respect to non-banking investments (model 5), but gain significance for a negative overall impact on investments in UK (model 4). This underlines Hypothesis 2 where we argue that due to the BREXIT vote and the subsequent Pound depreciation, we find increasing investments in the non-banking sector, and supports the BARRELL/PAIN (1996) theoretical model. The coefficients of all other control variables remain unaffected, adding to the robustness of the analyses. When controlling for correlation in Table 6 (in Appendix), we find the expected negative correlation for *brexitvote* and *dollar_pound_rate*, which supports our arguments.

When the 'nationality' of the investing bank is that of an EU27 member country, it only matters significantly for investments in the non-banking sector model (2) (0.204***, standard error 0.055): EU27 countries invest significantly more in the UK non-banking sector.[13] When checking for the Eurozone instead of EU27 membership, we find the same results for *brexitvote* in models (7)-(9), but the Eurozone holds significantly more claims in the UK – especially in UK banks – than the rest of the world (Table 5, in Appendix). Subsequently we find that non-Eurozone EU27 countries are more likely invest in UK industry, while Eurozone EU27 countries are more likely to invest in EU banks.

Table 3 shows the findings for models (10)-(12), where we analyze the investment pattern of UK banks outside their home country.

Table 3:   Claims of UK Banks in the World, in all sectors (Non-banking and Banking), 1977-2018

VARIABLES	(10) asset_all	(11) asset_nonbanks	(12) asset_banks
partner_eu	-0.240***	-0.948***	0.0960*
	(0.0406)	(0.0505)	(0.0558)
brexitvote	-0.130	0.0183	-0.163
	(0.0925)	(0.137)	(0.120)
ln_partner_gdp	0.854***	0.422***	1.015***
	(0.0467)	(0.0509)	(0.0635)
ln_uk_gdp	0.827***	1.377***	0.596***
	(0.0929)	(0.158)	(0.0986)
Constant	-26.05***	-31.85***	-24.60***
	(2.392)	(4.303)	(2.367)
Observations	4,270	4,270	4,270
R-squared	0.963	0.971	0.903

*Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1*

Once again, GDPs show highly significant results; larger countries in terms of GDP attract more investments, which adds to the robustness of the model in general. The variable

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[12] We use the FRED real foreign exchange rate index; decreasing numbers mean weaker BPS and stronger USD.

[13] Adding exchange rates in model (5) leaves results unchanged.

brexitvote shows no significant results in all models (10), (11) and (12), indicating that UK banks' investment choices have not been affected by the BREXIT vote on 23 June 2016. Note that this does not mean that UK investment patterns did not change in the time frame since then, but changes were controlled for via fixed effects and were not caused by preparations for a future BREXIT, which would have been captured by a significant *brexitvote* variable.

EU membership however has significant signs for the total asset model (10), the non-banking sector (11) and the banking sector (12); UK banks invest significantly more in non-EU27 countries than in EU27 countries in total (-0.240***, standard error 0.041), a finding that in large part is explained by the role of the US, where the UK holds assets worth $1,275 billion in Q1 2018 which is about the amount of France, Germany and the Netherlands combined. The UK also has holdings in Japan worth $390 billion, followed by Australia, Switzerland and Hong Kong, which are all non-EU27 countries. This, however, is mainly driven by the non-banking sector, as we can tell by model (11), whereas the UK is significantly more likely to invest in the EU27 banking sector than in the banking sectors of non-EU27 countries, even though only slightly (0.096*, standard error 0.056). This mirrors the merge of the UK and EU27 banking industries in the last decades, and thus far has not been affected by the BREXIT vote.

The fact that the sectoral effects of the *partner_eu* variable are different in sign could, however, also indicate an indirect BREXIT effect: The *partner_eu* variable has a positive effect and shows that in general there are positive incentives for the banking sector to invest in EU partner countries which could also reflect the particular aspect of the banking sector being part of the services sector which for practical purposes often requires a complementary local presence, for example in investment banking. By contrast, the non-banking sector, read the manufacturing industry, will often consider outward asset stocks (e.g. outward FDI stocks in EU partner countries) to be a substitute for trade which could explain the negative sign for the *partner_eu* variable outside the banking sector. The foreign presence of the home country bank typically will encourage non-banking FDI outflows into the host country selected by the respective bank (for empirical evidence, see POELHEKKE 2014). The implication is that British non-banking FDI outflows to the EU27 could increase on the basis of this mechanism to some extent; however, the net effect on non-banking FDI still should be negative according to our regression results.

Overall, we see a one-sided effect: While global banks shifted their UK investments from the banking sector to the non-banking sector after the BREXIT vote, and EU27 investments in the UK non-banking sector additionally increased in general, UK banks' outward investments have not been affected by the UK decision to leave the EU up to this point.

4. Policy Conclusions

The full implementation of BREXIT would be a stronger signal than the EU referendum decision which left unclear for most investors how future EU-UK trade and investment relations – and cooperation in the banking sector – would look after March 29, 2019. The

results presented have shown a distinct pattern of asset accumulation abroad in the banking sector versus the non-banking sector.

The UK should expect reduced capital inflows into the non-banking sector post-BREXIT while the prospects for inward capital flows into the banking sector are rather unclear as regards the pure BREXIT effect. As, however, most simulations of macro models show a negative long-run GDP effect for the UK post-BREXIT – and very much so in the case of a No-Deal BREXIT (see, e.g., HM GOVT. (2016) a pre-referendum study by the Treasury) – one should expect that overall capital inflows into the UK (both in the banking sector and in the non-banking sector) would decline post-BREXIT. Thus, for the UK government there will be a strong incentive to stimulate output growth in the UK by various policy measures, in the fields of monetary policy, broadly defined, fiscal policy as well as in regulatory policy.

If the UK would want to avoid a negative effect of BREXIT on banking FDI inflows, one could consider three basic policy options:

- To deregulate banking in the UK, by signaling, for example, that the loan-to-value (LTV) ratio policy will be rather generous so that the prospects for an expansion of loans in the UK would be rather favorable. This in turn might attract complementary FDI inflows from outside the banking sector, say in the construction sector. However, any deregulation that pushes for a soft LTV policy stance also runs a risk, namely to the extent that monetary policy is shaped by a Taylor rule (for the case of the US see e.g. BACHMANN/RUTH, 2017). As the Taylor rule suggests (with r standing for the normal real interest rate, π for the inflation rate and π' for the central bank's inflation target; Y is output and Y' normal output; H and H' are positive parameters) to set the central bank interest rate $i^{CB} = r + H(\pi - \pi') + H'(Y-Y')$, a soft LTV policy that would raise output in the construction sector - and thus raise Y - could lead to a generally more restrictive monetary policy since the Bank of England would have to react to the more frequent positive output gaps (Y-Y'). It is not clear how this interaction would ultimately affect the stability of the UK's banking system and of the British economy at large.

- One natural policy option for attracting higher overall FDI into the UK could be further reductions of the corporate tax rate as emphasized in WELFENS/BAIER (2018). Whether or not this is politically feasible and how the EU countries would react to such a strategic reduction of corporate tax rates is unclear.

- Promotion of Fintech activities of UK banks could be useful, as higher expected profits of banks would stimulate FDI inflows in the UK.

The Eurozone and the EU27, respectively, could benefit from higher banking FDI inflows in the medium term and the long run, not least since mainly big banks will relocate to some Eurozone countries. Big banks already have subsidiaries or branches in the Eurozone so that legal adjustment is sometimes needed in the short term, while the hiring of more staff and the implementing of complementary asset accumulation could be a gradual stock adjustment process. The stability of the Eurozone/EU27 banking system could be reinforced by the inflow of higher banking FDI from London's City banks. However, there is one caveat, namely that the ratio of banking value-added to the GDP of the respective host country should not be raised toward a higher critical level – if there were any future national or international banking crisis, the governments of host countries must come up with bridging

financing and possibly the ability and willingness to recapitalize ailing banks. From this perspective, the Eurozone has no interest in witnessing the attracting of high banking FDI inflows into countries such as Italy, Greece, Belgium or Cyprus, all of which are countries which currently face a high public debt-GDP ratio. A particular challenge for the Eurozone and the EU27 could emerge if a considerable share of London banking activities would be relocated to the US where new banking deregulation and other economic policy initiatives, including tax reforms, would raise the US relative stock market valuation so that US-based banks could more easily take over foreign rivals, for example banks in the Eurozone/EU27. A similar argument holds, of course, if UK banking deregulation would be adopted. Any broad banking deregulation in the US and in the UK would thus put new pressure on the EU27 to also deregulate banking; if this is done in an excessive way, the seeds of the next international banking crisis would have been sown. From this perspective, it is quite important that EU27 countries would coordinate their international activities more strongly, say at the IMF, the G20 and at the Bank for International Settlements. To the extent that the UK government takes sides with the Trump Administration in multilateral organizations, the EU27 could be facing a rather difficult challenge in the future – post-BREXIT.

If BREXIT should trigger partial instability in the Eurozone – for example in the context of induced conflicts between a majority of Eurozone countries and Italy over the latter's proposed fiscal policy – there could be additional effects to be considered. Outside the banking sector, changes in asset positions and FDI stocks, respectively, could also be influenced by changes in relative unit labor costs. Whether or not British trade unions' wage policy, for example, will change after BREXIT remains an open question. If the EU27 should face a higher concentration ratio in banking post-BREXIT, this could also affect relative labor costs in that sector. These are questions for future research. One may wish that the governments of the EU28 countries would finally consider publishing the available FDI data in the banking sector in a transparent and timely fashion – this would help economists and others to conduct research in a more precise way which, in turn, would generate potential benefits for policymakers who could get a better understanding of FDI dynamics in key sectors of the economy. Once the UK leaves the EU it is likely to adopt broad banking deregulation so that OECD regulatory indices for the UK and the EU27 countries can be expected to differ more strongly post-BREXIT, which represents yet another field for future research.

Appendix

Table 4:   Claims of Foreign Banks in the UK, Additionally Controlling for Average Annual Exchange Rates, 1977-2018

VARIABLES	(4) asset_all	(5) asset_nonbanks	(6) asset_banks
partner_eu	0.0324	0.204***	0.0287
	(0.0543)	(0.0548)	(0.0659)
brexitvote	-0.713***	-0.377	-0.965***
	(0.175)	(0.231)	(0.198)
ln_partner_gdp	0.513***	0.500***	0.500***
	(0.0420)	(0.0606)	(0.0515)
ln_uk_gdp	1.225***	1.312***	1.246***
	(0.0843)	(0.115)	(0.0969)
dollar_pound_rate	-0.784***	-0.746**	-0.615**
	(0.217)	(0.316)	(0.243)
Constant	-27.38***	-31.34***	-29.60***
	(2.048)	(2.744)	(2.302)
Observations	4,270	4,270	4,270
R-squared	0.943	0.968	0.907

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5:   Claims of Foreign Banks in the UK, Controlling for Partner in the Eurozone, 1977-2018

VARIABLES	(7) asset_all	(8) asset_nonbanks	(9) asset_banks
Partner_euro	0.207***	0.000771	0.327***
	(0.0349)	(0.0634)	(0.0366)
brexitvote	-0.136	0.208**	-0.526***
	(0.0887)	(0.0936)	(0.105)
ln_partner_gdp	0.496***	0.500***	0.479***
	(0.0425)	(0.0649)	(0.0502)
ln_uk_gdp	1.102***	1.320***	1.102***
	(0.0755)	(0.0738)	(0.0862)
Constant	-25.01***	-33.03***	-24.67***
	(1.936)	(1.746)	(2.182)
Observations	4,270	4,270	4,270
R-squared	0.943	0.968	0.914

Note: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 6: **Correlation Matrix of Investment Variables in the UK, BREXIT vote and USD-GBP exchange rates**

	asset_all	asset_nonbanks	asset_banks	brexitvote	dollar_pound_rate
asset_all	1				
asset_nonbanks	0.8799	1			
asset_banks	0.9423	0.6701	1		
brexitvote	0.084	0.1038	0.0582	1	
dollar_pound_rate	-0.0455	-0.0613	-0.0278	-0.3267	1

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