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Foreign debt and investment responses to currency
shocks by multinational affiliates and local firms:
Evidence from the UK

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Statement of integrity

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Abstract

This dissertation is divided into two parts. In the first, I compare the response of multinational affiliates and local firms when exposed to a currency depreciation shock. In the second part, I analyze whether having outstanding foreign debt affects the response of local firms to a currency depreciation crisis. In the analyzed period, from 2008 to 2017, two depreciation episodes were identified. The first and more significant one is registered in 2009 and derives from the 2008 financial crisis. The second episode comes in 2016 and has a political reason behind it: the *Brexit*, which might lead to a contradiction of the initial hypothesis.

Desai, Foley and Forbes (2008) suggest that multinational affiliates use their internal capital markets to capitalize on the benefits of large currency depreciation, increasing sales and investment more significantly than domestic firms. Thus, a different ability to overcome financial constraints might contribute significantly to the differential performance of multinational affiliates. Analyzing the first question addressed in this study, for the first depreciation episode, I found that subsidiaries firms increase their fixed assets by 4,78% more than local firms in the years following the depreciation. However, for the 2016 depreciation shock, the results diverge from the initial hypothesis, since local firms registered a better performance in the aftermath of the depreciation.

With a local currency depreciation, the firms' debt denominated in foreign currency increases, the initial hypothesis predicts a better response of firms that only issue debt denominated in local currency, in a depreciation period. In the 2009 shock, the results contradicted the initial hypothesis, as firms that issued debt denominated in foreign currency increased their fixed assets 29,7% more than firms that only issued debt in local currency. However, in the second depreciation episode analyzed (2016), a better performance of firms without foreign debt is registered, as expected. Firms that issued foreign debt decreased sales and assets by 31,7% and 22,4%, respectively, more than local competitors that did not use foreign debt financing.

Keywords: Currency depreciation, foreign debt, multinational firms

Resumo

Esta dissertação encontra-se dividida em duas partes. Na primeira, compara-se a resposta de subsidiárias multinacionais e empresas locais quando expostas a um choque de depreciação cambial. Na segunda parte, analisa-se se o facto de possuir dívida denominada em moeda estrangeira, afeta a resposta das empresas locais a uma crise de depreciação cambial. No período analisado, de 2008 a 2017, foram identificados dois episódios de depreciação. O primeiro e mais significativo foi registado em 2009 e veio na sequência da crise financeira de 2008. O segundo foi registado em 2016 e teve por trás uma razão política, o “Brexit”, o qual poderá levar a uma contradição da hipótese inicial.

Desai, Foley e Forbes (2008) sugerem que as subsidiárias das empresas multinacionais usam os seus mercados de capitais internos para capitalizar os benefícios de uma grande depreciação da moeda, aumentando significativamente as vendas e o investimento comparativamente com as empresas locais. Assim, a diferente abordagem para superar restrições financeiras pode contribuir positivamente para o desempenho das subsidiárias multinacionais. Analisando a primeira questão abordada neste estudo, referente à depreciação de 2009, percebemos que as subsidiárias em comparação com as empresas locais aumentam os ativos, nos anos posteriores à depreciação, em 4,78%. No entanto, no fenómeno de depreciação de 2016, os resultados divergem da hipótese inicial, registando as empresas locais uma melhor performance nos anos posteriores à depreciação.

Com a depreciação da moeda local, a dívida externa das empresas em moeda estrangeira aumenta, a hipótese inicial prevê que em período de depreciação haja um melhor desempenho das empresas que só emitem dívida na moeda local. No choque de depreciação registado em 2009, os resultados contradizem a previsão teórica, empresas que emitem dívida estrangeira aumentam os ativos aproximadamente mais 30% do que empresas locais que emitem apenas dívida denominada na moeda local. Porém no segundo episódio analisado (2016), regista-se um melhor desempenho das empresas sem dívida estrangeira, conforme esperado. Empresas que emitem dívida estrangeira diminuem as vendas e os ativos, em 31,7% e 22,4%, respetivamente comparando com empresas que apenas emitem dívida em moeda local.

Palavras-chave: Depreciação cambial, dívida estrangeira, empresas multinacionais

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1. Introduction

The trade theory, as referred by Sharma (2016) who analyzed the effect of a local currency depreciation on importations, predicts that when the local currency depreciates, the relative prices of the goods manufactured by the country declines. For domestic firms, an increase in exportation will be noticed, leading to higher foreign sales. However, firms that made an extensive use of imported inputs will support higher costs. A local currency depreciation will improve the competitiveness of the country and the investment opportunities of its firms, but at the same time will increase leverage and financial constraints, being the expected operating growth mitigated by it.

This dissertation is divided in two parts. First, following Desai, Foley, and Forbes (2008), using firms based on the United Kingdom and affected simultaneously by the same macroeconomic event, a currency depreciation shock, I compare the impact of a depreciation in firms, whether they are foreign or domestic owned companies. In the second part of this dissertation, I compare the response of local firms to a currency depreciation crisis whether they issue foreign debt or not, in terms of assets, sales and investment growth.

The whole study is based on the United Kingdom. The sample of firms is composed of 3,721 local firms and 10,476 multinational affiliates based in the UK, with the respective parent firm based in the European Union or in the United States. In the analyzed period, from 2008 to 2017, a sterling pound depreciation relative to euro and dollar is registered in two years. The first and more significant is registered in 2009 and derives from the 2008 financial crisis. The second in 2016 is provoked by the Brexit.

Desai *et al.* (2008), compares the response of American multinational affiliates and local firms in the tradable sectors of emerging markets, to a currency crisis. The authors find that, after a sharp currency depreciation, foreign owned firms increase sales, assets and investments significantly more than local firms. Facilities in internationalization and the differential access of use of internal capital market will give subsidiaries firms distinctive investment opportunities when compared to local competitors. Multinational parents can provide affiliates additional financing, mitigating the effects of a sharp depreciation. Under these assumptions, as initial hypothesis it is expected that multinational affiliates increase sales, assets and investments more than local competitors, in a depreciation period.

The coefficients result indicates that following the first depreciation episode (in 2009), multinational affiliates increase assets by 4,78% more, than local competitors. However, looking at the coefficient considering the depreciated year 2016, the results diverge from the initial hypothesis. Local firms demonstrate higher growth in the aftermath of the depreciation, for affiliates the fixed assets fall around 8% and the investment 1,12%. This result might be explained by the second depreciation shock being associated to a political reason, the *Brexit* and even with a depreciation, parent companies are afraid to invest in their subsidiaries.

In the second part of this study the focus is on local firms, whether they issue foreign debt or not. Taking into account that, following a currency depreciation crisis, financial leverage for firms with foreign debt exposure will increase, unless these firms are part of a multinational conglomerate that allows the subsidiaries to borrow from the parent firm. As initial hypothesis, it is expected that firms issuing foreign debt demonstrate a worse response in terms of assets, sales and investment growth, when compared to local competitors that only issue debt denominated in domestic currency.

For the first depreciation episode identified, the resulted coefficients contradict the initial predictions. With a currency depreciation, firms with outstanding foreign debt are especially constrained, since their debt burdens denominated in local currency increases. However, for the first episode analyzed (in 2009), I find that firms issuing foreign debt demonstrate a greater response when compared to local firms without foreign debt, in terms of assets, sales and investment growth. On the other hand, the outputs driven from second episode identified (in 2016) go in line with the expected. In 2016 and in the following year, a greater response is registered for companies that only issue debt denominated in local currency.

The remainder of the dissertation is structured as follows: Section 2 provides more detailed overview of the related literature; based on that literature, also in this section the hypothesis tested are presented. In section 3 it is presented the methodology process, where an econometric regression and the expected coefficients are described. Section 4 describes the sample of firms and the depreciation events and presents the summary statistic. Section 5 presents and discusses the results, and section 6 the conclusion.

2.Literature Review

In this dissertation it is compared the response of multinational affiliates and local firms, during and after a currency depreciation crisis. The analysis was based on the currently available literature related to the effects of the currency depreciation crisis which, in turn, will improve investment opportunities and, simultaneously, increase leverage and financial constraints. The corporate investment, the firm growth during and after the shock, the plausible reasons for the differential performance (such as the access to internal capital markets by multinational affiliates), and the role of foreign direct investment after depreciation are some of the topics in which this dissertation is based on.

2.1. Corporate investment and growth after depreciation

Sharp depreciations are expected to increase competitiveness due to the raise of prices in imports and the associated lowering production costs in the affected countries, relatively to foreign competitors, providing cost advantages to export markets;

In his work of 2002, Forbes finds that firms with a greater foreign sales exposure show higher growth in sales, net income, assets and market capitalization after depreciation episodes. This is the reason why in this dissertation I only consider firms from the tradable sector, since the impact of the depreciation will be more visible. The exclusivity of the product might lead to different investment opportunities and it may justify the different responses between these companies. However, Desai *et al.* (2008) show that the product market exposure alone cannot explain the magnitude of differential responses between affiliates and local competitors following a currency crisis. Cushman (1985) and Lipsey (2001), conclude that the firms that take more benefits from sharp depreciation are the ones that do not make an extensive use of imported inputs and sales directly to foreign markets. If affiliates firms register higher exportations compared to local competitors, then they might face better investment opportunities following depreciations.

Desai, Foley and Forbes (2008) finds that US multinational affiliates increase sales, assets and investments significantly more than local firms, during and after a large depreciation. This study compares the response of American multinational affiliates versus local firms in tradable sectors of emerging markets to sharp depreciations. The ability to overcome financial constraints is different for

local and subsidiaries firms. Moreover, the access to international sources of capital can allow foreign owned firms to overcome constraints related with local capital markets, which is more noticed in emerging markets. In this perspective, the affiliates that are more able to act in international markets might outperform local firms. Stulz (1990) demonstrates that financial market liberalizations can reduce the cost of capital for local firms. Liberalization is associated with investment booms, as showed by Henry (2000b), and with the increased stock market valuations (Bekaert and Harvey, 2000). Desai *et al.* (2004b) analyze the impact of the parent firm on its relative affiliate, concluding that multinationals capitalize their affiliates and these firms substitute internal borrowing for costly external finance stemming from adverse capital market conditions.

Agénor and Montiel (1996) report that sharp depreciations do not explicitly have an expansionary effect. Calvo and Reinhart (2000) by considering two emerging and developed markets, infer that after a currency crisis, large contractionary effects are noticed on countries with emerging markets, while developed markets exhibit an expansionary effect. Bernanke and Gertler (1989) argue that emerging markets are more affected by depreciations since it is common to find a large share of liabilities denominated in foreign currency, due to the conditions of the country, the firm needs to find credit outside. Thus, the depreciation of the country currency will result in the increase of firm liabilities, the aggravation of credit constraints and, consequently, worsen balance sheets, hindering investment.

The different response of multinational affiliates and local firms after a depreciation episode might be explained by their different ability to overcome financial constraints. Especially in emerging markets, in order to overcome constraints related with local capital markets, the access to international sources of capital market will allow multinational affiliates to outperform local competitors.

In line with the reviewed literature above, the first hypothesis of this dissertation is formulated as following:

Hypothesis I: When a sterling pound depreciation occurs, the associated increase on sales, investment and assets of subsidiary firms are higher than local firms.

Using multinational affiliates based in the United Kingdom with their relative parent firm located in the United States or European Union, it will be compared the responses of them with the local competitors, when exposed to a sterling pound depreciation. In this hypothesis, foreign debt will

not be considered, and all the local and subsidiaries firms located in the UK will be used, to identify which ones increase sales, assets and investment the most.

2.2. The importance of internal capital market for corporate investment

The predicted cash-flows, the value of the firm and the investment decisions can be affected by changes in foreign exchanges rates. These changes are time-varying and, therefore, challenging to estimate (Jorion, 1990; Boudt, Liu and Sercu, 2015). In order to avoid extreme situations, firms must be prepared for all possible market situations. The existence of an internal capital market in multinational companies will have a negative impact on the cash holdings of their subsidiaries compared to local firms, thus allowing affiliates companies to hold less cash. However, the existence of a well-developed internal capital market will provide some advantages to multinational firms and their subsidiaries in a case of adverse and unexpected macroeconomic situation, such as a financial crisis or a currency shock.

Capital structure, particularly the financial leverage and the access to foreign debt, affects the market value and the performance of firms. Accordingly, the ability of the firm to borrow abroad might depend on its performance. In a depreciation period, local firms with greater financial exposure are expected to experience larger reduction of investments. Moreover, after a local depreciation shock, multinational affiliates are expected to receive equity infusions from their parent companies. These phenomena demonstrate the importance of internal capital markets to multinational companies, which will allow their affiliates to expand their output after severe depreciations, precisely when economies are fragile and susceptible to severe economic contractions. Thus, multinational affiliates can mitigate some of the aggregate effects of currency crises. Besides, issuing bonds in international markets exposes the firm to a stricter monitoring by foreign lenders, leading to a decrease in the information asymmetry and agency costs, which will also contribute to a better performance of firms.

Beuselinck, Deloof and Vanstraelen (2011) reported that firms that can raise external capital more efficiently tend to hold less cash, therefore, avoiding agency problems related to excessive cash holding. The quality of the corporate governance, a better law and lower corruption will also reduce the agency costs, causing a positive effect on the subsidiary cash holding, which will make the affiliate firm

more independent. In a depreciation episode, firms with higher cash holding are more protected and have more resources to mitigate the effects of the crisis.

Boudt, Neely, Sercu and Wauters (2017) studied the response of multinational firms when exposed to macroeconomic news and how they affect the perception of the investors. They conclude that the value of exporting firms is sensitive to changes in the foreign exchange rate, and that a multinational firm benefits from local currency depreciation. Chaieb and Mazzotta (2013) show that the exposure of multinational firms increases in times of domestic recessions. This result is in accordance with Boudt *et al.* (2015), who demonstrated that the firm's exposure depends on the moneyness of the option to export. They argue that a firm's exposure should increase when the exporting becomes more beneficial. In line with this study, Bliss, Cheng and Denis (2013) find significant reductions on corporate payouts – dividends and share repurchase - during the crisis.

According to Forbes (2002), the way that a firm reacts after a large depreciation leads to a higher growth in market capitalization. This suggests that depreciations increase the present value of firms expected cash-flows and significantly lower growth in net income, suggesting that even if firms benefit from depreciations in the long run, the present impact on performance might be negative. When they tried to identify which of the firm's characteristics will have more impact in the firm value after a depreciation, they found that firms with greater foreign sales exposure have significantly better performance after depreciations and that firms with higher debt ratios tend to have lower growth in net income after depreciations.

2.3. Effects of foreign debt financing in firms' performance

A vast amount of research is focused on the effects of a depreciation on the firm's policy and financial constraints. Desai *et al.* (2008) compare the responses of multinational and local firms following a depreciation period. They conclude that the investment opportunities increase for both firms, but the sales and assets growths are greater for subsidiaries firms, less affected by financial constraints, since they take advantages from internal capital market. Forbes (2002) analyzes the impact of the shock on the firm's policy and concludes that, after a currency crisis, smaller firms with lower leverage, lower foreign sales exposures and, hence less exposure to foreign markets, tend to have greater growth values in comparison to other firms.

Kahle and Stulz (2013) focus on the impact of financial crisis on corporate investment and report that corporate borrowing and capital expenditures falls after the crisis. They showed that firms cash holdings exhibit a U-shape during the crisis, a shock in the corporate credit supply will cause a reduction in investments, falling more for bank-dependent firms. Dewally and Shao (2014) report that during the crisis the change in leverage of bank-dependent firms is less than that observed on firms with access to public debt markets. Bank-dependent firms rely more on cash than net equity issuance to finance operations. Firms vary in their ability to access finance, depending on whether they are foreign or domestic owned. Desai (2008), by analyzing the impact of the depreciation in American multinational affiliates, observes that, following a currency crisis, US-owned firms had increased investments in overseas operations more than domestic firms. Foreign firms frequently own a portfolio of assets and liabilities in multiple currencies, which neutralize the impact of the depreciation of any currency. They may also hedge foreign exchange rate risk by trading on well- developed forward markets (Clark *et al.*, 2004; Greenaway *et al.*, 2012).

In a study about the effects of financial leverage and foreign financing on firm's performance after a financial crisis, developed by Gabrijelcic, Herman and Lenarcic (2016), it is observed that the leverage has a negative impact on firm's performance. Also, a positive relation between performance and foreign debt was unveiled, that is, firms issuing foreign debt financing outperformed firms which only use domestic debt financing in their capital structure (Giannetti and Ongena, 2012). Harris and Raviv (1991) report that financial leverage is lower in more profitable firms. Rajan and Zingales (1995) demonstrate that leverage is affected positively by the tangibility of the assets, the investment opportunities, the size of the firm and negatively by profitability. Regarding so, Fama and French (2002) confirm that more profitable firms and firms with more investments, usually have lower financial leverage due to a higher return on investments.

Bernanke-Gertler-Gilchrist (1989) framework shows that in the presence of foreign currency debt, the currency depreciations may be contractionary. In line with this, Céspedes, Chang and Velasco (2002) show that the presence of liabilities denominated in foreign currency does not necessarily lead to contractionary depreciations. This might depend of imperfections in internal capital markets or may also be related with the amount of foreign debt, being the contractionary effect only noticed in large amounts of debt denominated in foreign currency.

A paper by Galindo, Panizza and Schiantarelli (2003), presents the depreciation effect on debt composition, focusing on economic and investment growth, and analyzing if the foreign debt depreciation has an expansionary or a contractionary effect. They evaluate the effects of real exchange rate fluctuations on economic performance and concluded that the presence of debt denominated in foreign currency can reverse the expansionary impact of exchange rate depreciations. Galindo *et al.* (2003) report that devaluations can have a contractionary impact in countries with heavy liabilities denominated in foreign currency. Most importantly, they find a negative correlation between depreciation and growth, since a 10% depreciation is associated with a drop in the growth of 1,2 pp.; For developing countries with low external debt in foreign currency they find a positive and significant correlation between the variables; For countries that do not have foreign currency debt, a 10% depreciation is associated with an increase in growth of 0,7 pp and in countries with a large percentage of debt denominated in foreign currency a 10% depreciation is associated with a decrease in growth of 1,6 pp. Since these countries have debt denominated in foreign currency, with the country's currency depreciation, the foreign debt becomes more expensive with a noticeable decrease in growths.

Based on the mentioned assumptions, it is possible to formulate the following hypothesis, which will be tested using only local firms. Moreover, responses to the crisis on whether the firm issues foreign debt or not will be compared:

Hypothesis II: Local firms without foreign debt register a better performance in terms of assets, sales and investment growth compared to local firms that issue debt in foreign currency.

The negative relation between leverage and firms' performance is consistent with the hypothesis that higher leverage leads to higher agency costs stemming from the conflict between shareholders, managers and bondholders, resulting either in underinvestment (Myers, 1977; Stulz, 1990) or investment in overly risky projects (Jensen and Meckling, 1976). Harvey, Lins and Roper (2004) report that the information asymmetry and agency costs decrease more in firms that issue bonds on international markets. As they are subjected to stricter monitoring by foreign lenders, a positive effect of foreign debt in firms' performance is expected. In addition, the financial standards that these firms must meet are higher, in order to attract foreign lenders, improving their profitability. The agency costs occur when there is a considerable level of debt and the risk of bankruptcy is higher. A currency depreciation might increase the costs associated to foreign issued debt, in turn increasing

the agency costs. Moreover, high debt levels increase the chance of financial distress. If firms have high probability of distress, to minimize the costs associated to it, too much debt should be avoided by firms opting for the use of banks rather than many bondholders. However, if the company is not in a situation of financial distress, leverage will have a positive impact in the firm (MM proposition).

2.4. The role of foreign direct investment (FDI) after depreciation

Campello, Graham and Harvey (2010) investigate how public and private firms in Europe use credit during the financial crisis, given a especial emphasis to corporate managers decision. They find that small, private and unprofitable firms, that usually face restricted access to credit, draw more funds from their credit lines during the crisis than their large, public and profitable counterparts. They conclude that the credit conditions changed significantly with the crisis, with higher costs of borrowing and difficulties in initiating or renewing credit lines during this time.

Alfaro and Chen (2010) compare how multinational firms around the world respond to the crisis in comparison to local firms. They conclude that multinational firms perform, on average, better than local competitors. The authors focus on the role of foreign direct investment (FDI), noticing a considerable heterogeneity in this variable, which varies with the incidence of the crisis in host and home country. In this study, they consider three main ways in which FDI can affect the firm's performance. Firstly, considering production as a way to alleviate the financial crisis impact, multinationals can react to adverse shocks by adjusting home and foreign production. Secondly, in regard to financial constraints, subsidiaries firms might be less dependent on host country credit conditions because of the credit supply received from the headquarter. By allowing multinational firms to access international credit, this will support capital market diversification which will be an important advantage when the incidence of a crisis is greater in host countries and smaller in subsidiaries-based countries, and when financial constraints are intensified. Lastly, they analyze the effect of multinational networks, in which they conclude that larger multinational networks enable multinationals to diversify production and financial markets.

These results show that multinationals located in host countries that experience sharp declines in output, demand and credit conditions display a greater advantage relatively to local firms. Nonetheless, headquarters of multinationals settled in countries with a greater incidence of the crisis,

which includes lower demand and worse credit conditions, present a worse performance abroad. Additionally, these results indicate that multinationals with stronger financial constraints exhibit a better performance in comparison to local firms. They also find that the size of multinationals networks has impact in the firm performance during the crisis, suggesting that being part of a larger multinational network leads to a superior economic performance as a result of a larger number of countries in which the multinational operates.

3. Methodology

To test the first hypothesis of this dissertation, I follow Desai *et al* (2008). In order to identify if multinational affiliates and local firms perform distinctively in the year and years following a currency depreciation, I consider as operating activities measures the level of assets, sales and investment growth. The investment growth was measured by the capital expenditures (CAPEX) which was calculated by the sum of the variation of the fixed assets and depreciation relatively to the total assets. By comparing the operating measures accordingly to the firm ownership, it is possible to identify if there is a different response by subsidiaries and local competitors to the depreciation, which might indicate an investment in the affiliate from their relative parent firm in a period of a local currency depreciation.

Since the effects of a currency depreciation are not immediate and require a longer time to be noticed, two different tests were applied. The first test (a) considers four depreciation dummies variables, *depreciation t-1*, *depreciation t*, *depreciation t+1* and *depreciation t+2* which are equal to 1 in each of the three years after the depreciation and the year before it, separately, indicating the relative effects of the depreciation in each of the years. The second test (b) considers only one depreciation dummy variable, *post depreciation*, which combines the year of the depreciation and the two subsequent years into a single dummy variable.

Using the following regressions, it will be possible to analyze the first question addressed in this dissertation.

$$Y_{i,t} = \beta_0 + \beta_1 * MNC_i + \beta_2 * Depreciation(t-1)_i + \beta_3 * Depreciation(t)_i + \beta_4 * Depreciation(t+1)_i + \beta_5 * Depreciation(t+2)_i + \beta_6 * MNC_i * Depreciation(t-1)_i + \beta_6 * MNC_i * Depreciation(t)_i + \beta_6 * MNC_i * Depreciation(t+1)_i + \beta_6 * MNC_i * Depreciation(t+2)_i + firm, industry FE + \varepsilon_{i,t}$$

(1a)

$$Y_{i,t} = \beta_0 + \beta_1 * MNC_i + \beta_2 * Post_Depreciation_i + \beta_3 * MNC_i * Post_Depreciation_i + firm, industry FE + \varepsilon_{i,t}$$

(1b)

Y_{it} is a measure of operating activity: assets, sales and the investment growth, for firm i in the year t . *Subsidiary* is a dummy variable equal to one if the company is a multinational subsidiary; the *depreciation* dummy variable is set equal to one for observations from the year of the depreciation (t), the year before ($t-1$), one year after ($t+1$) and for two years after ($t+2$), separately. *Post depreciation* dummy variable is set equal to one for the year of the depreciation and the two following years. $\varepsilon_{i,t}$ is an error term. As time-varying control variable the producer-price inflation is considered. Each of the specifications includes firm fixed effects and industry fixed effect to correct for serial correlation. Industry is classified using the two-digit SIC-codes.

The key variable of interest is the interaction between the depreciation dummy variables and the dummy variable for the multinational affiliates. The relative coefficient of *depreciation* dummy measures the response of local firms to depreciations. Under the first hypothesis, a negative coefficient for this variable is expected, indicating a decline in investment, sales and assets growth for local firms. The interaction terms capture the different response of multinational affiliates relatively to local firms, which is my key variable. A negative coefficient of this variable indicates a bigger investment from local competitors comparatively to multinational affiliates (MNC). Regarding so, based on reviewed literature, significant and positive coefficient for the key variable is expected, suggesting a greater investment from affiliates over local firms.

In the second hypothesis addressed in this dissertation, I analyze the impact of depreciation in firms issuing or not foreign outstanding debt. To do so, I consider a sample of UK local firms. With the sterling pound depreciation, firms with foreign debt will increase their liabilities and firms that do not present foreign debt will demonstrate a greater response in terms of assets, sales and investment, following a depreciation period. To test this hypothesis, I use the subsequent regressions: in (2a) each dummy indicates the firm behavior for each year separately; and (2b) captures the effects after the depreciation episode as a whole, as described above.

$$Y_{it} = \beta_0 + \beta_1 * Foreign_debt_{i,t} + \beta_2 * Depreciation(t-1)_i + \beta_3 * Depreciation(t)_i + \beta_4 * Depreciation(t+1)_i + \beta_5 * Depreciation(t+2)_i + \beta_6 * Foreign_debt_{i,t} * Depreciation(t-1)_i + \beta_6 * Foreign_debt_{i,t} * Depreciation(t)_i + \beta_6 * Foreign_debt_{i,t} * Depreciation(t+1)_i + \beta_6 * Foreign_debt_{i,t} * Depreciation(t+2)_i + firm, industryFE + \varepsilon_{i,t}$$

(2a)

$$Y_{i,t} = \beta_0 + \beta_1 * Foreign_debt_{i,t} + \beta_2 * Post_Depreciation_{i,t} + \beta_3 * Foreign_debt_{i,t} * Post_Depreciation_{i,t} + firm, industry FE + \varepsilon_{i,t}$$

(2b)

$Y_{i,t}$ is a measure of operating activity (such as sales, investment and assets); i is a subscript for each firm and t a subscript for each year; *Depreciation* is a dummy variable equal to 1 for observations from the year of the depreciation (t), one year after ($t+1$) and for two years after ($t+2$); *Post depreciation* dummy variable is set equal to one for the depreciation year and the following two; *Foreign debt* is a dummy variable equal to one if the company have foreign debt in the respective year t ; $\varepsilon_{i,t}$ is an error term. As time-varying control variable the producer-price inflation is considered. Each of the specifications includes firm fixed effects and industry fixed effect to correct for serial correlation. Industry is classified using the two-digit SIC-codes.

The key variable of interest is the interaction between the depreciation dummy variable and the foreign debt dummy variable, *foreign debt X post depreciation*. The coefficient of the *foreign debt* dummy variable measures the response of local firms using foreign debt to depreciation and the interaction terms capture the performance of local firms using foreign debt relatively to the ones that do not use it, which is the key variable. According to the hypothesis, it is expected a negative coefficient of the interaction variable, which indicates a greater performance of firms issuing debt in local currency, in relation to the ones issuing debt in foreign currency, the denominated debt will appreciate increasing the firm liabilities.

4. Depreciation Event and Data set

4.1. Depreciation Event

In order to identify the impact of a depreciations on multinational affiliates and local firms, it is necessary to compute a currency depreciation episode, i.e., sterling pounds depreciation relatively to euros and dollars, since the relative headquarters are based in USA and European Union. The exchanges rates are download from DataStream database using Bank of England source, from January 2006 to December 2017. Particularly, the quarterly nominal exchange rate from euro to sterling pounds ($x \text{ €} - 1 \text{ £}$) and from dollar to sterling pounds ($x \text{ \$} - 1 \text{ £}$) were obtained. Then, the real exchange rate was computed by adjusting the nominal exchange rate to the inflation, using UK consumer price index downloaded from DataStream.

Based on similar studies from Desai, Foley and Forbes (2008), it was made a homologous analysis as a way to identify depreciation episodes. By doing so, it will be possible to identify not only extreme events, but also periods when a country's exchange rate depreciates slowly for a cumulative depreciation, and so, focusing on depreciations over longer periods of time captures any large depreciations that occur in small increments, rather than just one-time large depreciation.

According to the paper developed by Desai *et al.* (2008), a country is classified as having a currency crisis in a given year if the real exchange rate of the country in any given quarter decreases by over 25% relatively to the value of exchange rate in the same quarter one year earlier. Although doing a homologous analysis and using a 25% exchange rate decreases, only one episode was identified regarding the EUR - GBP currency, in 4Q2008 of 26,85% and two episodes regarding to USD - GBP currency, 4Q2008 of 30,45% and 1Q2009, 30% decrease. Due to this, using a lower rate of decrease, 15%¹; it was possible to identify another period in the last two quarters of 2016 (EUR to GBP) and in the last three quarters of 2016 for USD-GBP, all around 16%. It is important to refer the veracity of these results: the first shock in 2009 was provoked by the financial crisis occurred in 2008 and the second episode, in 2016 may be justified with the Brexit announced that year.

¹ Analyzing to the results derived from the homologous analysis, it was considerate an 15% decline between the exchanges rates in the way to obtain more significant results.

For the second question analyzed, the currency in which the debt is issued has a major relevance. About 95% of the foreign debt is issued in dollar and euro, so the same depreciation episodes as mentioned in the first question, 2009 and 2016, are considered.

4.2. Sample of firms

To collect data for the empirical analysis it was used AMADEUS database, composed of a large number of listed and non-listed companies. All the financial and operating data of the subsidiaries and local firms are from this database, which includes information of over 5 million public and private companies from 34 countries.

Regarding this analysis, all the available financial and operating data, from 2008 to 2017, for UK local firms and affiliates firms based in the UK with their parent firm based in the United States and European Union was requested from AMADEUS database. To collect the sample of firms, the following main restrictions were followed: all firms need to have at least 100 thousand pounds of total assets; being active companies with at least 5 employees; companies with “financial” and “utilities” activities were excluded. All the companies are from the tradable sector², in accordance to Forbes (2002), since the tradable sector has more incentives to invest and produce in a country with currency depreciation being the impact of a depreciation more noticed and significant in this sector. Hence, companies from the non-tradable sector were excluded from this analysis.

Therefore, it was collected an initial sample of 3,721 UK local firms and 10,476 multinational affiliates firms based in the UK with the global ultimate owner³ located in the United States and European Union.

Then, to assess how depreciation affects firm’s growth, variables as sales, investment and assets growths before and after the shock will be computed. These are relevant variables considerate to measure the operating activity, being plausible indicators of a possible over investment from the

² The sample therefore includes firms that are active and with tradable activities such as: agriculture, forestry, fishing mining and manufacturing.

³ According to AMADEUS database it is considerate an ultimate owner firms, in which the percentage for the path from a subject company to its ultimate owner is larger than 50%; and it has no identified shareholder or its shareholder’s percentages are not known;

headquarter to their relative affiliates. To measure how individual firm characteristics, affect the performance, the following variables are used: fixed assets, total assets, operating P/L EBIT, operating revenues, net income, long term debt, depreciations and amortizations.

For the second question of this dissertation, foreign debt needs to be considered. Using only local firms, since the amount of foreign debt of an affiliate firm is hard to identify, all the financial data of the local companies were obtained, as previously, from the AMADEUS database. Then, using Securities Data Companies, SDC Platinum database, it was possible to identify the firms that issue debt in foreign currency. SDC Platinum provides over 760,000 bond deals, including investment-grade, high-yield, and emerging market corporate bonds, bond issues as non-convertible bonds, mortgage/asset backed, bonds pipeline and registrations, MTN programs and private debt. From here, all local companies that issued bonds from 1990 to 2017⁴ were downloaded, getting an initial sample of 12,328 issues. All the debt issued in sterling pounds was excluded and, considering only foreign issues, the sample was reduced to 9,331.

The only way to identify companies that issue foreign debt was through the three digits ticker. Due to this, the sample of firms will include only publicly traded companies, reducing the sample of local firms from 3,721 to 569 firms. Within these 569 companies, 65 issued debt in foreign currency at least one time over the 10 years-period analyzed. Only 11.42% of the sample uses foreign debt in their capital structure, thus, the small percentage of firms due to the limited ways to match SDC data with AMADEUS data, might lead to insignificant results.

⁴ Although the analysis starts in 2008, firms issued debt in the pass with the final maturity in the years analyzed or even after the ten years, being important to collect data from a significant period.

4.3. Summary statistics

4.3.1. Local and Multinational affiliates

The resulting sample includes 3,721 UK local firms and 10,476 subsidiaries in the UK with the headquarter firm in US and Europe, around 70% of the sample is composed for these firms. Sales, assets and the investment growth ⁵ are the proxies for firm operating performance.

The following tables provide descriptive statistics for the variables used in the empirical analysis. First, for all the firms (table 1), then, by splitting the sample, the statistics values of the subsidiaries and local firms are presented (table 2). To reduce the effects of possibly spurious outliers and extreme values, all the variables are winsorized at 1% level. *Type* is a dummy variable equal to one for subsidiaries firms. For the empirical analysis it was included the following firm data: sales, fixed assets, total assets, depreciations and amortizations, the long-term debt and operating P/L ratio⁶, and for the growth measures all the variables were logarithmized and then winsorized at 0.01.

⁵ The growths variables to compute the firm operating activity and performance were calculated follows: $(X_t - X_{t-1}) / X_{t-1}$

⁶ All the variables were downloaded in nominal local currency, thousands of sterling pounds.

Table 1 : Descriptive statistics of main variables for the full sample

Variables	(1) Mean	(2) Standard Deviation	(3) Median
Fixed Assets	56,457	264,184	1,620
Log of fixed assets	7.48	2.88	7.61
Total assets	116,582	458,767	10,083
Log of total assets	9.32	2.07	9.22
Operating revenues	90,606	297,389	14,709
Log of sales	9.62	1.84	9.60
CAPEX	0.57	0.18	0.60
Inflation	2.39	1.28	2.65
CPI	95.27	6.12	97.29
Type	0.74	0.44	1
Type	ALL	ALL	ALL

Note: values of fixed assets, total assets and operating revenues are measured in thousands of local currency units, sterling pounds. All the variables (expect dummies) are winsorized at 1% level.

As presented in table 1, the average (median) firm in the subject sample has £116,582 (£10,083) million in total assets, £56,457 (£1,620) in fixed assets and £90,606 (£14,709) million in operating revenues. 9.62% sales growth, and 7.48% assets growth. The average capital expenditure as a proportion of total assets is 0.57%. The capital expenditures are measured as the variation of fixed assets from t-1 to t plus depreciation in proportion of total assets. 74% of the sample is composed by subsidiaries firms, the average firm experience 2.4% inflation per year and the average of the consumer price index is 95.27.

Table 2 : Descriptive statistics of main variables for local and multinational affiliates

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Mean	Standard deviation	Median	Mean	Standard deviation	Median
Fixed assets	75,599	310,925	3,593	49,644	245,048	1,121
Log of fixed assets	8.05	2.79	8.23	7.26	2.89	7.31
Total assets	131,660	516,125	10,572	111,215	436,412	9,904
Log of Total assets	9.37	2.05	9.27	9.30	2.07	9.20
Operating revenue	107,292	357,265	12,787	84,585	272,325	15,429
Log of sales	9.50	1.98	9.46	9.66	1.78	9.64
CAPEX	0.58	0.18	0.61	0.56	0.18	0.60
Type	LOCAL	LOCAL	LOCAL	MNC	MNC	MNC

Note: Values of fixed assets, total assets and operating revenues are measured in thousands of local currency units, sterling pounds. All the variables (except dummies) are winsorized at 1% level.

Analyzing the data presented in table 2, the average (median) firms has £75,599 (£3,593) million in fixed assets, £131,660 (£10,572) million in total assets and £107,292 (£12,787) million in operating revenues. The average sales growth is 9.50%, total assets growth 9.37% and fixed assets growth 8.05%. The average capital expenditure as a proportion of total assets is 0.58%.

Looking into the data of the multinational affiliate firms based in the UK with their ultimate parent based in the United States and European Union, the average (median) of local firms has £49,644 (£1,121) million in fixed assets, £111,215 (£9,904) million in total assets and £84,585 (£15,429) million in operating revenues. The average sales growth is 9.66%, total assets growth 9.3% and fixed assets growth 7.26%. The average capital expenditure as a proportion of total assets is 0.56%.

4.3.2. Local firms with foreign debt

In this section, the main variables used for the second part of the study are presented. Regarding table 3, it is presented the descriptive statistics of the main variables for the whole sample. In turn, table 4, by splitting the sample, presents the descriptive statistics of the main variables for the firms with foreign debt for at least one year in the 10 years analyzed and for the firms that never issued debt in foreign currency in that period.

Table 3 : Descriptive statistics of main variables for the whole sample

Variables	(1) Mean	(2) Standard Deviation	(3) Median
Fixed assets	1,758,156	6,823,497	47,219
Log of fixed assets	10.91	2.92	10.76
Total assets	2,364,701	8,579,918	97,112
Log of total assets	11.71	2.53	11.48
Operating revenues	1,696,567	5,917,362	75,014
Log of sales	11.29	2.82	11.23
CAPEX	0.01	0.07	0.00
Inflation	2.39	1.28	2.65
CPI	95.27	6.12	97.29
Foreign debt	0.12	0.33	0
Type	LOCALS	LOCALS	LOCALS
Foreign debt	ALL	ALL	ALL

Note: Values of fixed assets, total assets and operating revenues are measured in thousands of local currency units, sterling pounds. All the variables (except dummies) are winsorized at 1% level.

Table 3 presents the statistics descriptive for the main variables used in the analysis. The average (median) firm in the sample has £2,364,701 (97,112) million in total assets, £1,758,156 (47,219) in fixed assets and £1,696,567 (£75,014) million in operating revenues. The average sales growth is 11.29% and 10.91% fixed assets growth. The average capital expenditure as a proportion of total assets is 0.01%. Only 12% of the sample firms have foreign debt in any year during the sample period. The average firm experience 2.39% inflation per year and the average of the consumer price index is 95.27.

Table 4 : Descriptive statistics for the main variables of firms without foreign debt

Variables	(1) Mean	(2) Standard Deviation	(3) Median
Fixed assets	758,709	4,360	29,262
Log of fixed assets	10.35	2.62	10.28
Total assets	1,024,608	5,310,547	62,350
Log of total assets	11.20	2.22	11.04
Operating revenue	703,877	3,339,590	48,861
Log of sales	10.76	2.56	10.80
CAPEX	0.01	0.08	0.00
Type	LOCAL	LOCAL	LOCAL
Foreign debt	NO	NO	NO

Note: Values of fixed assets, total assets and operating revenues are measured in thousands of local currency units, sterling pounds. All the variables (except dummies) are winsorized at 1% level.

Table 4 presents the descriptive statistics for the main variables analyzed, for the sample of firms that do not issue debt denominated in foreign currency. The average (median) firms has £758,709 (£29,262) thousand in fixed assets, £1,024,608 (£62,350) thousand in total assets and £703,877 (£48,861) thousand in operating revenues. The average sales growth is 10.76%, total assets

growth 11.20% and fixed assets growth 10.35%. The average capital expenditure as a proportion of total assets is 0.01%.

Table 5 presents the descriptive statistics for the sample of local firms that issue foreign debt. The average (median) firms has £8,669,397 (£2,008,450) thousand in fixed assets, £11,631,518 (£3,285,850) thousand in total assets and £8,242,951 (£2,324,150) thousand in operating revenues. The average sales growth is 14.78%, total assets growth 15.25% and fixed assets growth 14.80%. The average capital expenditure as a proportion of total assets is 0.00%.

Table 5 : Descriptive statistics for the main variables of firms with foreign debt

Variables	(1) Mean	(2) Standard Deviation	(3) Median
Fixed assets	8,669,397	13,515,880	2,008,450
Log of fixed assets	14.80	1.58	14.51
Total assets	11,631,518	17,024,354	3,285,850
Log of total assets	15.25	1.46	15.01
Operating revenue	8,242,951	11,968,885	2,324,150
Log of sales	14.78	1.76	14.66
CAPEX	0.00	0.03	0.00
Type	LOCAL	LOCAL	LOCAL
Foreign debt	YES	YES	YES

Note: Values of fixed assets, total assets and operating revenues are measured in thousands of local currency units, sterling pounds. All the variables (except dummies) are winsorized at 1% level.

5. Empirical results

In the tables 6, 7, 8 and 9 are presented the outputs resulting from the regression (1) and (2) mentioned in section 3. In order to compare the firms responses on each of the depreciation events identified, firstly I run the regressions considering the depreciate year (t): 2009, the resulted coefficients are present in tables 6 and 8, and then, considering the depreciate year (t): 2016, where the regression coefficients are presented in table 7 and 9. Furthermore, two outputs are presented for the same depreciation year: (a) the *depreciation* dummy variable is considered as equal to one for the year of the depreciation (t), the year before it (t-1), the year following the depreciation (t+1) and two years following the episode (t+2), separately, to be able to capture the effect of the depreciation in each of the years; And (b) where the depreciated year and the following two years, are combined into a single dummy variable: *post depreciation*, which is set equal to one in the year of and the two years following the depreciation, and intends to capture the cumulative effect of the depreciation.

This section is divided into two subsections: the first one analyzes the regression results in order to address the first question of this study, the different responses of multinational affiliates and local competitors to a depreciation; the following subsection describes the regression results relating to the second question analyzed, the differential responses of local firms to currency depreciation when they are exposed to foreign debt. Following Desai *et al.* (2008), as proxies of the firm operating performance are considered the sales, assets and investment growth. There were included, in both regressions, variables that account for consumer price index and a time trend variable, the inflation. Since the whole study is concentrated in the UK, as control variables is used the industry and firm fixed effects. All standard errors are clustered at the firm level to correct for serial correlation.

5.1. Responses of MNC and local firms to depreciation

In table 6 are presented the results of the econometric regression (1a) and (1b) presented in the methodology, considering 2009 as the currency depreciation year, which is the year of the analysis that register the most significant depreciation episode, around 26% and 30%; (euro to sterling pounds and dollars to sterling, respectively).

Table 6 : Response of MNC affiliates and Local firms to Currency Crisis of 2009

<i>Dependent variable</i> <i>(Model 1, t=2009)</i>	<i>Assets growth</i>		<i>Sales growth</i>		<i>CAPEX</i>	
	(1a)	(2b)	(3a)	(4b)	(5a)	(6b)
<i>Constant</i>	3.473*** (0.150)	7.303*** (0.00927)	6.687*** (0.0773)	9.465*** (0.568)	0.637*** (0.0157)	0.497*** (0.00441)
<i>Depreciation (t-1)</i>	0.240*** (0.0273)		0.175*** (0.0171)		- ⁷ -	
<i>Depreciation (t)</i>	0.196*** (0.0240)		0.133*** (0.0132)		-0.0167*** (0.00264)	
<i>Depreciation (t+1)</i>	0.137*** (0.0196)		0.111*** (0.0105)		-0.00989*** (0.00224)	
<i>Depreciation (t+2)</i>	0.0489*** (0.0135)		0.0464*** (0.00778)		-0.00807*** (0.00177)	
<i>Post depreciation</i>		0.0545*** (0.0129)		0.152*** (0.00823)		0.00617*** (0.00153)
<i>Depreciation (t-1) x MNC</i>	0.141*** (0.0201)		-0.00546 (0.0149)		- -	
<i>Depreciation (t) x MNC</i>	0.0982*** (0.0181)		-0.0438*** (0.0107)		0.00599*** (0.00209)	
<i>Depreciation (t+1) x MNC</i>	0.0712*** (0.0160)		-0.0255*** (0.00890)		0.00686*** (0.00196)	
<i>Depreciation (t+2) x MNC</i>	0.0347** (0.0135)		-0.00549 (0.00775)		0.00628*** (0.00186)	
<i>Post depreciation x MNC</i>		0.0478*** (0.0104)		-0.0233*** (0.00584)		0.00632*** (0.00129)
Observations	132,499	132,499	123,909	123,909	108,650	108,650
R-squared	0.916	0.916	0.946	0.946	0.767	0.767

⁷ There are not available outputs for the year before the currency crisis (2008) since the CAPEX was measured as the sum of the variation of fixed assets and depreciation, there are not available data for 2007 to measure the CAPEX in 2008.

INDUSTRY FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Note: This table presents the coefficients estimates from the regression (1a) and (1b) presented in section 3. The dependent variable is the assets growth in column (1a) and (2b), the sales growth in column (3a) and (4b) and CAPEX in column (5a) and (6b). In columns (a) are presented the coefficients estimated when the depreciation dummy variable is set equal to one for each of the years, separately; In column (b) are presented the estimated coefficients when the depreciation dummy variable is equal to one in the depreciated year and the two following; MNC is a dummy variable set equal to one for multinational affiliates firms. All the variables (except dummy variables) are winsorized at 1% level. As time-varying control variable the producer-price inflation is considered. Each of the specifications includes firm fixed effects and industry fixed effect. Industry is classified using the two-digit SIC-codes. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimates are significant at 1%, 5% or 10% level, respectively.

MNC affiliates increase sales 4% more than local

Looking at the coefficients presented in column (1a), it is noticeable that the average fixed assets growth for local firms was higher in the year previous the depreciation than before, however significantly above the average, by 24 percentage points, before the depreciation and 4,89 percentage points two years following the depreciation crisis. As well as the *post depreciation* coefficient of 5,45 percentage points, which indicates that local firms increase more their fixed assets, on average after the depreciation. The coefficient resulted from the interaction dummy variable, *post depreciation x MNC*, presented in column (2a), indicates that multinationals expand their fixed assets, 4,78% more than local competitors after the depreciation crisis. This is comparable to 7,5% coefficient reported by Desai *et al.* (2008) and goes accordingly to the expected result: multinationals companies are able to access internal capital markets increasing their output and activity more than local competitors in a period of local currency depreciation. It is important to mention that, regarding column (1a), the years registering greater growth values, in terms of fixed assets, are the depreciation year, and its following, MNC affiliates increased fixed assets by 9,82% and 7,12% more, respectively, than comparing to local competitors.

The *sales level* was measured by the operating revenues activity, in nominal local currency units, after being winsorized at 1% level. Regarding the regression outputs of the first episode identified, the coefficient *depreciation* dummy variable presented in column (3a), indicates that local firms increase their sales, on average by 13.3%, in the year of the depreciation, 11.11% in the year following the shock and, on average by 4.64% two years after the episode. Looking at the interaction coefficient *post depreciation x MNC*, presented in column (4b), after the depreciation, MNC affiliates decrease their sales by 2.3% more, comparing to domestic firms. However, the level of sales might not indicate an investment from the parent company to their relative affiliate. This negative coefficient might be caused by external factors.

The last column analyzes the impact on the investment⁸ of local and subsidiaries firms during the depreciations, using as dependent variable the capital expenditures scaled by total assets.

⁸ It is possible that different levels of investment between multinational affiliates and local firms may simply reflect differences in the scope of activity following depreciations, instead of differences in the investment responses of entities of a similar size. However, in this study we didn't test this hypostasis using only one measure of investment activity, capital expenditures scaled by total assets.

Regarding the first depreciation episode in 2009, local firms experienced a small decrease⁹ in the investment of 0.17%, on average, in the year of the depreciation. Looking at the interaction coefficients, *post depreciation x MNC*, presented in column (6b) it is possible to conclude that multinational affiliates increase their investment 0.6% more than local firms, registering a continuous growth in the subsequent years of the episode, when compared to local competitors.

⁹ The unique product exposure might take to different investment opportunities and it may justify the differences in performance between these companies

Table 7: Response of MNC affiliates and Local firms to Currency Crisis 2016

<i>Dependent variable (Model 1, t=2016)</i>	<i>Assets growth</i>		<i>Sales growth</i>		<i>CAPEX</i>	
	(1a)	(2b)	(3a)	(4b)	(5a)	(6b)
<i>Constant</i>	7.303*** (0.00927)	7.303*** (0.00927)	0.00635*** (0.000466)	0.00768*** (0.000318)	0.000252*** (7.48e-05)	0.544*** (0.00651)
<i>Depreciation (t-1)</i>	0.160*** (0.0125)		0.0390*** (0.00625)		0.00457*** (0.00155)	
<i>Depreciation (t)</i>	0.207*** (0.0144)		0.0721*** (0.00716)		0.00422*** (0.00159)	
<i>Depreciation (t+1)</i>	0.211*** (0.0166)		0.0655*** (0.00851)		0.000821 (0.00178)	
<i>Post depreciation</i>		0.461*** (0.0157)		0.384*** (0.00911)		0.00172 (0.00126)
<i>Depreciation (t-1) x MNC</i>	-0.0487*** (0.0155)		-0.00199*** (0.000686)		-0.00407** (0.00185)	
<i>Depreciation (t) x MNC</i>	-0.0799*** (0.0178)		-0.00226*** (0.000700)		-0.0113*** (0.00190)	
<i>Depreciation (t+1) x MNC</i>	-0.101*** (0.0204)		-0.00360*** (0.000679)		-0.0124*** (0.00205)	
<i>Post depreciation x MNC</i>		-0.0840*** (0.0140)		-0.00259*** (0.000517)		-0.0112*** (0.00146)
Observations	132,499	132,499	123,909	123,909	108,650	108,651
R-squared	0.916	0.916	0.946	0.946	0.767	0.768
INDUSTRY FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Note: This table presents the coefficients estimates from the regression (1a) and (1b) presented in section 3. The dependent variable is the assets growth (1a) and (2b), the sales growth (3a) and (4b) and CAPEX (5a) and (6b). The *depreciation* dummy variable is set equal to one for the year previous the depreciation (t-1), the depreciate year (t), the year following the crisis (t+1) and the second year following the depreciation crisis (t+2). *Post Depreciation* dummy variable is set equal to one in the year and the two-following two years after the depreciation. MNC is a dummy variable set equal to one for multinational affiliates. All the variables (expect

dummy variables) are winsorized at 1% level. As time-varying control variable the producer-price inflation is considered. Each of the specifications includes firm fixed effects and industry fixed effect. Industry is classified using the two-digit SIC-codes. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimates are significant at 1%, 5% or 10% level, respectively.

Regarding the second depreciation shock identified, in 2016, the estimated coefficients presented in table 7, contradict the theoretical predictions. Relatively to fixed assets, the *post depreciation* coefficient presented in column (2b), 0.461 indicates that local firms increase on average their fixed assets.

Analyzing the *depreciation* dummy variable coefficients, presented in column (1a), is noticed that local firms increase their fixed assets, on average 20.7% in the year of the depreciation. Multinational affiliates decreased their fixed assets in the aftermath of the depreciation (-8.4%) column (2b), which might indicate an investment reduction from their relative headquarter. The opposite expected reaction by subsidiaries companies to the depreciation episode, might be explained by the fact that the second depreciation episode has a political reason behind: with the *Brexit*, parent firms might be afraid to invest in their subsidiaries; Other reason which might justify these differential responses is that the second depreciation is far less significant comparing to the first one, since it was noticed a small decrease of around 15%. This substantial decrease may not lead to an investment opportunity from the headquarters to their relative affiliates.

Regarding the *post depreciation* coefficient 0.384, presented in column (4b) it indicates on average, an increase in sales for local competitors, after the currency depreciation. Analyzing the *depreciation* dummy variable in each of the years separately, showed in column (3a) it is evident that local firms increase their sales on average by 3.9%, in the year before the episode and by 6.55% in the year following the shock. MNC affiliates decrease their sales by 0.26% comparing to local firms, after the depreciation episode. As in the fixed assets analysis, the results of the second episode diverge from the initial expectations. As referred by Desai *et al.* (2008) the ability to substitute internal funds for external financing will give to MNC affiliates opportunities, in a depreciation period, that local competitors do not have, which have a more limited access to global capital markets. Therefore, it is expected a greater performance of affiliates companies however local competitors outperform them.

Regarding the impact of the depreciation on the investment, presented in columns (5a) and (6b), the results diverge from the expectations. Multinational affiliates decrease their fixed assets on average by 1.12% more than local firms. However, different levels of investment do not necessarily indicate a different response of the entities towards the shock, it may only reflect a difference in their scope of activity following the depreciation.

5.2. Responses of firms using foreign debt to depreciation

In this section, the results from the second question addressed in this dissertation are discussed: the responses of local firms to currency depreciation when they are exposed to foreign debt. At the time of currency depreciation, firms with outstanding foreign debt are especially constrained since their debt burdens expressed in local currency increase. Considering only UK local firms, are examined the level of assets, sales and investment growth before and after the currency depreciation, depending on whether the firm has foreign outstanding debt or not. Table 8 and table 9 report the regression coefficients that result from equations (2a) and (2b) presented in section 3.

Table 8: Response of local firms that issue foreign debt to the currency crisis 2009

<i>Dependent variable</i> <i>(Model 3, t=2009)</i>	<i>Assets growth</i>		<i>Sales growth</i>		<i>CAPEX</i>	
	(1a)	(2b)	(3a)	(4b)	(5a)	(6b)
<i>Constant</i>	8.614*** (1.103)	9.907*** (0.469)	6.694*** (1.168)	9.465*** (0.568)	-0.00312 (0.00495)	-0.619*** (0.0694)
<i>Depreciation (t-1)</i>	0.183 (0.150)		0.426** (0.183)		-	
<i>Depreciation (t)</i>	0.112 (0.128)		0.309** (0.147)		0.00208 (0.0125)	
<i>Depreciation (t+1)</i>	0.0963 (0.0959)		0.316*** (0.117)		0.00775 (0.0112)	
<i>Depreciation (t+2)</i>	0.0624 (0.0465)		0.121 (0.0754)		0.0254 (0.0135)	
<i>Post Depreciation</i>		-0.0371 (0.0276)		-0.0287 (0.0437)		0.0137 (0.0101)
<i>Foreign debt x Depreciation (t-1)</i>	0.373** (0.149)		0.371** (0.180)		-	
<i>Foreign debt x Depreciation (t)</i>	0.451*** (0.132)		0.453*** (0.157)		-0.00644 (0.00667)	
<i>Foreign debt x Depreciation (t+1)</i>	0.384*** (0.112)		0.286* (0.168)		-0.00260 (0.0112)	
<i>Foreign debt x Depreciation (t+2)</i>	0.214** (0.0906)		0.238** (0.119)		-0.00998 (0.0120)	
<i>Foreign debt x Post depreciation</i>		0.297*** (0.0867)		0.273** (0.118)		-0.00609 (0.00886)
Observations	4,100	4,101	3,934	3,934	3,145	3,146
R-squared	0.437	0.437	0.416	0.415	0.761	0.761
INDUSTRY FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Note: This table presents the coefficients estimates from the regression (2a) and (2b) presented in section 3. *Foreign debt* is a dummy variable equal to one if the firm issue foreign debt. *Depreciation* is a dummy variable equal to one in the considerate years. *Post Depreciation* dummy variable is set equal to one in the year and the

two-following two years after the depreciation. All the variables (except dummy variables) are winsorized at 1% level. As time-varying control variable the producer-price inflation is considered. Each of the specifications includes firm fixed effects and industry fixed effect. Industry is classified using the two-digit SIC-codes. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimates are significant at 1%, 5% or 10% level, respectively.

The estimated coefficients of the dependent variable *fixed assets growth* presented in columns (1a) and (1b), indicate that firms issuing foreign debt increased their fixed assets 29,7% more than local firms without foreign debt, in the first depreciation episode identified (2009), contradicting the initial hypothesis.

Looking into the coefficients presented in column (3a), local firms that do not issue foreign debt, increase their sales on average by 30.9% in the year of the shock, and by 31.6% in the year following the depreciation episode. Lastly, the interaction coefficient, *post depreciation x foreign debt* presented in column (4b), indicates a positive and significant sales growth (27.3%) for firms that issued foreign debt, compared to the ones that do not. Such results diverge from what is expected. Galindo *et al.* (2003) reported that devaluations can have a contractionary impact in firms with heavy liabilities denominated in foreign currency, as showed in the study, and firms that do not have foreign currency debt, experience an increase in growths values. In a period of currency depreciation, firms with outstanding foreign debt are especially constrained since the debt of firms issued at the foreign currency increases. Hence, firms that issue foreign debt are expected to perform worse when compared to local competitors without foreign debt.

Looking to the coefficients related to the investment responses, measured by the CAPEX, they are not statistically significant values to analyze. The coefficients resulted from the related regressions are presented in column (5a) and (6b) of table 8.

Table 9: Response of Local Firms that Issue Foreign Debt to a Currency Crisis of 2016

<i>Dependent variable (Model 4, t=2016)</i>	<i>Assets growth</i>		<i>Sales growth</i>		<i>CAPEX</i>	
	(1a)	(2b)	(3a)	(4b)	(5a)	(6b)
<i>Constant</i>	10.30*** (0.458)	10.26*** (0.452)	10.43*** (0.600)	10.17*** (0.575)	-0.636*** (0.0712)	0.603*** (0.0314)
<i>Depreciation (t-1)</i>	0.0716* (0.0420)		0.165** (0.0644)		0.00882 (0.0139)	
<i>Depreciation (t)</i>	0.182*** (0.0645)		0.272*** (0.0675)		0.0416*** (0.0119)	
<i>Depreciation (t+1)</i>	0.130* (0.0747)		0.336*** (0.0792)		0.00384 (0.0110)	
<i>Post depreciation</i>		0.143** (0.0597)		0.258*** (0.0577)		0.0115*** (0.00371)
<i>Foreign debt x Depreciation (t-1)</i>	-0.302*** (0.0941)		-0.398*** (0.113)		-0.00309 (0.0116)	
<i>Foreign debt x Depreciation (t)</i>	-0.279** (0.139)		-0.348** (0.166)		-0.0293** (0.0125)	
<i>Foreign debt x Depreciation (t+1)</i>	-0.251 (0.162)		-0.395** (0.184)		-0.00757 (0.0123)	
<i>Foreign debt* Post depreciation</i>		-0.224* (0.135)		-0.317** (0.159)		-0.0100* (0.00539)
<i>Observations</i>	4,100	4,100	3,934	3,934	3,145	3,145
<i>R-squared</i>	0.437	0.437	0.416	0.416	0.762	0.761
INDUSTRY FE	YES	YES	YES	YES	YES	YES
FIRM FE	YES	YES	YES	YES	YES	YES

Note: This table presents the coefficients estimates from the regression (2a) and (2b) presented in section 3. *Foreign debt* is a dummy variable equal to one if the firm issue foreign debt. Depreciation is a dummy variable equal to one in the considerate years. *Post Depreciation* dummy variable is set equal to one in the year and the two-following two years after the depreciation. All the variables (except dummy variables) are winsorized at 1% level. As time-varying control variable the producer-price inflation is considered. Each of the specifications includes firm fixed effects and industry fixed effect. Industry is classified using the two-digit SIC-codes. T-statistics are in parentheses. ***, ** or * indicates that the coefficient estimates are significant at 1%, 5% or 10% level, respectively.

Concerning the second depreciation episode, the results are in agreement with the initial hypothesis. Firms that issue foreign debt decreased their fixed assets approximately 22,4% more, comparatively to local firms that did not issue debt in foreign currency, as present in column (2b). Local firms with foreign debt increase their fixed assets, on average by 18.2% in the year of the depreciation and by 13% in the year following the episode (column 2a).

By assessing the *depreciation* coefficients presented in column (3a), local firms that not issue foreign debt increase their sales, on average by, 27.2% in the year of the depreciation and by 33.6% in the year following the shock. Additionally, regarding the coefficients in column (4b), sales of local firms without foreign debt increased approximately 25,8%, after the depreciation episode in 2016. Analyzing the interaction coefficients, firms that issue foreign debt decrease their sales by 31.7% more than local firms that not issue foreign debt. Therefore, these results are in line with what has been described: firms with foreign debt increase their liabilities in a depreciation period, registering a worse performance. However, these results might not be directly caused by the depreciation episode registered in the previous year, but instead, it could have been caused by the political crisis, associated with the Brexit announcement, which in turn will penalize the firms' investment.

Related to the impact of the depreciation on the investment, firms with no foreign debt experienced increase their investment on average by 4.16% in the year of the shock. In turn, looking to the coefficient of the interaction terms, *Foreign debt x Post depreciation* present in column (6b), firms with foreign debt reduce their investment approximately by 1% comparing to firms that did not issue debt in foreign currency.

It is important to mention that these coefficients might not be statistically significant due to the reduced sample herein analyzed. This comes as a result of the necessity to match data from different databases through the three-digit ticker code indicator, which only included publicly traded companies, resulting in a reduction of the available sample.

6. Conclusion

This dissertation is focused on two main issues: the first one, by replicating Desai *et al.* (2008), aims at comparing the impact of a currency depreciation on firms, whether they are subsidiaries or local companies; the second issue intends to assess if firms that issue foreign debt respond differently to a currency depreciation crisis. To answer these assumptions, I analyzed a sample of 3,721 UK local firms and 10,476 subsidiaries firms based in the UK with their relative headquarter firm based in EU and US, over the time period 2008 to 2017. During the scrutinized period, a sterling pound depreciation in relation to euro and dollars is registered in two years: 2009 and 2016.

For the first episode, the results supported the theoretical predictions, multinational affiliates expand assets and investment during and after depreciation, more than local competitors. This data suggests that the internal capital markets of multinational companies help their relative subsidiaries to take advantages of the investment opportunity mitigating the financial constraints caused by the depreciation. However, regarding 2016, the second depreciation year identified, the results diverged from the initial hypothesis. Multinationals affiliates showed a reduction in each of the proxies of operating activity acknowledged in this study, during and after the second depreciation episode. This differential response might be justified by the second shock being associated to political reasons, as Brexit, which might have reduced the incentives from the parent company to invest in the United Kingdom. Furthermore, the second depreciation episode is characterized by a decrease of approximately 15%. This is considered a minor decline when compared to the approximate 30% decrease registered in the first identified episode, which might justify the disparity between the expected and the actual response.

The revised literature suggests that the internal capital markets of multinational firms help their relative subsidiaries to mitigate the financial constraints, as well the potential debt burden increments due to the shock. To test if the outstanding foreign debt has impact on the firm's response during a depreciation episode, the second question addressed in this study, assessing only local firms, compares the differential responses on whether the firm issues foreign debt or not. Since, in a depreciation period the foreign debt will appreciate firms' liabilities, local firms are expected to have a worse performance. Regarding the first depreciation episode, 2009, the results showed the opposite of the initial predictions. Firms that issue foreign debt presented a greater performance when compared

to local competitors without foreign debt. However, the obtained results from the second depreciation episode, 2016, are in line with what was anticipated. Firms issuing foreign debt registered a worse performance before and following the currency crisis, concerning sales, assets and investment growth.

The results provided in this dissertation are informative for firms' managers when they need to take decision on financial structure. Depending on the amount of debt and foreign debt, financing might have a positive or negative impact on the firm's performance, accordingly to the current situation of the country. This study provides a perception, not only for corporate risk managers but also for investors with an international portfolio, who could combine these results to improve the portfolio performance and take advantages of several hedging strategies.

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