Bachelor Thesis: Economics and Business Economics 2015-2018

Title: The effect of the exchange rate fluctuations on the volume of cross-border M&A activity

Abstract:

This thesis investigates the effects of exchange rates on the volume of M&A activity between the US acquirers and target companies from the OECD countries. The impact of the appreciation of the US dollar on the subsample of deals between 1993 and 2017 was investigated. It is concluded that along with other determinants of cross-border M&A such as relative GDP per capita, market capitalization, taxes on goods and services and distance, language and legal system differences between the acquirer and target countries, real exchange rates have a significant effect on the number of M&A. However, when the effect of exchange rates was examined for the deals with different payment methods, it is observed that the appreciation of the real exchange rates of the target country has a significantly negative effect on the number of stock financed deals. In addition, when the value of the target currency appreciates against US dollars, although insignificantly, the number of deals paid in cash increases as well. Furthermore, there was not any significant difference between the coefficients of real exchange rates for the deals in low and high R&D industries, as opposed to the previous studies.

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1. Introduction

Mergers and acquisitions have become increasingly popular in the last decades, as the globalization is taking place with large firms trying to expand their business overseas to gain quick access to new markets (Rappaport & Sirower, 1999). More and more businesses merge with companies beyond their national borders and purchase foreign assets, which in turn, leads to enhanced economic and political conditions, and the strengthened cultural bonds between nations. Although foreign direct investment in general and its determinants have recently been the focus of financial literature, very few research has been done on the specific types of FDI, such as greenfield investments, cross-border mergers and acquisitions and joint ventures (Moosa, 1998). This paper will focus on the cheapest form of FDI – the cross-border mergers and acquisitions, and analyze the effect of exchange rate fluctuations in determining the M&A decision of the companies.

Several economists have tried to find links between exchange rates and the FDI in the past, but it has led to mixed results. One of the main commonsensical views in favor of the relationship between the two variables relies on the idea of treating FDI as the exports of a country (Agarwal, 1980). This view suggests that, if the currency of the country appreciates, then it makes the domestic assets seem more expensive and foreign assets seem relatively cheaper. Therefore, as the country is at a "comparative disadvantage", instead of exporting its goods, it can purchase the assets of the target country, thus, becoming an acquirer. In light of this argument, Georgopoulos (2008) and Sharma (2016) also agree that during the times of appreciated domestic currency in the country, large volumes of cross-border M&A activity is observable.

In contrast, several economists argue against the relationship between currency appreciation and the M&A flows from the country. For instance, Fransson (2010) tests the effect of currency devaluation on cross-border deals in several countries during the period from 1999 to 2009. He fails to establish a link between these variables for the companies in the US and Sweden but still finds a significant relationship in the Euro area and the UK. Also, a few other researchers such as Stevens (1993) could not obtain a significant relationship between the rate of exchange and capital outflows of the country. The debatability of this topic makes this research even more intriguing and challenging.

The main focus of this research is the cross-border M&A from the U.S. between 1993 and 2017. This is the time interval that covers the fifth M&A wave and onwards. The fifth wave of the M&A is particularly interesting because this is the period where the foreign investors started to acquire large U.S. firms, and the international takeovers of companies became known as "cross-border M&A" (Nouwen, 2011). The fifth wave of M&A also includes the biggest merger deals in history, which makes it interesting to explore. To view the effects of exchange rate on M&A activity throughout the years and across countries, panel data is used. The selected sample of data covers the M&A deals between the U.S. and 34 OECD member countries from all over the world to better capture the relevancy of the exchange rate effect on a broad scale.

Thus, the research question is formulated as follows: "*How do the variations in the relative exchange rate of the U.S dollar affect the volume of cross-border M&A deals from the U.S.?"*

Despite the extent of the research on the FDI and the determinants of M&A, almost none of the previous works looks into the effects of exchange rates on the acquirer company's decision of payment method to finance the deals. The two most popular methods of financing M&A are cash payment and exchanging the stocks with the target company (Loughran&Vijh, 1997). This paper compares the effect of exchange rate on the number of deals financed by these two methods. It was expected that since the cash is directly affected by changes in the exchange rates, bidding companies would refuse to finance the merger by cash when the target country's currency appreciates.

Moreover, to explore this relationship in more detail, the effect of exchange rates was also analyzed on the number of deals in low and high R&D industries, similar to Blonigen's previous study on Japanese and US mergers. Blonigen (1997) investigates the currency effects on the volume of FDI and concludes that the relationship between the two variables is only positive for high-intensity R&D industries. The author explains this result by suggesting that the high R&D intensive industries are more capital intensive, therefore, more likely to be influenced by the exchange rate fluctuations than low R&D industries. This is also in line with Froot and Stein's findings (1991). As the former literature exploring this particular subject is limited and predominantly outdated, this thesis further investigates Blonigen's ideas and looks into the effects of exchange rates on the cross-border M&A in different R&D intensive industries using the most recent data.

The findings of this paper revealed that along with the other determinants of cross-border M&A such as relative GDP per capita, market capitalization, taxes on goods and services and distance, language and legal system differences between acquirer and target countries, the real exchange rates have a significant effect on the number of cross-border M&A. Also, it is concluded that the effect of the appreciation of the real exchange rates of the target country reduces the number of stock-financed deals as opposed to the initial expectations. Furthermore, in contrast to Blonigen's findings, there was not a significant difference between the coefficients of the real exchange rate for the volume of deals in low and high R&D intensive industries. The theoretical framework section will discuss these theories in detail, including the literature review of some previous similar studies on this subject.

The remainder of the paper is organized as follows. Section 3 covers the sources of data, a detailed explanation of the chosen variables and the descriptive statistics. Section 4 describes the scientific methodology conducted on the data, including the description of the mathematical model. Section 5 will report and discuss the results of the paper and finally, Section 6 will conclude.

2. Theoretical Framework

The following section discusses the previous literature on the relationship between the exchange rates and the M&A inflows. Later, the hypotheses, as well as the reasoning and motivation behind the hypotheses are explained.

2.1. Literature review:

Up until the last decade, a number of researchers have sought to investigate the factors affecting cross-border M&As and M&A in general. Among them, Erel, Liao, and Weisbach (2012) analyze the role of valuation, geographical distance and quality of accounting disclosure in determining the cross-border deals. The economists analyzed the data from 56,978 cross-border M&A deals in the period from 1990 to 2007 and concluded that the valuation has a significant role in the foreign companies' decision to merge. Throughout their research, they refer to three types of valuation differences between firms that lead to cross-border M&A: increase in the value of the stock market between countries, increase in the value of the country's currency, and the difference between the firm's market-to-book value. Using monthly, country-level real exchange rate data, the authors find that fluctuations in currency levels

between countries are an essential element influencing cross-border mergers. Scientific results of their research suggest that the relative difference between the acquirer and target countries' exchange rates are 1.12%, 2.13%, and 3.43% in the first, second and third years prior to the deal (Erel, et al., 2012). After restricting their sample to observe firm-level returns, they still find a similar pattern in exchange rates prior to the M&A. Their findings also suggest that differences in the currency rates and the stock market value between countries can be used to predict the level of cross-border M&A.

Similarly, other authors have also tried to associate foreign acquisitions of the domestic firms with the exchange rate. Agarwal (1980) and Horst (1972) suggest a different perspective on the issue. They compare the effect of currency appreciation on cross-border M&A to its effect on a country's trade of goods. As mentioned earlier, Agarwal (1980) compares the logic behind that opposite relationship between the country's currency value and the exports, to the link between exchange rates and FDI. According to the researcher, a lower relative value of currency makes the host country's assets more favorable to the foreign acquirers and bidders, therefore, making the country a "source of FDI" (Sharma, 2016). As the cross-border M&A is just one of the types of FDI, this view can be easily applicable to the mergers of different international firms. This approach is quite similar to the valuation hypothesis of Erel, et al. (2012), which states that the variations in the relative valuation of assets can be a major factor influencing mergers. This view is also consistent with Kindleberger's (1969) observations and implies that once the currency of the country in which a local firm operates, depreciates, it makes the relative cost of capital of acquiring seem cheaper for foreign companies. This, in return, motivates the cross-border acquisitions between these country pairs.

Despite the extent of research in favor of exchange rates' association with cross-border M&A, more recently, literature has emerged that has challenged the traditional view. Researchers such as Stevens (1993) show that the relationship between the value of the domestic currency and foreign investments is insignificant for the period of 1973-1988, which is inconsistent with Froot and Stein's (1991) findings for the same interval. In contrast to earlier findings, Fransson (2010), Kosteletou and Liargovas (2000) have also found little to no evidence of any relationship between the two variables.

Fransson (2010) analyzed data from 8,435 domestic and cross-border deals in and between Sweden, the UK, the US, and the Euro area during 1999 and 2009. His findings suggest

a mixed indication of correlation between currency levels and foreign acquisitions. As opposed to the previous literature, he finds, surprisingly, a positive relationship between the two variables in the U.S and Sweden. In other words, the author finds that during the severe depreciation periods in the U.S, the volume of foreign acquisitions in the U.S have declined. He finds somewhat similar evidence for Sweden as well, whereas, for Europe and the UK, there seems to be still a significant rise in the cross-border M&A volume due to the devaluation of the foreign currencies. However, one of the main weakness of Fransson's study is the time period used in his research. To be exact, the one-fifth of the data analyzed in his paper covers the latest financial crisis period of 2008-2009, which might be the reason for a severe decline in the cross-border M&A during depreciation of U.S dollar, as the foreign investors' expectations were severely fallen during the period.

The main line of criticism on the previous literary works relies on the idea that as the domestic country's currency depreciates, the revenues and returns from all the assets in this country also declines, therefore, the seemingly cheaper prices of domestic assets do not benefit the potential foreign acquirers (Froot & Stein, 1991; Georgopoulos, 2008). This view argues that foreign investors cannot take advantage of the relatively weaker currency. Blonigen (1997) has responded back to criticisms by explaining the effect of exchange rates on cross-border M&A involving only transferable assets. The author suggested that the transferable assets can generate revenues in other currencies as well, therefore, making these assets attractive to foreigners during the periods of depreciation.

Georgopoulos (2008) further investigates Blonigen's hypothesis and conducts research on the cross-border M&A data between Canada and the U.S. during 1985-2001. He finds significant evidence that a decline in the currency of the Canadian dollar, causes more U.S. companies to acquire/merge with the Canadian local firms in the high R&D intensive industries such as technology and healthcare.

Other empirical works have focused on the effect of exchange rate expectations on the probability of foreign investments. Chakrabarti and Scholnick (2002) studied the data on the FDI flows from the U.S to other OECD countries, and found a relationship between the expectations in the currency levels and the probability of foreign investments. Bianco and Loan (2017) - who confirmed the negative relationship between the volatility of the exchange rate and the volume of cross-border deals, have obtained similar results.

2.2 Hypotheses:

Although various research have been conducted on the subject, the majority of them have limitations in terms of outdated data and the restricted number of countries investigated. Also, none of the papers distinguishes between the effects of currency levels on the number of mergers with different financing methods. As pointed out earlier in Fischer's (2017) article, the international mergers and acquisitions are funded mainly by two methods: stock and cash payments. He also finds that the company's long run post M&A returns are higher for all-cash deals than the all-stock financed deals, which is also in line with Loughran and Vijh's (1997) findings. As the payment method of mergers plays an important role in determining the long run profits of the company, it is an important decision for managers to decide the way they want to finance the cross-border M&As. To fill in the gap of knowledge in this field, this paper will investigate the exchange rate effects in deals paid in fully-cash and those financed with stocks and other securities. Since cash payments are directly affected by depreciation in the domestic currency, it is expected that, when the USD depreciates, managers of the acquirer companies are more likely to finance the cross-border deal with stocks and others forms of securities rather than with only cash. Hence, the first two hypotheses are formulated as follows:

H_A: *The appreciation of US dollar relative to other currencies causes a significant increase in the number of mergers by U.S. acquirer firms.*

H_B: *The appreciation of the target currency levels will decrease the volume of cash financed deals rather than stock financed deals.*

Furthermore, to examine the effects of real exchange rates on the industry level, I compare the effect of currency appreciation on the number of deals in high R&D intensive and low R&D intensive industries similar to Blonigen's study. Blonigen (1997) finds a significant increase in the US-Japanese mergers in industries with high R&D spending during the appreciation of the US dollar. Thus, to investigate the applicability of this relationship for the cross-border deals in recent decades and for the US-OECD mergers, the third and the final hypothesis of this paper is formulated as follows:

H_C: *The change in the exchange rate will affect number of mergers in high R&D intensive industries more severely than the number of deals in low R&D industries.*

Last but foremost, there are also many other variables that affect the decision of companies to merge internationally. To obtain more accurate results, additional important determinants of the cross-border M&A were also included in the analysis. Literature available on mergers and acquisitions lists the cheap foreign labor, opportunity to gain quick access to foreign markets, desirable location, size of the company, legal and taxation differences between countries as some of the motivations for M&A across nations (Bertrand et al, 2007).

The different legal systems of countries have been suggested to be one of the driving characteristics of cross-border M&As. Several researchers, including La Porta et al. (2000) conducted several studies on the cross-border M&As in the past. It's been concluded that, whether a country has a civil or a common law system have important consequences for M&A decisions of the acquirer. La Porta et al. (2000) argue that countries, which have a common legal system, have a better investor protection, which is in line with Rossi and Volpin's (2004) findings. Rossi and Volphin suggest that the probability of M&A in target countries with a civil law system is lower, because of the less investor protection and fewer business opportunities. Therefore, I include a dummy variable for the legal system of the target countries, to capture this effect on the cross-border M&A.

Erel, Liao, and Weisbach (2012) find a significant relationship between the relative wealth of the acquirer and target countries and the volume of M&A deals between them. The authors use GDP per capita of each country and conclude that the companies in wealthier countries are more likely to involve in mergers with those in less wealthy countries. Their finding is also in line with Froot and Stein's (1991) wealth-effect results.

Moreover, Ahern et al (2015) investigate the role of culture in M&A deals between countries. The authors take cultural and geographical distance as an explanatory variable in determining the volume of cross-border M&A activity. They find a negative relationship between the distance between the two countries and the volume of cross-border M&A. It is concluded that the countries that share the same cultural values, the same language and share the common borders are more likely to engage in M&A with each other than those that are located far from each other, and do not share any common cultural values or speak different languages.

Previous research has also found the effect of taxation differences between the acquirer and target countries having significant effects on cross-border deals. Arulampalam, Devereuxa, and Liberini (2010) conclude that the companies in target countries are more likely to be

acquired by bidder firms in countries with relatively higher levels of taxes. They suggest that the acquirer firms seek to shift their profits from the "home jurisdiction" (Arulampalam et al, 2010). Thus, the taxation levels of each of the target countries have also been included in this research.

The next section of this thesis, discuss the data and descriptive statistics associated with the research, including the detailed explanation of the dependent and explanatory variables. The methodology, results, and discussion of the results will follow later.

3. Data

The paper analyzes the data including 18016 cross-border deals between the U.S acquirers and target companies from 34 OECD member countries. The panel data covers the period starting from the Fifth M&A waves from January 1993 until December 2017.

3.1. Dependent variable:

The dependent variable in this research is the count of mergers and acquisition deals between acquirer and target countries, which takes non-negative integer values. The sample includes the total number of 18016 completed mergers and acquisitions deals between 34 target countries and the US acquirers. The data is selected from SDC Financial Database and covers the period between January 1993 and December 2017.

Because the given panel data contains both time and cross-section variables, the data is sorted and grouped by target countries and years. The total deals variable is calculated as the sum of number of deals in each year for each country. The descriptive statistics displaying the mean, standard deviation and the numbers of deals by countries is listed in Table A of Appendix. The maximum number of deals is 259, meaning that the maximum deals by one country in one year was 259 deals, and the minimum deal number - 0, shows that some countries engaged in no M&A deals with the US in some years. The standard deviation of observations is 40.42 which shows that the data on total deals is widely spread and varies by different countries and years.

The total number of deals by countries over in the last 25 years is illustrated by the histogram in Figure 1. As observed from the chart, the UK and Canada have the most number of M&A deals with the US. In other words, American firms have acquired/merged with 4087 Canadian and 4042 British companies since 1993, which accounts for approximately 22.4% and 22.7% of the total M&As respectively. Also, Australia, Germany, and France also seem to have

engaged in many deals with the US companies over the past decades, the total number of deals between the given countries are 1174, 1614 and 1130 accordingly. The least number of deals was for Slovenia, which was only 5 deals over the period of 25 years.

Figure 1. Histogram displaying the number of cross-border M&A between the US and target countries

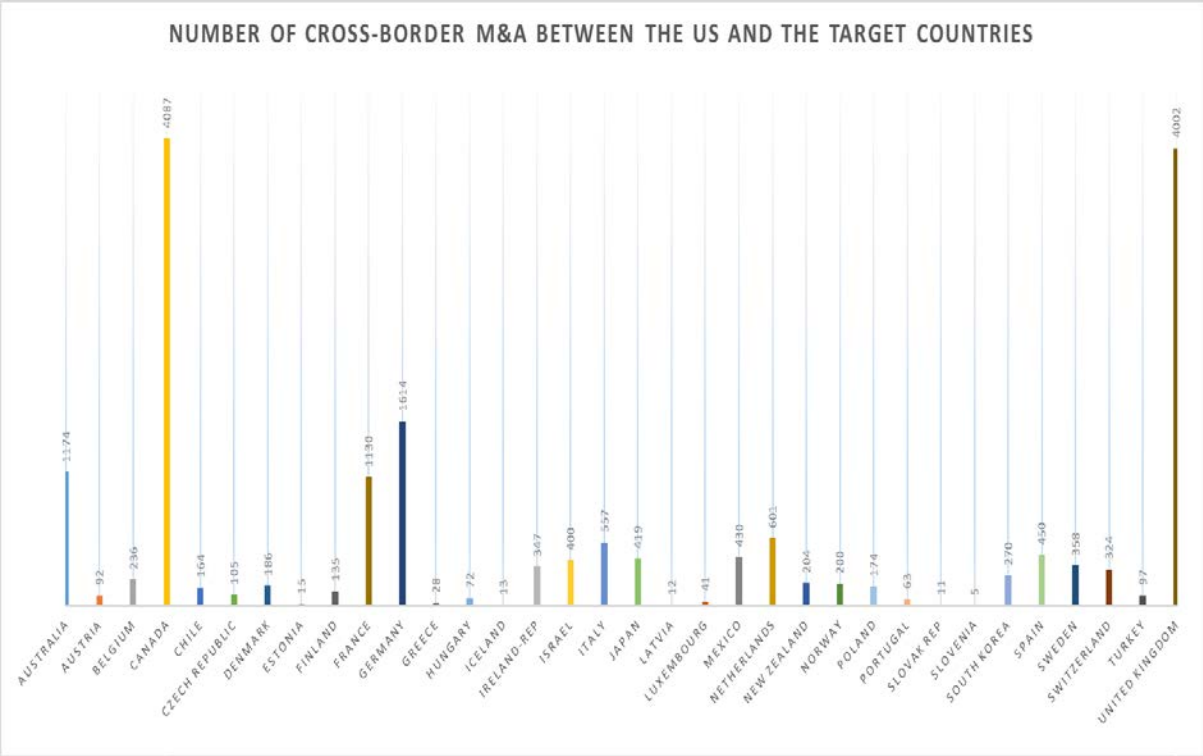

Figure 2. Histogram displaying the number of total cross-border deals from the US from 1993 to 2017

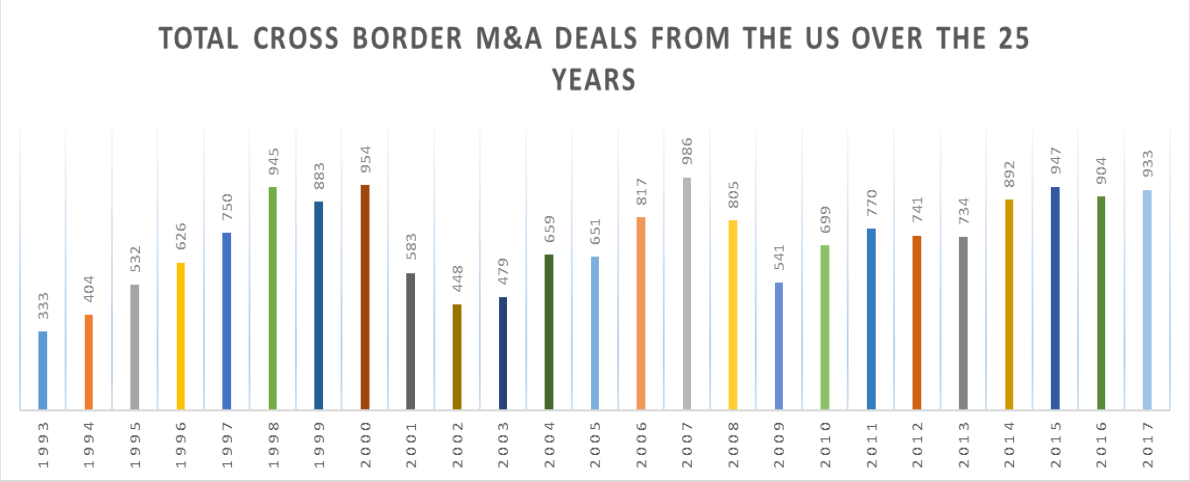

Figure 2 illustrates the total number of M&A deals the US acquirer companies has engaged with each year since 1993. The chart shows that the US acquirer firms purchased the most number of foreign firms in 2007, which is the year before the recent financial crisis, when the companies were quite optimistic about the future, without realizing the bubble in the economy. In addition, it's possible to see an increasing trend of M&A deals from 1993 to 2000, which is the period of Fifth M&A wave, where the biggest and largest mergers have occurred (Nouwen, 2011).

3.2 Independent variables:

The main independent variable of this thesis is the real exchange rates (RXR) of 34 countries calculated based on the relative consumer prices as shown below :

$$\text{Real Exchange Rate}_{(domestic/foreign)} = \text{Nominal Exchange Rate}_{(domestic/foreign)} \times (CPI_{foreign} / CPI_{domestic})$$

Both the nominal exchange rates and Consumer Price Indices[1] for acquirer US and target countries have been extracted from the OECD Statistical Bureau (2018). An increase in the real exchange rate variable *RXR* denotes an appreciation of the target country's currency against the U.S. dollar.

To restrict the omitted variables bias, several macroeconomic and financial factors that might influence cross-border M&A are also included in the regression as independent variables. The list with the name of the variables and their explanations are given in Table 1 below:

Table 1. Explanation of the independent variables of the regression

Variable Names	Explanations
RXR	real exchange rates
LOG_TAXES_GS	logarithm of taxes on goods and services in the target countries
LOG_TAXES_CORP	logarithm of corporate taxes in the target countries
LOG_US_MARK_CAP	logarithm of stock market capitalization of the acquirer country
LOG_RELATIVE_GDPCAPITA	logarithm of relative GDP per capita of target country versus the acquirer country,
LOG_RELATIVE_INFLATION	logarithm of relative inflation levels target country and acquirer country
LOG_DISTANCE	logarithm of distance in kilometers between target and acquirer
BF_RANK	Business friendliness of target country (lowest number indicating the most business friendly)
CIVIL	Dummy variable denoting 1 if the target country has civil law and 0 if it has common law
ENGLISH	Dummy variable denoting 1 if the target country has English as at least one of its official languages

[1] CPI indices are calculated based on 2010=100 Index. (OECD, 2018)

The data on taxes on goods and services has been collected from the OECD (2018) database, and are indicated as a percentage of total GDP for each country. This covers all the value-added and sales taxes.

Another tax variable *LOG_TAXES_CORP* indicates the logarithm of the percentage of taxes on the companies' net profits and capital gains (OECD, 2018). Additional macroeconomic variables include the logarithm of relative GDP per capita and the logarithm of relative inflation levels of target and acquirer countries labeled as *LOG_RELATIVE_GDPCAPITA* and *LOG_RELATIVE_INFLATION* respectively. The data on both variables have been collected from OECD statistical bureau (2018). The GDP per capita for each country is measured in US dollars and Inflation levels are measured in terms of annual growth rate using Consumer Price Index 2010 as a base year. Thereafter, the relative values were calculated by dividing the GDP (Inflation) of target country by the GDP(Inflation) of acquirer country.

Financial explanatory variable included in this analysis is the market capitalization of the listed companies in the acquirer country and has been retrieved from the World Federal Exchanges (The World Bank, 2018) database. Market capitalization is calculated by multiplying the share prices by the number of shares for the listed US companies[2]. The data is given in US dollars.

As discussed in the previous literature, geographical distance between countries are also one of the main factors affecting the international merger decisions of the companies. Therefore, I included another variable *LOG_DISTANCE* – a logarithm of air distance (in kms) between the acquirer and target countries based on the GPS coordinates - longitude and latitudes. The data on the distance between the U.S. and 34 target countries are listed in Table E of Appendix along with the other country-specific characteristics of the OECD member countries.

Another important variable in the analysis is the ease of doing business index/business friendliness index - indicated as variable *BF_RANK*. The variable is based on a 2017 survey that ranks the countries based on ten indicators covered in World Banks Doing Business: Starting a business, Dealing with Construction Permits, Getting Electricity, Registering Property, Getting Credit, Protecting Minority Investors, Paying Taxes, Trading Across Borders, Enforcing Contracts and Resolving Insolvency (Doing Business Project, 2018). The index is calculated by

[2] Investment funds, unit trusts, and companies whose only business goal is to hold shares of other listed companies are excluded

taking averages of rankings of these indicators. Lowest number in ranking shows that the country that has the most suitable regulatory environment for business and the highest number indicates the least convenient place for business operation. The original list of countries are ranked from 1 to 190, and as this research only concerns 34 target countries, they have been ranked using the original rankings from 1 to 34. Table E displays the ranking of the countries. The data on ease of doing business index is retrieved from the World Bank Group.

Moreover, several control variables are added into the data, including common language and legal system variables. In this analysis, six countries have the common law system, and the rest has either mixed or civil law system, five countries have English as at least one of their official languages. The data on the legal system and language variables are obtained from "The World Factbook" of the Central Intelligence Agency. To control for the different country-specific characteristics, dummy variables for each of the mentioned factors are created. The individual dummies such as *ENGLISH*, *CIVIL* denote whether the target company is from an English speaking country, or from a country with the common law system, denoted as 1 and 0 otherwise. The sources of the country-specific characteristics and explanatory variables are listed in Table C of Appendix.

Furthermore, to see the difference in exchange effects on the cash financed deals, the original data is divided into two subsections: a number of deals paid fully in cash amount, and the deals that were paid with stocks and other securities, indicated as non-cash deals. For the third hypothesis, the data is divided into - mergers in high R&D intensive industries and low R&D intensive industries, similar to Blonigen's analysis (1997). The sum of the cross-border M&A deals in industrials, high technology, and health industries is included in the high R&D intensity group and the rest of the macro-industries were grouped into low industry group based on the 2016 statistics of EU Scoreboard (2016).

Table D of Appendix illustrates the summary of some important characteristics of the data on total deals. It can be observed that cash financed deals only account for the 17% of the total deals, while the remaining 83% of the deals are financed by stocks, leveraged buyouts, and other securities. In contrast, the number of deals is distributed approximately evenly by low and high R&D intensity industries. More specifically, the deals in low R&D industries cover 53% of the total deals and the remaining 47% of the deals are involved in the high R&D industries.

Last but not the least, to see the possible relationship between the independent variables, a correlation matrix is derived as displayed in Table 2.

Table 2. Correlation matrix of the independent variables

	LOG RXR	*BF RANK*	*LOG DISTANCE*	*LOG US MARKET CAP.*	*LOG RELATIVE GDP*	*LOG RELATIVE INFLATION*	*TAXES CORP*	*TAXES GOODS& SERVICES*	*ENGLISH*	*CIVIL*
LOG_RXR	1.000									
BF_RANK	0.010	1.000								
LOG_DISTANCE	0.050	-0.015	1.000							
LOG_US_MATKETCAP	-0.005	-0.008	-0.046	1.000						
LOG_RELATIVE_GDP	-0.307	-0.204	-0.037	0.081	1.000					
LOG_RELATIVE_INFLATIC	0.140	0.178	0.026	-0.093	-0.316	1.000				
TAXES_CORP	0.020	-0.121	0.111	0.165	0.367	-0.111	1.000			
TAXES_GS	-0.038	-0.123	0.203	-0.004	-0.097	0.046	-0.136	1.000		
ENGLISH	-0.231	-0.442	-0.099	-0.004	0.192	-0.051	0.255	-0.176	1.000	
CIVIL	0.212	0.333	0.033	-0.003	-0.180	0.048	-0.257	0.137	-0.914	1.000

As observed from the table, the correlation between the explanatory variables is low to moderate, except for the civil and English dummy variables. This is because countries used in this research are mostly civil law countries and those who have English as at least one of their official language has common law system as a result of the historical influence of the British.

4. Methodology

The aim of this thesis is to analyze the potential relationship between the real exchange rates and the total number of cross-border M&A deals. As mentioned earlier, the main independent variable of this research is the real exchange rates, calculated based on CPI of each target country, to be able to capture the inflation differences within target countries and the acquirer country. The nominal exchange rates only state the average exchange rates of the foreign currency relative to the USD. Since this research is more interested in capturing the real price differences of assets, the relative inflation levels of the countries, inflation-adjusted real exchange rates were used.

To evaluate the relationship between the number of total deals variable and the real exchange rates, multivariate regression has been obtained. Since the data contains both time variables and country variables, the Wald test is used to test whether there is a need to add fixed

effects into regression models (University of Wisconsin, 2016). The results of the Wald test is given in Appendix Table B. According to Wald test, the null hypothesis that the year and target parameters are equal to zero is rejected, meaning that there is a need for fixed dummies for both time effects and cross-section variables. Therefore, fixed dummy variables for time and target countries have been included in the regression.

As the original model lacks the linearity, and because of very large values of some explanatory variables, I converted independent variables to logged values to reduce the non-linearity of the model. Therefore, final linear-log regression model is plotted as follows:

$$\text{Total_Deals} = \alpha + \beta_1 \log(\text{RXR})_{i,t} + \beta_2 \log(\text{Relative_GDPcapita})_{i,t} + \beta_3 \log(\text{US_Marketcap})_t +$$

$$+ \beta_4 \log(\text{Relative_inflation})_{i,t} + \beta_5 \log(\text{Distance})_{i,} + \beta_6 \log(\text{Taxes_GS})_{i,t} +$$

$$+ \beta_7 \log(\text{Taxes_Corp})_{i,t} + \beta_8 \text{BF_rank}_i + \beta_9 \text{Civil}_{i,t} + \beta_{10} \text{English}_{i,t} + u_i + u_t + \varepsilon_{it}$$

The model contains α - the intercept, the dummies for time fixed-effects - u_t, the dummies for target country fixed effects - u_i, and the ε_{it} represents the error term.

To test the second and the third hypotheses, the additional regression models were obtained – the dependent variables for each model are given as follows: (a) the number of deals financed by cash, (b) the number of deals financed by stocks and other securities, (c) total number of deals within high R&D intensive industries and (d) total number of deals within low R&D intensive industries. The independent variables used for these regressions are the same as the previous one.

5. Results

This section of the paper discusses the obtained results from the regression analysis and gives potential explanations for the (in) significance of the coefficients of included variables.

5.1.The discussion of explanatory variables of the regression

Table 3 displays the multivariate regression results for both full sample of total deals and for the deals paid in cash and those paid in stocks and securities. To reduce the potential heteroscedasticity effects, robust standard errors were obtained. Firstly, it is possible to see significant coefficients for all the explanatory variables except for *LOG_TAXES_CORP* and

LOG_RELATIVE_INFLATION, that is, corporate taxes and relative inflation levels of the target and the acquirer countries respectively.

Table 3. Regression results including the total number of M&A deals, M&A deals paid in cash and M&A deals paid in stocks and other securities.

	Full Sample		Cash-financed deals		Non-cash financed deals	
VARIABLES	Coefficients	Std. Errors	Coefficients	Std.Errors	Coefficients	Std.Errors
LOG_RXR	-10.04**	(4.915)	1.651	(1.368)	-11.55***	(4.371)
LOG_DISTANCE	-146.0***	(14.85)	-21.47***	(2.907)	-124.4***	(13.31)
LOG_US_MARK_CAP	14.92***	(3.899)	1.916**	(0.786)	13.06***	(3.414)
LOG_RELATIVE_GDPCAPITA	-19.59***	(5.044)	-1.316	(1.123)	-18.51***	(4.566)
LOG_RELATIVE_INFLATION	0.435	(0.320)	-0.0467	(0.0766)	0.476	(0.300)
LOG_TAXES_CORP	0.924	(1.768)	-0.0869	(0.360)	0.967	(1.510)
LOG_TAXES_GS	-17.38***	(6.165)	-0.773	(1.454)	-16.69***	(5.257)
BF_RANK	1.680**	(0.668)	0.198	(0.152)	1.447**	(0.593)
CIVIL	-48.92***	(6.449)	-4.587***	(1.689)	-44.36***	(5.776)
ENGLISH	102.7***	(18.30)	18.58***	(4.027)	83.52***	(16.53)
Constant	916.3***	(170.7)	137.0***	(34.01)	777.4***	(150.8)
Observations	717		717		717	
Adjusted R-squared	0.897		0.828		0.888	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Business-friendliness rank of the target countries – the variable labeled as BF_RANK has a surprisingly positive coefficient of 1.680 at the 5% significance level. Business Friendliness Index, which is the ranking of the countries based on the selected indicators desirable conditions for business operation, seems to have a significant role in determining the country's choice of merger and acquisitions. As obtained from the regression results, the number of cross-border deals increase by approximately 1.680 units, when the Business Friendliness Index of the target country increases by one unit, that is when the target country is less business-friendly. These results are not in line with the commonsensical view that, the more business-friendly the country

is, the more M&As it attracts. A possible explanation for this could be the limited number of countries in the sample data. Another plausible interpretation of the result might be the fact that the Business Friendliness Index is only based on a survey, which might not always be an accurate source for the analysis.

In addition, another important determinant of the cross-border deals is the geographical distance between the target countries and the acquirer – the U.S. As shown in Table 3, the coefficient of the *LOG_DISTANCE* variable is -146.0 and is significant at the 1% level. This coefficient indicates that as the air distance to a given target country is higher by 1 percent, the number of cross-border M&A between the acquirer and the target decreases by approximately 146 units. This result is in line with the previous literature, and the findings of Ahern et al (2015), where the long distance between the countries discourages the managers to engage in cross-border deals. This might be due to the transaction costs of involving in the merger, as well as the difficulty of business operation in countries that are located further away from the US. Considering the fact that, the longer distance between the countries usually translates into differences in their business culture, this result is consistent with Ahern et al's (2015) view.

Moreover, as the previous research indicates, the situation in the acquirer country's stock market is also an important determinant of the cross-border M&A. Therefore, the included variable *LOG_US_MARKCAP* is taken as a proxy for how well the acquirer country's market is operating. As expected, the variable for the market capitalization of listed US companies shows a significantly positive effect on the cross-border M&A. The regression results of this paper show the coefficient of 14.92 at the 1% significance level, indicating that, as the percentage of market capitalization increases by 1% in the acquirer country, the U.S. companies engage in 14.92 units more cross-border deals. The observed result is not so surprising as the higher levels of market capitalization mean increased investor expectations, wealth and investment prospects for the acquirer country, thus, resulting in higher levels of M&A activity.

Negative *LOG_RELATIVE_GDPCAPITA* variable implies that as the target country's GDP per capita increases relative to the U.S., the volume of M&A transactions decreases significantly. This result is in line with Froot and Stein's view of higher wealth countries acquiring lower wealth countries. In their previous study, the economists suggest that a better relative wealth position of foreigners "allows them to bid more aggressively" for domestic assets

(Froot and Stein, 1991). In the case of the GDP per capita, the wealth effect applies in the context of investor expectations of the acquirer country. When the GDP levels rise in the US, resulting in higher GDP per capita, many companies and businesses try to expand their businesses overseas to gain more foreign assets and to improve their business relations with the foreign countries. The results of the regression show that the inverse of this relationship holds as well. More precisely, in the case of cross-border M&As from the US, the regression results indicate that as the GDP per capita of the target country increase by 1% relative to the acquirer's country, the number of M&A from the US decreases by 19.59 units.

Another important variable of this research is the taxes on goods and services as a percentage of GDP. As observed in Table 3, LOG_TAXES_GS variable plays a crucial role in determining the US acquirer's M&A decisions. In other words, as the percentage of taxes as a GDP of target country increase by 1%, the number of deals between these countries decrease substantially, by 17.38 units. This is because; acquirer companies see higher tax rates as an additional cost to the M&A transaction, and try to avoid paying high taxes as much as possible. Another explanation for this could be the higher regulatory conditions related to the increase in tax levels of the target community.

Further, the dummy variables for CIVIL and ENGLISH seem to influence the number of M&A between the target country and the U.S. As observed from the table, the *CIVIL* variable has a coefficient of -48.92, which indicates that when the target country has a civil law system the number of acquisitions from the U.S. decrease by approximately 49 units. This is not surprising since the common law countries demonstrate better investment opportunities and more market-oriented regulations, therefore making it a more attractive environment for mergers and acquisitions than the civil law countries (Lee, Staats & Biglaiser 2012). Also, the ENGLISH dummy variable is positively significant at the 1% level, that is, when the target country has the English language as at least one of its official languages, the number of cross-border M&A deals increase by approximately 102.7 units. This was also expected, as Ahern, Danielli, and Fracassi (2015) find that the acquirer companies show a higher return performance after engaging in a country with similar cultural values and the same language, therefore, are less likely to merge with companies in culturally distant countries. They explain this finding by the synergy effects of the merger, as the companies can build stronger relationships when there are no language barriers.

5.2 Discussion of the hypotheses:

As shown in Table 3, LOG_RXR for the full sample of deals has a significantly negative coefficient of -10.4. This result indicates that as the target country's exchange rate appreciates against the USD by 1%, the number of M&A by the US companies decreases by 10.4 units. This is in line with previous findings of Froot and Stein (1991), Georgopoulos (2008) and Sharma (2016). These results can be explained in several ways: firstly, as mentioned earlier, an increase in the value of target country's currency might make the valuation of the target assets more expensive for the US acquirers. This, in turn, leads to a lower number of deals between the US and the given country. Based on the results of the regression model, the first hypothesis of this thesis cannot be rejected, therefore, it is concluded that the total number of cross-border M&A between the US acquirer companies and the OECD target companies increase as the US dollar appreciates against the currency of the target country.

In the second model, the data on M&A are grouped by their payment methods. In other words, the number of M&A that were financed by only cash was included as a dependent variable and the coefficients of real exchange rates, as well as other explanatory variables, were obtained. At the same time, the number of deals that were financed by stocks and other securities was also included in the second regression model with the same explanatory variables. Table 3 indicates the results of the multivariate regression of this model. As displayed in the table, *LOG_RXR* variable shows a significantly negative coefficient of -11.55 in explaining the non-cash financed cross-border deals. This result can be interpreted such that, when the target country's' currency appreciates by 1%, the number of deals paid by stocks and securities decrease by 11.55 units. In other words, as the US dollar depreciates, fewer deals are paid in stocks, and more deals are paid in cash. Although the result is not in line with the second hypothesis, there is still a plausible explanation for this behavior of bidders.

Table 4. Regression results including the total number of M&A deals, M&A deals in high R&D intensive industries and M&A deals in low R&D industries.

	Full Sample		High R&D intensive		Low R&D intensive	
VARIABLES	Coefficients	Std. Errors	Coefficients	Std.Errors	Coefficients	Std.Errors
LOG_RXR	-10.04**	(4.915)	-4.485*	(2.589)	-5.546*	(2.959)
LOG_DISTANCE	-146.0***	(14.85)	-67.18***	(6.946)	-78.83***	(9.441)
LOG_US_MARK_CAP	14.92***	(3.899)	8.424***	(1.928)	6.492***	(2.039)
LOG_RELATIVE_GDPCAPITA	-19.59***	(5.044)	-10.99***	(2.726)	-8.577***	(2.717)
LOG_RELATIVE_INFLATION	0.435	(0.320)	0.262	(0.170)	0.172	(0.161)
LOG_TAXES_CORP	0.924	(1.768)	-0.0756	(0.790)	0.990	(1.083)
LOG_TAXES_GS	-17.38***	(6.165)	-13.52***	(3.267)	-3.842	(3.326)
CIVIL	-48.92***	(6.449)	-29.30***	(3.576)	-19.61***	(3.540)
BF_RANK	1.680**	(0.668)	0.517	(0.331)	1.164***	(0.408)
ENGLISH	102.7***	(18.30)	34.05***	(9.298)	68.67***	(10.98)
Constant	916.3***	(170.7)	399.3***	(83.07)	517.0***	(99.76)
Observations	717		717		717	
Adjusted R-squared	0.897		0.875		0.883	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Firstly, As Rappaport & Sirower explain, when the management of the acquirer company is very confident about the future of the M&A deal, it usually chooses to pay the target company in cash rather than in stocks (1999). In contrast, the stock payment is offered when the management is somewhat hesitant about the synergy effects between the two companies in the future, therefore they try to hedge their positions in a way by offering to share risks and profits of the target (Rappaport & Sirower, 1999).

Similar reasoning can be applied in the case of this appreciated domestic currency of the target company. The appreciation of the currency is mainly associated with the stronger economic growth of the country, especially when the increased exports is the reason for such growth levels. Therefore, the appreciation of the target currency can be a signal to the better economic conditions and prospects of the company to be acquired. This might be one of the reasons the for such payment decision by the management of the acquirer company.

Therefore, as obtained from the Table 3, the number of deals paid in stocks decrease by approximately 11.55 units, when the target country's currency appreciates. Also, there is still a positive relationship between the appreciation of the target currency and the deals paid in cash, even though the result is not significant. Hence, the second hypothesis of this thesis is rejected.

The third model of this thesis is given in Table 4, displaedy variables containing the total number of deals grouped into two sections - the number of deals within high and low R&D intensive industries.

The coefficient of the variable of LOG_RXR indicating the number of M&A in low R&D intensive companies is -5.546, whereas for high R&D intensive companies this coefficient is equal to -4.485. As opposed to the initial expectations, both coefficients not very different from each other, and are only insignificant at the 10% level. However, it still seems that real exchange rates affect M&As in lower R&D industries stronger than the ones in high R&D industries. These results are completely opposed to the previous research on Japanese and US mergers and acquisitions by Blonigen. This can be explained by the difference in the time frame of the M&As, that is, while the Japanese-US mergers occurred from 1975 to 1992, this paper covers the time interval between 1993 and 2017. Even though for Japan, change in the real exchange rates influenced their merger decisions more strongly in high R&D manufacturing industries, the real exchange rates affect the number of deals in low R&D industries more strongly in the case of OECD target countries. This might occur because US firms are more elastic to the changes in relative valuation of assets in low R&D industries, because of the less interest in the acquisition of low R&D businesses. In contrast, as the technology is one of the most popular business fields in the 21st century, there is an increasing need for building relationships with foreign higher R&D intensive businesses to be able to grow in the future. Therefore, a depreciation of the US dollar against the target country's currency does not significantly affect the M&A decision of managers. Meaning, that even if the currency appreciates against the US dollars, American companies are still willing to pay higher in the domestic currency amounts to acquire foreign high-tech companies.

Thus, the third hypothesis of this thesis, which states that the number of M&A in high R&D intensive industries is more significantly affected by the appreciation of the dollar than in low R&D industries, is rejected.

6. Conclusion

This thesis conducts an empirical analysis of the effect of fluctuations in real exchange rates on the volume of 18016 cross-border M&A from the US between 1993 and 2017. Overall, this thesis sheds light on the previous mixed findings about the currency levels and cross-border M&A relationship.

The research concludes that there is indeed a significant effect of changes in the domestic exchange rates on the management's decision to engage in cross-border M&A. I find that as the currency of the acquirer company appreciates against the currency of the target, the management is more likely to be engaged in this deal. This is in line with the previous research by Froot and Stein. There are several possible reasons explaining this relationship. Firstly, as expected, higher appreciated domestic currency leads to seemingly relatively lower costs of production in the foreign country, making it an attractive place to start a business, hence, stimulating M&A. Agrawal (1980) offers a slightly different approach, by comparing the FDI in general to the imports of the country. The author suggests that the firm's' decision to buy foreign companies relies on the similar reasoning as trading goods with a foreign country when the foreign currency is depreciated.

The paper also investigates the relationship between the relative currency levels and the cross-border M&A by their payment methods. It is concluded that the appreciated currency of the target country encourages the cross-border deals to be paid in cash rather than in stocks and other securities. Even though this finding is not in line with the relative-cost theory in previous studies, these results still have a plausible explanation. Higher levels of target currency might signal higher economic growth led by exports, therefore, better economic and business conditions in the future, stimulating the cross-border acquisitions. As the bidding companies usually choose to pay in cash when they are confident about the merger, the higher currency levels in the country lead to reduced numbers of stock paid offers, and higher volumes of cash financed deals.

Further, the relationship between the M&A and the cross-border and the currency levels is analyzed at the industry level using Blonigen's study (1997). The data was divided into two subsamples of M&As in the low R&D and high R&D industries such as high technology, healthcare, and industrials. Although Blonigen finds currency effects in high R&D intensive

M&As between Japan and the U.S., the cross-border deals between US and OECD countries show an opposite trend. The paper finds a less but stronger relationship in high R&D intensive industries rather than in low R&D industries. This finding is explained by the increasing popularity of R&D intensive fields such as modern medicine and high technology in the last few decades. Therefore, the relative currency values do not particularly influence the firms' decision to acquire or to merge with such companies. Therefore, I conclude that the US is more price inelastic when acquiring the companies that invest highly in research and development than the companies with low R&D spending.

Lastly, there are still possible points for improvement in this paper. For instance, due to data limitations, I was unable to include some variables that possibly correlate with both the exchange rates and the number of M&As that were not included in the analysis, such as the level of debt in the private sector. Future research could solve this endogeneity problem by adding more explanatory and control variables to the regression and using interaction terms as well. Also, it would be interesting to further investigate the effects of volatility of exchange rates in the M&A volumes and use more countries for better results.

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Appendix

Table A. Descriptive statistics

Variable	Total number of deals	Observations (as included in panel data)	Mean	Standard Deviation	Minimum number of deals	Maximum number of deals
Deals	18016	850	21.19529	40.41868	0	259

Table B. Wald test results for the time and country fixed effects

Target fixed effects	F(29, 655) = 62.52 Prob > F = 0.0000		Year fixed effects	F(22, 655) = 3.50 Prob > F = 0.0000

Table C. Country-Specific independent variables and their sources

Variable Names	Explanations
DISTANCE	Distance From To. (2018). Distance between Cities places on Map. Retrieved from https://www.distancefromto.net/
BF_RANK	Doing Business Project. (2018). Ease of doing business index. Retrieved from The World Bank Group:https://data.worldbank.org/indicator/IC.BUS.EASE.XQ
CIVIL	"Legal system." The World Factbook. Central Intelligence Agency. Web. Access on 22 June 2018.
ENGLISH	Languages. The World Factbook. Central Intelligence Agency. Web. Access on 22 June 2018.

Table D. Distribution of total number of deals by their payment methods and R&D intensity

	Payment method		Industry	
	Cash	Non-cash	High R&D	Low R&D
Number of deals	2995	15021	8500	9516
Percentage of total deals	17%	83%	47%	53%
Total Deals	18016			

Table E. Country-specific characteristics of the OECD members.

Country	Distance in kms	Legal system	"Business friendly" index	Official language
Australia	15201.49	Common	9	English
Austria	8353.28	Civil	15	Non-English
Belgium	7562.36	Civil	30	Non-English
Canada	2264.07	Common	12	English
Chile	8476.33	Civil	32	Non-English
Czech Republic	8243.61	Civil	20	Non-English
Denmark	7496.3	Civil	2	Non-English
Estonia	8059.66	Civil	7	Non-English
Finland	7832.06	Civil	8	Non-English
France	7674.17	Civil	21	Non-English
Germany	7870.28	Civil	14	Non-English
Greece	9419.42	Civil	35	Non-English
Hungary	8661.75	Civil	28	Non-English
Iceland	5719.93	Civil	16	Non-English
Ireland-Rep	6686.09	Common	11	English
Israel	10872.21	Common	31	Non-English
Italy	8628.71	Civil	27	Non-English
Japan	10161.81	Civil	24	Non-English
Latvia	8174.89	Civil	13	Non-English
Luxembourg	7703.37	Civil	34	Non-English
Mexico	1634.36	Civil	29	Non-English
Netherlands	7514.49	Civil	22	Non-English
New Zealand	12564.06	Common	1	English
Norway	7194.85	Civil	5	Non-English
Poland	8289.01	Civil	17	Non-English
Portugal	7325.69	Civil	19	Non-English
Slovak Republic	8559.56	Civil	26	Non-English
Slovenia	8476.12	Civil	25	Non-English
South Korea	10754.68	Civil	3	Non-English
Spain	7597.42	Civil	18	Non-English
Sweden	7676.05	Civil	6	Non-English
Switzerland	8020.18	Civil	23	Non-English
Turkey	10193.06	Civil	33	Non-English
United Kingdom	6838.06	Common	4	English