The impact of foreign direct investment in real estate on property prices and economic growth

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Abstract:

There has been a growing importance of foreign direct investment (FDI) in the real estate market. It has been argued that these investments may improve economic growth, but it could also be a driver of increasing property prices. The purpose of this research is to examine the relationship between foreign direct investments in the real estate market, the property prices and economic growth. The inflation and interest rates will be used as control variables. Furthermore, the effect of the global financial crisis of 2008 on these variables is reviewed. The dataset consists of 9 OECD-countries from the beginning of the 1990's until the most recent available data. The results from the empirical analysis are ambiguous and differ greatly by country. A consistent finding is evidence for structural change as a consequence of the 2008 global financial crisis. The most important findings are that there is evidence that FDI may lead to higher property prices in some countries and that higher property prices are a positive determinant of FDI in real estate in 4 out of the 9 countries. Lastly, FDI in real estate may have a decreasing effect on economic output.

Keywords: FDI, foreign direct investment, financial crisis, real estate, GDP, economic growth, OECD, property prices, housing prices

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1. Introduction

Foreign direct investment, often abbreviated to FDI, has experienced enormous changes over the last couple of decades. At the beginning of the 1980's the stock of FDI inflow of developed countries averaged at 4,7% relative to the Gross Domestic Product (GDP). These numbers rapidly changed to 14,5% in 1999. The same pattern can been seen for the stock of outward FDI where this ratio increased from 6,4% to 19% (Hejazi & Pauly, 2003). The peak of the global FDI flow took place in 2007, when it amounted for about 2 trillion US dollars. Since then these investments have nearly halved to a little more than 1 trillion USD due to the worldwide financial crisis of 2008 (Mohapatra & Gopalaswamy, 2016). A significant part of these investment flows are involving the real estate market. Foreign real estate investments accounted for 1 trillion US dollars in the period from 2007-2012 (McAllister & Nanda, 2016).

According to the International Monetary Fund (IMF) foreign direct investment can be defined as category of international investment with the objective of a long-lasting involvement in a business or asset in a non-domestic country (IMF, 2009). FDI is a main element of the rapidly increasing economic integration of the world, which is well known as the globalization process (OECD, 2008). Foreign real estate investment includes both inflows of individuals, as inflows of foreign companies. Those investments only count as FDI if these firms do not have a permanent residence in the host country (Rodríguez & Bustillo, 2010).

Real estate can be considered as a unique service because it is heterogeneous, has high transaction costs and limited liquidity. Furthermore, real estate investment is tied to a certain location. These limitations limited foreign investment in the real estate market in the past. However, recently there has been a large increase in the amount of foreign direct investment in real estate (FDIRE). At first, this development was mainly concentrated in developed countries, but is lately taking place increasingly in developing markets as well (He & Zhu, 2010). This trend is accompanied with a shift of traditional foreign direct investments in primary sectors and the manufacturing industry towards international investments in services such as real estate (Ramasamy & Young, 2010 & Gholipour et al., 2014).

Every investor that invests abroad has to possess, as stated in Dunning's eclectic theory, specific monopolistic advantages over local firms to be successful. In other words, a foreign investor needs a certain edge over their local counterparts to be able to succeed. This theory can be applied for real estate investment as well. The diversification potential and return forecasts will persuade investors to choose a foreign location over a domestic location. However, the gains of investing in a foreign country must exceed the associated transaction costs. These transaction costs are a consequence of exchange rates and the liability of foreignness (Lieser & Groh, 2014). The latter can be defined as 'the price of doing business abroad' and refers to the disadvantage foreign firms and individuals experience due to amongst others an unfamiliarity with the local market, economic nationalism and travel expenses and coordination costs (Barnard, 2010).

Foreign real estate investment is an important factor and accounted for example for 40% of the total FDI inflows in Spain during the first decade of the 21st century (Rodríguez & Bustillo, 2010). In the same period in China FDIRE accounted for 10-15% of the total of foreign direct investments and peaked in 2007 when accounting for nearly 23% of the total FDI flows (He et

al., 2011). In the Netherlands an increasing amount of real estate properties are of foreign ownership (PBL, 2016). Therefore, it is important to know what consequences of such a development are on the prices of properties and if it can contribute to economic growth and development. It is also crucial to know how each variable affects the other, since the variables named above are quite interrelated and could cause a serious endogeneity problem. The interrelationship between the different variables will be highlighted further on in this research.

Foreign direct investment is widely encouraged to promote economic growth and development (Gholipour et al., 2014). However, for both investors and governments it is highly relevant to know if that's really the case and what the effect of foreign investment is on the property market. Governments can benefit from the knowledge and decide if they should promote foreign companies and individuals to buy real estate in their country. If governments are aware of the effects of the investments from abroad they can use the most effective policy on this case. For investors it is also highly relevant to know what the effect of their investment is on the real estate market.

There has been previous research regarding FDI and its impact on the prices of property and economic growth. For example, Gholipour et al. (2014), Rodríguez & Bustillo (2010), Hui & Chan (2014) and Lieser & Groh (2014) all recently researched the relationship and the effect of foreign direct investment in the real estate sector on property prices and the growth of the economy. Some studies focus on explaining what causes the foreign direct investment, while others on what the impact of the FDI in real estate is on other variables.

This research contributes to the existing literature by using the most recent data. The vast majority of the studies only include data until the financial crisis of 2008 in their analysis. Related to the impact of this major financial event, another contribution of this study will be the use a dummy variable approach to question the impact of the recent financial crisis of 2008.

The aim of this research is to clarify and analyse the impact that foreign direct investment in the real estate sector has on the economic growth and property prices. This will create a better understanding of the interrelationship of the variables. Moreover, the financial crisis that started in 2008 had a major impact on global FDI flow, house prices and other macroeconomic variables, such as GDP growth. Therefore this research will, besides analysing and discussing the relationship between the variables, focus on the effect of this major event.

In the next section the existing literature concerning foreign direct investment in real estate will be reviewed. Firstly the theoretical framework will be determined and consequently a summary a selection of relevant empirical studies will be shown. These will give a good overview what already has been tested concerning the impact of FDI in real estate on economic growth and property prices. Subsequently, section 3 will describe the data and its properties and the model and methodology are reviewed in section 4. This paper is finalized by sections 5 and 6, where the empirical results and conclusions will be shown and discussed. The references and appendix will follow after these final sections.

2. Theoretical framework

2.1 Theory

The relationship between FDI, economic growth and property prices has been researched extensively before. In this section the most important theories and concepts will be reviewed.

Firstly, Economic growth can be both a positive and a significant determinant of FDI. The argument is that high growth reflects high potential and therefore foreign investors are interested in such a market. Market size is an important characteristic as well, where bigger markets are usually preferred by investors (Ramasamey & Yeung, 2010). However, FDI can also impact GDP growth. In other words, a relationship can be present both ways. FDI can be an important source of capital that is complementing the domestic sources. In this way new jobs can be created and technology exchanged. Eventually, this could foster economic growth (Chowdhury,2006). Besides growth, FDI can also have positive externalities, like the exchange of skills, innovation and technology (Nguyen,2011).

Secondly, FDI in real estate could cause property prices to appreciate. Since real estate is relatively fixed in the short term, increased demand in the form of investments will tend to drive the prices upwards. Others argue that this effect is negligible, since the total of FDI in real estate is relatively a small portion of the total investment in this sector (Rodríguez & Bustillo, 2010 & Gholipour et al., 2014). However, capital inflows in the form of foreign investments can increase the money supply and the liquidity, which in turn could increase asset prices. Large amounts of capital inflows have been known to cause economic booms, which could drive up the real estate prices as well (Kim & Yang, 2009).

Thirdly, the interaction between economic growth and property prices is relevant. When economic output increases, companies will increase their demand for labour to fill the increased demand. This will cause an increase in household labour income and individuals will be able to get larger loans and mortgages. A larger income can be either used for consumption or investment, where real estate is often chosen as a suitable investment. Higher house prices, in turn, increase wealth which will increase consumption. This will result in a higher aggregate demand and have a positive effect on the economic output (Demary, 2010).

According to Adams and Füss (2010) real estate prices are not as sensitive to economic news compared to other asset classes. This means that these prices typically have low fluctuations. Residential house prices have quite some downward price stickiness, because of the fact that homeowners do not want to sell their house below a certain minimum and the fact that they generally have high reservation prices.

2.2 Previous studies

Gholipour et al. (2014) found that foreign direct investment in real estate does not increase property prices and does not have an impact on the economic growth of a country. However, there is evidence for a positive and causal relationship between the property prices and economic growth in both the short and the long run. Data from 1995 until 2008 from 21 OECD countries were used in this article. Focussing on the Spanish market Rodríguez and Bustillo (2010) concluded that real estate investment from abroad is mostly influenced by factors like the housing prices, gross domestic product (GDP) per capita and the number of tourists.

Hui & Chan (2014) examine the determinants of FDI in real estate in the Chinese market. Using data from 2005 until 2010, it can be concluded that the strong economic growth of China and the openness of the market, measured by the number of foreign real estate firms, are significant contributors to the amount of FDI in real estate (FDIRE). Furthermore, it is also noted that FDIRE may overheat the property market. Although more evidence is needed to be able to be certain that this can be the case, both the land and house prices positively determine FDIRE. Foreign investors will earn more when their investments rise in value and could potentially drive prices up.

In a paper determining the drivers of international commercial real estate investment in 47 countries seven important variables are distinguished. Positive influences like economic growth, demographics and rapid urbanization draw FDI, while political instability, social-cultural issues, a lack of legal transparency and administrative hurdles create a less favourable environment for international investments in real estate (Lieser & Groh, 2014).

Farzanegan and Gholipour (2014) focus on transparency and its effect on foreign investments in the real estate market including 32 countries in their analysis. No significant relationship between real estate transparency and FDI is found. However GDP per capita and property prices are concluded to have positive significant and influences on the amount of foreign direct investments which is in line with the findings of He et al. (2011). The last finding is a strong and positive association between FDI in other sectors and FDIRE, which in turn is in accordance with the findings of He and Zhu (2010).

3. Data

The dataset used for the analysis consists of yearly data from 9 OECD-countries: Austria, Denmark, France, Germany, the Netherlands, Sweden, Spain, the United Kingdom and the United States. The dataset includes different time periods due to different data availability for each of the individual countries. Mostly the data represent the time from the beginning of the 1990's until either 2011, 2012 or 2013. The two exceptions are Sweden and Austria where the dataset starts in 1998. Hence, most of the countries have comparable timeframes as can be seen in table 1. Annual data is used and therefore the maximum lag length will be 2, since otherwise too much data points will be lost to be able to make sensible conclusions.

Table 1: Countries and their time frames

Country	Time frame available	Actual time frame analysis
Austria	1998-2013	2002-2013
Denmark	1993-2012	1996-2012
France	1994-2012	1996-2012
Germany	1992-2012	1995-2012
the Netherlands	1991-2012	1994-2012
Spain	1993-2011	1995-2011
Sweden	1998-2012	2000-2012
United Kingdom	1993-2011	1995-2011
United states	1992-2012	1995-2012

The majority of dataset is sourced using the OECD database, except for the data on the property prices and the inflation rate. The data of these individual variables is coming from respectively the Bank for International Settlements (BIS) and the International Monetary Fund (IMF). These three institutions provide reliable, accessible and consistent data. The descriptive statistics of all the individual datasets can be found in table 2a to 2i displayed below the next paragraph. Finally, a more detailed view and more information about the data sources as well as the data background can be found in table 3.

The data of the residential property prices has been transformed from quarterly to annual data to fit with the other variables. This alteration has been performed by using the yearly average of the quarterly data values as inputs.

Table 2a: Descriptive statistics of Austria (1998-2013).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	16	79,289912	195,0403	-298,201	387,85
PP	14	115,7436	17,63369	99,75	154,96
GDP	16	277748,8	22679,13	236939	305538,6
INFL	16	92,68786	8,859096	8,020375	107,9507
IR	16	2,585987	1,451488	,2206667	4,634233
Dummy	16	,375	,5	0	1

Table 2b: Descriptive statistics of Denmark (1993-2012).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	20	170,3183	383,7422	-691,606	1495,186
PP	20	185,5165	68,7336	82,795	293,6875
GDP	20	1676758	164130,5	1330519	1878249
INFL	20	86,27029	10,8181	69,96325	105,2227
IR	20	3,875456	2,276898	,6196917	10,85497
Dummy	20	,25	,4442617	0	1

Table 2c: Descriptive statistics of France (1994-2012).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	19	5359,145	5144,083	698,814	20091,72
PP	19	172,2912	65,10443	100	259,725
GDP	19	1823737	184582,2	1503728	2043761
INFL	19	90,00705	8,184892	78,08541	104,1146
IR	19	3,20709	1,628755	,5731834	6,578183
Dummy	19	,2631579	,4524139	0	1

Table 2d: Descriptive statistics of Germany (1992-2012).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	21	682,5611	1362,059	-621,17	5149,897
PP	21	101,7782	5,088137	93,6775	113,565
GDP	21	2372734	198744,3	2057856	2687649
INFL	21	89,15274	8,642222	73,75097	104,1253
IR	21	3,544609	2,114065	,5731834	9,5175
Dummy	21	,2380952	,4364358	0	1

Table 2e: Descriptive statistics of the Netherlands (1991-2012).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	22	605,4035	1341,295	-4320,321	2186,41
PP	22	189,0248	74,47283	73,5275	280,2275
GDP	22	544586,6	82294,02	410343,7	647158,8
INFL	22	85,59569	11,81411	66,43784	104,8541
IR	22	3,744475	2,346976	,5731834	9,3525
Dummy	22	,2272727	,428932	0	1

Table 2f: Descriptive statistics of Spain (1993-2011).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	19	1407,038	1309,247	-65,847	4341,659
PP	19	191,6929	87,93449	95,985	323,4575
GDP	19	914571,5	155875	675292,5	1120820
INFL	19	81,94241	13,29243	60,86701	103,1962
IR	19	4,375957	2,91294	,8109583	11,68808
Dummy	19	,2105263	,4188539	0	1

Table 2g: Descriptive statistics of Sweden (1998-2012)**.**

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	15	1084,765	3756,485	-6563,343	12232,29
PP	15	215,6418	67,06728	117,7125	308,05
GDP	15	3200292	332969,6	2610508	3613781
INFL	15	93,80122	6,224957	84,95538	103,8758
IR	15	2,654349	1,325533	,3983333	4,1875
Dummy	15	,3333333	,48795	0	1

Table 2h: Descriptive statistics of the United Kingdom (1993-2011).

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	19	245,3762	601,872	-777,244	1736,9
PP	19	204,6811	85,63438	96,7425	325,355
GDP	19	1470139	194894,7	1138897	1712996
INFL	19	85,09442	9,131725	71,74783	104,4842
IR	19	4,778239	1,95089	,6899583	7,336242
Dummy	19	,2105263	,4188539	0	1

Table 2i : Descriptive statistics of the United States (1992-2012)**.**

Variable	Observations	Mean	Std. Dev.	Min	Max
FDIRE	21	800,4762	1762,249	-3097	3962
PP	21	157,1392	50,52237	94,35	248,795
GDP	21	12732404	2021613	9266558	15354627
INFL	21	83,87927	12,8881	64,34906	105,2915
IR	21	3,435159	2,111538	,2825	6,455833
Dummy	21	,2380952	,4364358	0	1

Table 3: Data description and sources

Label	Description	Source
Main variables		
Property prices	Index of nominal residential property prices (1995=100)	Bank for international settlements, BIS (2016). "Source: National sources, BIS Residential Property Price database (http://www.bis.org/statistics/pp.htm)."
Foreign direct investment (FDI) in real estate	FDI inflow in the real estate sector, in USD millions.	OECD Statistics (2016). *FDI flows by industry*
Gross domestic product (GDP) growth	Gross domestic product (output approach). Constant prices, national base year.	OECD statistics (2016) *Annual National Accounts*
Control variables		
Interest rate	Short-term interest rate, percent per annum.	OECD Statistics (2016).
Inflation rate	Consumer Price Index (CPI) (2010=100)	IMF database, International financial statistics (IFS) (2016)
Dummy variable		
Financial crisis of 2008	*0=before crisis, 1= after crisis, (2008=1)*	Self-created

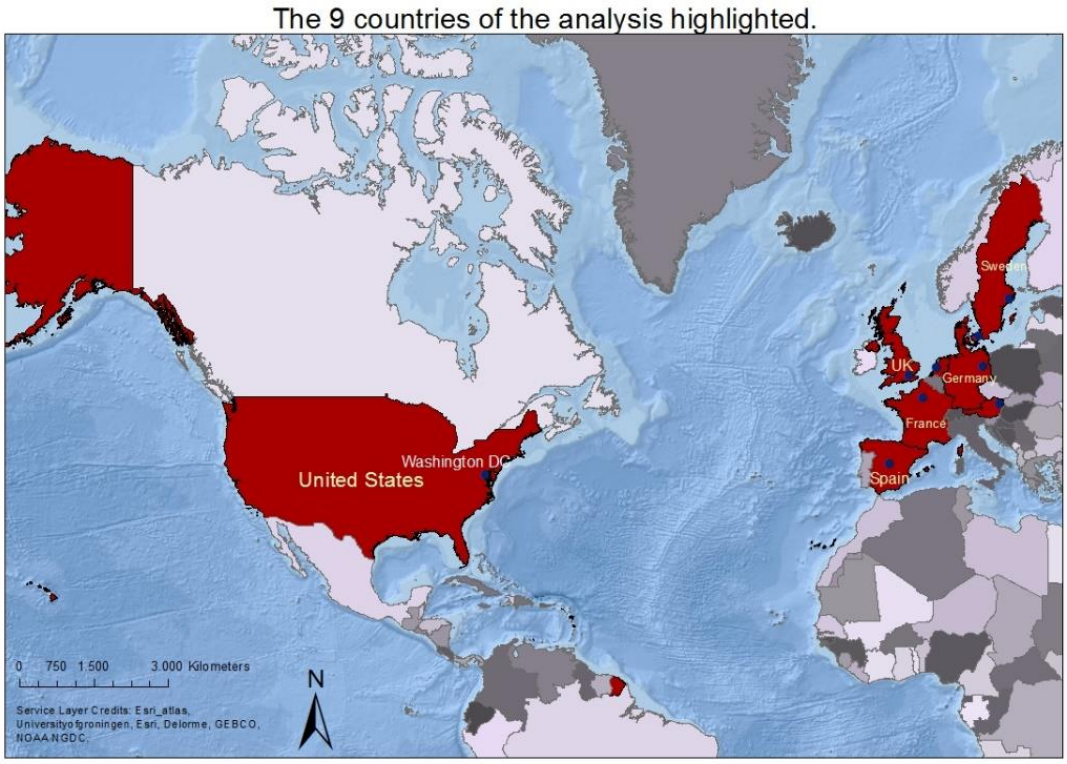

Figure 1: An overview of the countries examined in the data analysis. In the appendix a more detailed map of Europe is present.

4. Model and Methodology

A vector auto regression (VAR) model will be used in the empirical data analysis. The VAR-model has few restrictions and is suitable for dynamic effects, which is important since capital inflows like FDI are likely to have a dynamic impact on the other variables. Moreover, the VAR-model has been proven useful with interrelated variables and thereby determining the effect one variable has on another variable used in the analysis (Kim & Yang, 2009). Reverse causality and endogeneity are very important issues in this research and should be addressed.

There will be a dummy used to define the difference between the 2 different time periods. The first period will be the pre-crisis period and the second will represent the time after the crisis began. The year 2008 will be the first year to be included in the dummy. This variable is used in order to detect signs of structural change after the global financial crisis.

Based on the theory the following null hypotheses are formulated and tested.

H_{0a}: Foreign direct investment in real estate will not increase property prices

H_{0b}: Foreign direct investment in real estate will not enhance economic growth

$H_{0c:}$ There is no difference in results before and after the financial crisis of 2008

The following variables and corresponding model will be used.

$$Y_t = c + A_1 Y_{t-1} + \ldots + A_k Y_{t-k} + \mu_t$$

The vector containing the endogenous variables is Y_t = {Property prices, FDI real estate, GDP growth, inflation, interest rate), c represents the vector of the constants and A_i are the coefficient matrices. Finally, μ_t is the vector of the model's residuals (Demary, 2010).

The control variables are the inflation rate measured by the consumer price index and the short-term interest rate. Demary (2010), amongst others, finds empirical evidence that house prices and macroeconomic variables interact. In this particular study the linkages between house prices, inflation, economic output and interest rates in 10 OECD-countries are analysed. The main conclusions are that inflation and interest rate decrease house prices, while growth shocks do the opposite. Moreover, there is evidence that a demand shock for housing raises the prices, economic output and interest rates. In that paper interest rate, output, inflation and house prices are used. In other words, inflation and the interest rate are important determinants for property prices. Gholipour et al. (2014) also use inflation and the interest rate as control variables in their research. Moreover, interest rates and FDI also interact, a higher interest rate means that foreign investors have a higher cost of borrowing money (Hui & Chan, 2014).

The individual variables are tested for stationarity using an augmented-dickey-fuller (ADF) test. The null hypothesis reflects the presence of a unit root and the alternative is stationarity. Non-stationary variables are differenced to avoid a spurious regression. Afterwards, cointegration of the variables is tested using the Johansen test for cointegration. After running the Var-model, several diagnostics test are done to check the model for possible flaws.

These include residual correlation (autocorrelation) tests, normality and stability tests, which all will check the quality of the models output.

With respect to the crisis dummy, there will be an unrestricted model which will be a regular vector autoregressive model. This model will include the dummy variable as an exogenous variable. Furthermore, a restricted model or vector-error-correction model (VECM) will be used for every country as well. This model does not consider the dummy variable.

A likelihood ratio (LR) test can determine whether there is structural change when using the 'crisis-dummy'. Using both the unrestricted and restricted model the LR-statistic can be calculated according to the following formula. This statistic is distributed on a chi-square distribution which will tell which model is more appropriate and whether a dummy variable should be included in the analysis.

$$LR = (T\text{-}M)\,(\ln|\Sigma_r| - \ln|\Sigma_u|) \sim X^2(q)^1$$

The effect of financial crisis in the OECD countries will be known as well because of the dummy inclusion and it can be determined if there is structural change in the relationship between the variables.

5. Empirical results

5.1 Crisis dummy

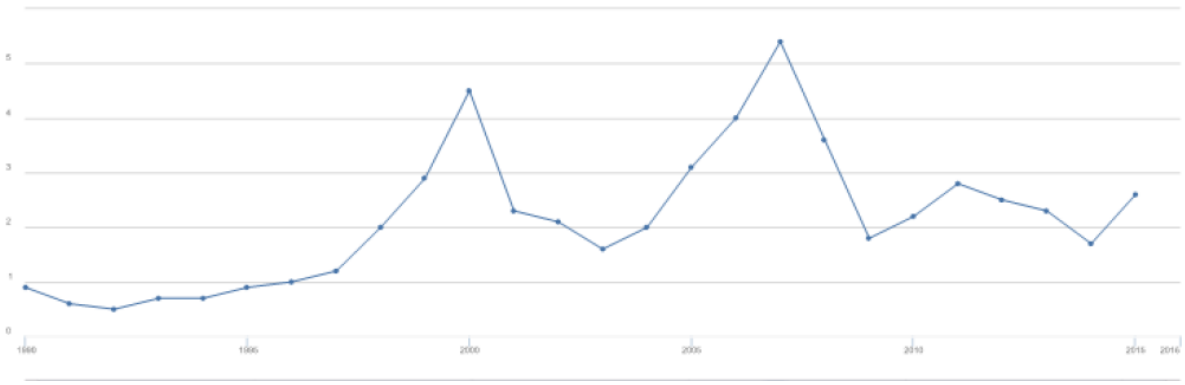

Figure 2: Net inflows of foreign direct investment 1990-2015 (% of GDP), OECD member average (Worldbank, 2016) Source: World Development Indicators, created on : 13/12/2016.

The graph above shows the FDI inflows from 1990 until 2015. There is a clear pattern visible as there are 2 spikes, the first one around 2000 and another peak in 2007, just before the start of the financial crisis. Since then FDI inflows experienced a substantial drop and afterwards stabilized, but did not return to the pre-crisis level. Therefore, it will be tested if this is a shift and if there is a significant difference in the results before and after this event.

[1] T= number of observations
M = number of parameters in each equation of the unrestricted system + constants + # of dummy variables
Σ = determinant of the residual covariance matrix
q = number of dummies*number of equations

Table 4: The results of the financial crisis dummy test. [2]

Country	LR-test statistic
Austria	34,10372***
Denmark	25,10365***
France	21,46304***
Germany	21,93231***
Netherlands	28,49019***
Spain	39,43187***
Sweden	23,84503***
United Kingdom	35,06558***
United States	23,74616***

Following table 3, there is very strong evidence for structural change in all countries. This mainly seems a result of a much lower level of foreign investments, which can represent a structural break from previous years.

Hence the outcome of the dummy variable analysis indicates that for all of the analysed countries the VAR-model with the crisis-dummy variable will act as the preferred model. These models will be used to show and discuss the outcomes. The results of the VECM-model without the dummy will therefore not be discussed in this paper.

5.2 Regression results

In section 5.3 the granger causality results of the vector autoregression are displayed and in the following section 5.4 the impulse response graphs of all the significant effects are shown. Consequently, table 6 in the appendix provides more detailed information about the significant effects. These three elements together form the main basis for the discussion of the results below.

In 5 of the 9 countries foreign direct investments in real estate impact the property prices. This is mainly applicable to Austria, Germany and the United States. The sign of the coefficient is ambiguous for these cases. In Austria a positive effect is present, the result of the United States indicates a negative relationship at first, but alters to a positive effect in the long run. In the case of Germany the initially positive influence is followed by an equally large negative one the following period. Denmark and the United Kingdom also show signs of a relationship between FDIRE and property prices, however, this is rather weak and only significant on a 10% level. The reversal effect is present in 4 countries. Hence, property prices explain FDIRE in 4 countries, which are Denmark, France, Germany and the Netherlands. The effect is positive for all of the countries, although the impulse response function of the Netherlands is less clear. Noteworthy is the fact that in the model of Denmark and Germany significant outcomes are present in both ways. It should be noted that this conclusion is mostly applicable to Germany, since Denmark has a uncertain result.

The residential property prices impact GDP growth positively in Austria, France (weak effect) and Spain. GDP growth influences the housing prices in turn in Denmark and Spain

[2] **** p<0,01, **p<0,05, *p<0,10. Chi square critical values: 11,070 (5%), 15.086 (1%)*

negatively in the Netherlands first positively in the United States. A negative effect is counterintuitive, since according to the theoretical framework economic growth increases demand for housing (Demary, 2010). Foreign direct investment in real estate influences the real GDP growth in Denmark, the Netherlands and Sweden. This effect is negative for all and uncertain in the case of Sweden (p<0,10). The model of Germany provides ambiguous results with both a positive and negative effect. This outcome is surprising, since this implies that FDIRE would harm economic growth. A closer look at the coefficients reveals that the effect, though significant, is not that large and would not have an enormous impact. However, this means that there is certainly no evidence found for a growth enhancing effect of FDIRE. Lastly, GDP growth is effecting FDIRE significantly in a negative manner in the United States, while a positive influence of GDP growth on FDIRE is present in the Netherlands.

It can be concluded that the results differ substantially by country and are hard to generalize. The outcomes of Spain can be compared to the results of Rodríguez and Bustillo (2010). However, unlike their analysis, no significant impact of the property prices and economic growth are present in this model of Spain. It should be marked that the timeframes of the different countries are quite divergent (see table 1), which may have had a slight influence on the outcomes. The levels of FDI also differ substantially by country as figures 4a and 4b show in the appendix. It can be concluded that the interrelationship between the variables is complex and could benefit from further research.

5.3 Granger Causality Results[3]

Dependent Variable: FDIRE

	Austria	Denmark	France	Germany	NL	Spain	Sweden	UK	USA
PP	,15084 (0,698)	54,809 (0,000) ***	4,2128 (0,040) **	9,5985 (0,008) ***	7,9321 (0,019) **	,22777 (0,633)	,76049 (0,383)	,68413 (0,408)	2,9155 (0,233)
GDP	,21822 (0,640)	3,8275 (0,148)	,51664 (0,472)	1,0439 (0,593)	25,596 (0,000) ***	1,0834 (0,298)	,57631 (0,448)	,04757 (0,827)	4,8348 (0,089) *
INFL	2,968 (0,085)	2,1514 (0,341)	1,7584 (0,185)	,41449 (0,813)	18,093 (0,000) ***	,09742 (0,755)	,5902 (0,442)	4,6548 (0,031) **	,05899 (0,971)
IR	1,3339 (0,248)	2,857 (0,240)	,06805 (0,794)	8,033 (0,018) **	35,117 (0,000) ***	,17986 (0,671)	1,0289 (0,310)	,00488 (0,944)	18,083 (0,000) ***
ALL	4,1739 (0,383)	105,92 (0,000) ***	4,6521 (0,325)	22,411 (0,004) ***	64,881 (0,000) ***	4,6543 (0,325)	3,5732 (0,467)	6,0135 (0,198)	19,096 (0,014) **

Table 5a: Chi^2 (probability) *** p<0,01, **p<0,05, *p<0,10

[3] *Degrees of freedom (df) used in table 4: Models with 2 lags (DEN, GER, NL, USA), 2 df are used for the individual variables and 8 df for all. In the case of 1 lag (AUS, FR, SP, SWE, UK), 1 df and 4 df respectively.*

Dependent Variable: PP

	Austria	Denmark	France	Germany	NL	Spain	Sweden	UK	USA
FDIRE	11,201 (0,001) ***	5,706 (0,058) *	,15386 (0,695)	29,839 (0,000) ***	,86367 (0,649)	1,0609 (0,303)	1,0434 (0,307)	3,4656 (0,063)	18,989 (0,000) ***
GDP	1,4838 (0,223)	6,7888 (0,034) **	2,6336 (0,105)	1,8292 (0,401)	9,7467 (0,008) ***	9,7291 (0,002) ***	2,3757 (0,123)	,13227 (0,716)	47,282 (0,000) ***
INFL	9,8811 (0,002)***	1,3504 (0,509)	7,1025 (0,008) ***	3,2437 (0,198)	24,859 (0,000) ***	4,0908 (0,043) **	,88926 (0,346)	5,214 (0,022) **	,20535 (0,902)
IR	1,6981 (0,193)	1,3521 (0,509)	1,9405 (0,164)	1,1131 (0,573)	24,114 (0,000) ***	,22887 (0,632)	,02608 (0,872)	6,5415 (0,011) **	44,827 (0,000) ***
ALL	20,609 (0,000)	22,591 (0,004) ***	30,809 (0,000) ***	46,261 (0,000) ***	61,492 (0,000) ***	24,866 (0,000) ***	13,46 (0,009) ***	40,56 (0,000) ***	82,932 (0,000) ***

Table 5b: Chi^2 (probability) *** p<0,01, **p<0,05, *p<0,10

Dependent Variable: GDP

	Austria	Denmark	France	Germany	NL	Spain	Sweden	UK	USA
FDIRE	1,2724 (0,259)	16,027 (0,000) ***	,34244 (0,558)	10,418 (0,005) ***	9,5615 (0,008) ***	,01784 (0,894)	2,7383 (0,098) *	,56154 (0,454)	2,3728 (0,305)
PP	6,3095 (0,012) **	4,5671 (0,102)	3,5926 (0,058) *	4,2024 (0,122)	1,3261 (0,515)	22,884 (0,000) ***	2,5245 (0,112)	,03823 (0,845)	4,4288 (0,109)
INFL	12,743 (0,000) ***	7,9051 (0,019) **	12,091 (0,001) ***	9,3947 (0,009) ***	22,649 (0,000) ***	56,57 (0,000) ***	3,0431 (0,081) *	1,733 (0,188)	12,603 (0,002) ***
IR	0,0404 (0,841)	1,8471 (0,397)	6,2849 (0,012) **	1,7056 (0,426)	8,979 (0,011) **	,20541 (0,650)	,55347 (0,457)	1,1995 (0,273)	,70512 (0,703)
ALL	21,426 (0,000) ***	73,689 (0,000) ***	54,319 (0,000) ***	39,799 (0,000) ***	71,262 (0,000) ***	84,105 (0,000) ***	44,342 (0,000) ***	5,9836 (0,200)	33,651 (0,000) ***

Table 5c: Chi^2 (probability) *** p<0,01, **p<0,05, *p<0,10

Dependent Variable: INFL

	Austria	Denmark	France	Germany	NL	Spain	Sweden	UK	USA
FDRIE	,9006 (0,343)	12,812 (0,002) ***	11,862 (0,001) ***	30,802 (0,000) ***	2,9668 (0,227)	8,1772 (0,004) ***	,01806 (0,893)	,35849 (0,549)	14,057 (0,001) ***
PP	1,7744 (0,183)	6,139 (0,046) **	,17341 (0,677)	43,923 (0,000) ***	14,788 (0,001) ***	8,4309 (0,004) ***	6,2613 (0,012) **	,42172 (0,516)	48,32 (0,000) ***
GDP	7,8848 (0,005) ***	1,2601 (0,533)	,23579 (0,627)	5,8999 (0,052) *	4,4996 (0,105)	,24729 (0,619)	,5221 (0,470)	,1595 (0,690)	2,6878 (0,261)
IR	1,8431 (0,175)	12,961 (0,002) ***	,00015 (0,990)	8,8298 (0,012) **	1,0755 (0,584)	,08343 (0,773)	1,2074 (0,272)	,05588 (0,813)	25,002 (0,000) ***
ALL	19,315 (0,001) ***	29,89 (0,000) ***	27,777 (0,000) ***	107,56 (0,000) ***	20,918 (0,007) ***	22,085 (0,000) ***	24,228 (0,000) ***	1,9204 (0,750)	248,3 (0,000) ***

Table 5d: Chi^2 (probability) *** p<0,01, **p<0,05, *p<0,10

Dependent Variable: IR

	Austria	Denmark	France	Germany	NL	Spain	Sweden	UK	USA
FDIRE	3,4225 (0,064) *	4,4716 (0,107)	,09788 (0,754)	6,9036 (0,032) **	50,793 (0,000) ***	,00521 (0,942)	,02984 (0,863)	1,6308 (0,202)	2,083 (0,353)
PP	21,099 (0,000) ***	1,2842 (0,526)	32,351 (0,000) ***	2,3809 (0,304)	32,142 (0,000) ***	4,7544 (0,029) **	2,3325 (0,127)	,02354 (0,878)	,78907 (0,674)
GDP	4,084 (0,043) **	3,926 (0,140	6,2639 (0,012) **	,2868 (0,866)	,10928 (0,947)	,23109 (0,631)	,35706 (0,550)	1,7764 (0,183)	1,2676 (0,531)
INFL	25,262 (0,000) ***	,19619 (0,907)	22,884 (0,000) ***	10,298 (0,006) ***	10,838 (0,004) ***	1,3853 (0,239)	3,4215 (0,064) *	,00529 (0,942)	1,4895 (0,475)
ALL	51,343 (0,000) ***	49,817 (0,000) ***	97,601 (0,000) ***	31,47 (0,000) ***	134,27 (0,000) ***	8,5718 (0,073) **	29,541 (0,000) ***	5,3095 (0,257)	6,2012 (0,625)

Table 5e: Chi^2 (probability) *** p<0,01, **p<0,05, *p<0,10

5.4 Impulse response functions

The impulse response functions are situated on the next two pages.

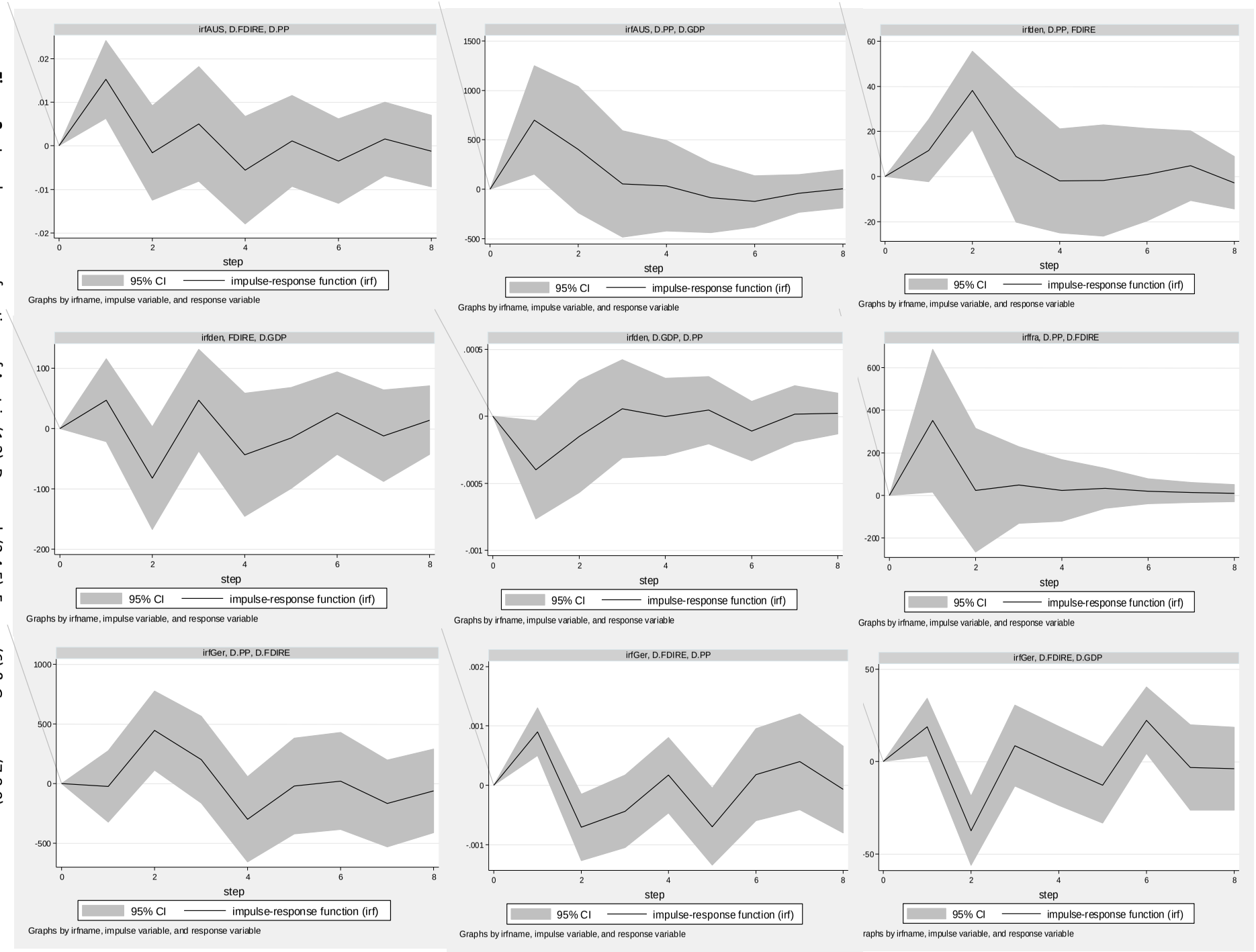

Figure 3a: Impulse response functions of Austria (1,2), Denmark (3,4,5), France (6) & Germany (7,8,9).

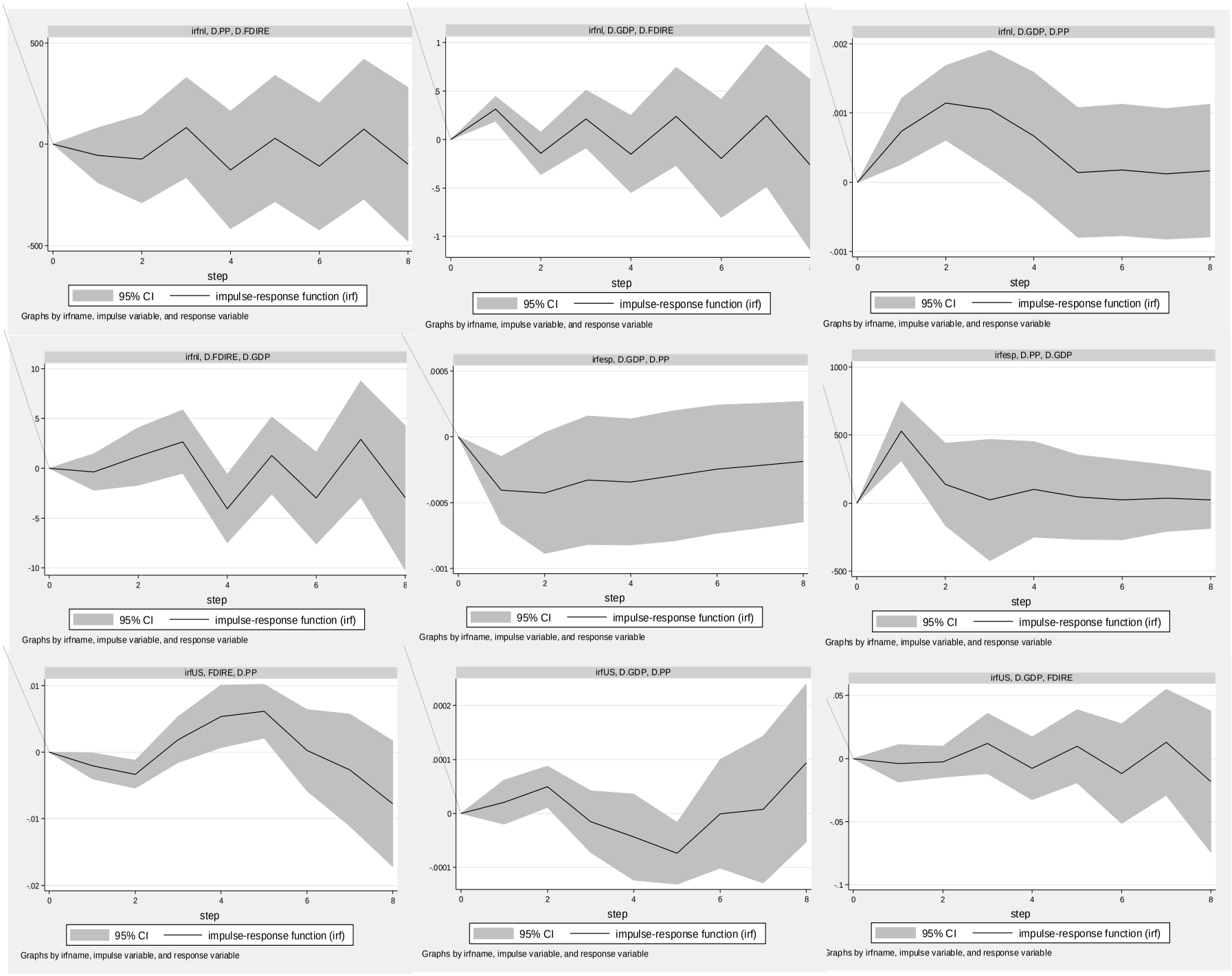

Figure 3b: Impulse response functions of the Netherlands (1,2,3,4), Spain (5,6) & the United States(7,8,9

6. Conclusions

The graphs concerning the foreign direct investments in real estate present some interesting patterns. Similar to FDI in other sectors a peak can be seen in 2007, just before the start of the financial crisis. Since then, the levels have not returned to the pre-crisis period for most countries. Therefore, this research tries to clarify the interrelationship between economic growth, residential property prices and FDIRE in the light of this major event. A financial crisis dummy is applied and there is evidence for structural change in all countries. Consequently, all models include this dummy variable. The most prominent results are concerning the interaction of the variables property prices and FDIRE, where only the United Kingdom and Sweden have no significant outcome. In some countries FDIRE has an increasing effect on the residential property prices. Moreover, foreign investments in real estate may be harmful for economic growth and according to this analysis are certainly not growth enhancing. All in all, it is difficult to construct solid conclusions because of the diversity in results.

The variations in the results could be due to different characteristics and environments concerning FDIRE, where individual countries attract various amounts of foreign real estate investment (Lieser & Groh, 2014). Furthermore, FDI in manufacturing is the single most determinant of FDI in services (Ramasamy & Young, 2010; Farzanegan & Gholipour, 2014). This could imply that some countries attract much more FDIRE and therefore this may explain the vast diversity in outcomes of this study.

There are a few limitations to this study. First of all, there is a limited scope of years after the financial crisis. Since the datasets have some lag, it could take some years before a broader range of years can be analysed. Secondly, since the focus on this paper is on residential housing prices, its results are only applicable to a specific part of the real estate market. The inclusion of commercial real estate for example could widen the scope of the analysis. Further research could be conducted when the dataset of years after the financial crisis is more elaborate and contains more years in order to increase the reliability and robustness of the results. The outcomes of this study need further research to clarify the implications and understand them better.

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Appendix

Table 6a: **** p<0,01, **p<0,05, *p<0,10*

Austria						
Dependent	**Explanatory**	**Coefficient**		**Std. Error**	**Z**	**P>|z|**
Property prices	FDIRE	,0152268		,0045496	3,35	0,001 ***
GDP growth	Property prices	700,2289		278,7683	2,51	0,012 **
Denmark						
Dependent	**Explanatory**	**Lag**	**Coefficient**	**Std. Error**	**Z**	**P>|z|**
FDIRE	Property prices	1	11,62498	7,062226	1,65	0,100
		2	34,34867	12,34576	2,78	0,005***
Property prices	FDIRE	1	,0487011	,0249431	1,95	0,051*
		2	-,0176853	,0094685	-1,87	0,062*
Property Prices	GDP growth	1	-,0004004	,0001865	-2,15	0,032**
		2	,0002486	,0001537	1,62	0,106
GDP growth	FDIRE	1	46,68395	34,93875	1,34	0,181
		2	-53,01182	13,26284	-4,00	0,000***
France						
Dependent	**Explanatory**	**Coefficient**		**Std. Error**	**Z**	**P>|z|**
FDIRE	Property Prices	350,8798		170.9509	2.05	0,040**
GDP growth	Property Prices	972,5481		513,1056	1,90	0,058*
Germany						
Dependent	**Explanatory**	**Lag**	**Coefficient**	**Std. Error**	**Z**	**P>|z|**
FDIRE	Property prices	1	-23,74855	152,7175	-0,16	0,876
		2	449,6741	150,3881	2,99	0,003***
Property Prices	FDIRE	1	,0009001	,000205	4,39	0,000***
		2	-,0009459	,0003053	-3,10	0,002***
GDP growth	FDIRE	1	18,7187	7,978864	2,35	0,019**
		2	-25,37976	11,88216	-2,14	0,033**
the Netherlands						
FDIRE	Property prices	1	-53,88526	68,27517	-0,79	0,430
		2	186,1717	80,553	2,31	0,021**
FDIRE	GDP growth	1	,3143373	,0640389	4,91	0,000***
		2	-,0290956	,0319867	-0,91	0,363
Property Prices	GDP growth	1	,0007359	,0002419	3,04	0,002***
		2	-,0000742	,0001208	-0,61	0,539
GDP growth	FDIRE	1	-,3684893	,9269486	-0,40	0,691
		2	-2,115056	,7151846	-2,96	0,003***

Table 6b: **** p<0,01, **p<0,05, *p<0,10*

Spain					
Dependent	**Explanatory**	**Coefficient**	**Std. Error**	**Z**	**P>|z|**
Property prices	GDP growth	-,000405	,0001298	-3,12	0,002***
GDP growth	Property prices	529,8144	110,7532	4,78	0,000***
Sweden					
GDP growth	FDIRE	-10,90643	6,590832	-1,65	0,098*
United Kingdom					
Property prices	FDIRE	-0,0040177	0,0021582	-1,86	0,063*
United States					
Dependent	**Explanatory**	**Lag**	**Coefficient**	**Std. Error**	**Z**	**P>|z|**
Property prices	FDIRE	1	-,0020506	,0009915	-2,07	0,039**
		2	-,0030417	,000698	-4,36	0,000***
Property prices	GDP growth	1	,0000206	,0000208	0,99	0,323
		2	,000053	,00000825	6,43	0,000***
FDIRE	GDP growth	1	-,0038507	,0074725	-0,51	0,611
		2	-,0058552	,0029623	-1,98	0,048**

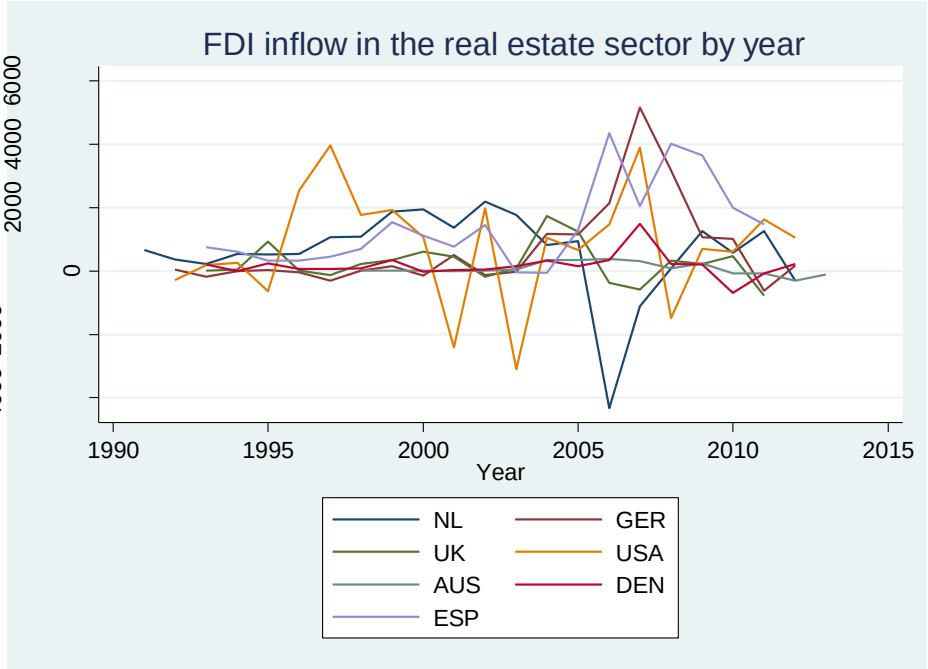

Figure 4a: FDI inflow in the real estate by year.

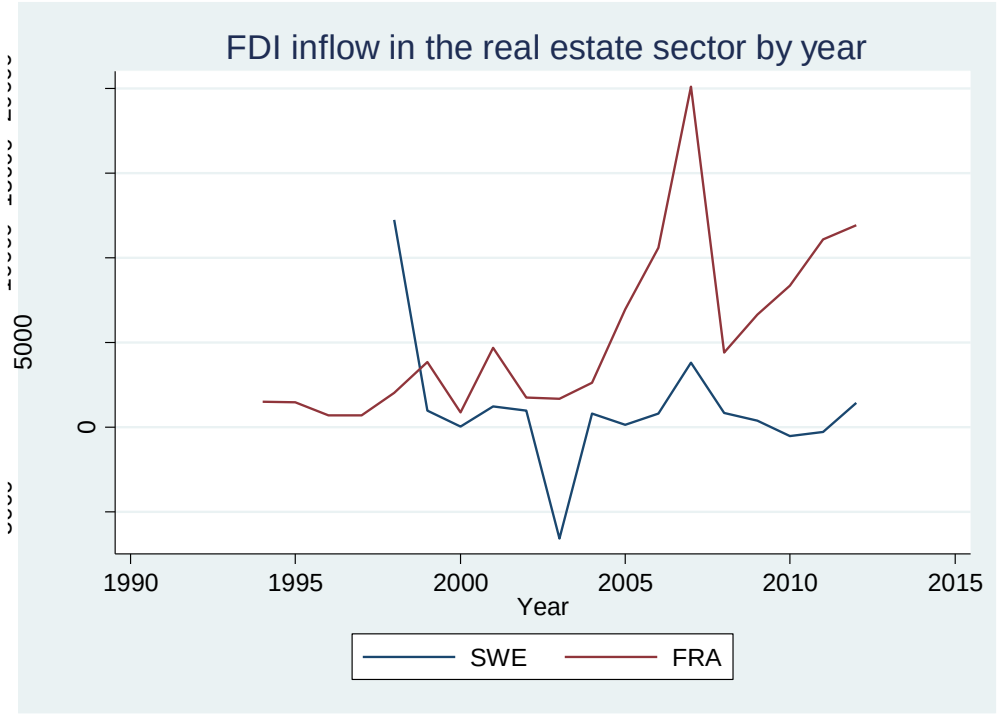

Figure 4b: FDI inflow in the real estate by year.

The location of the analysed countries situated on the European continent.

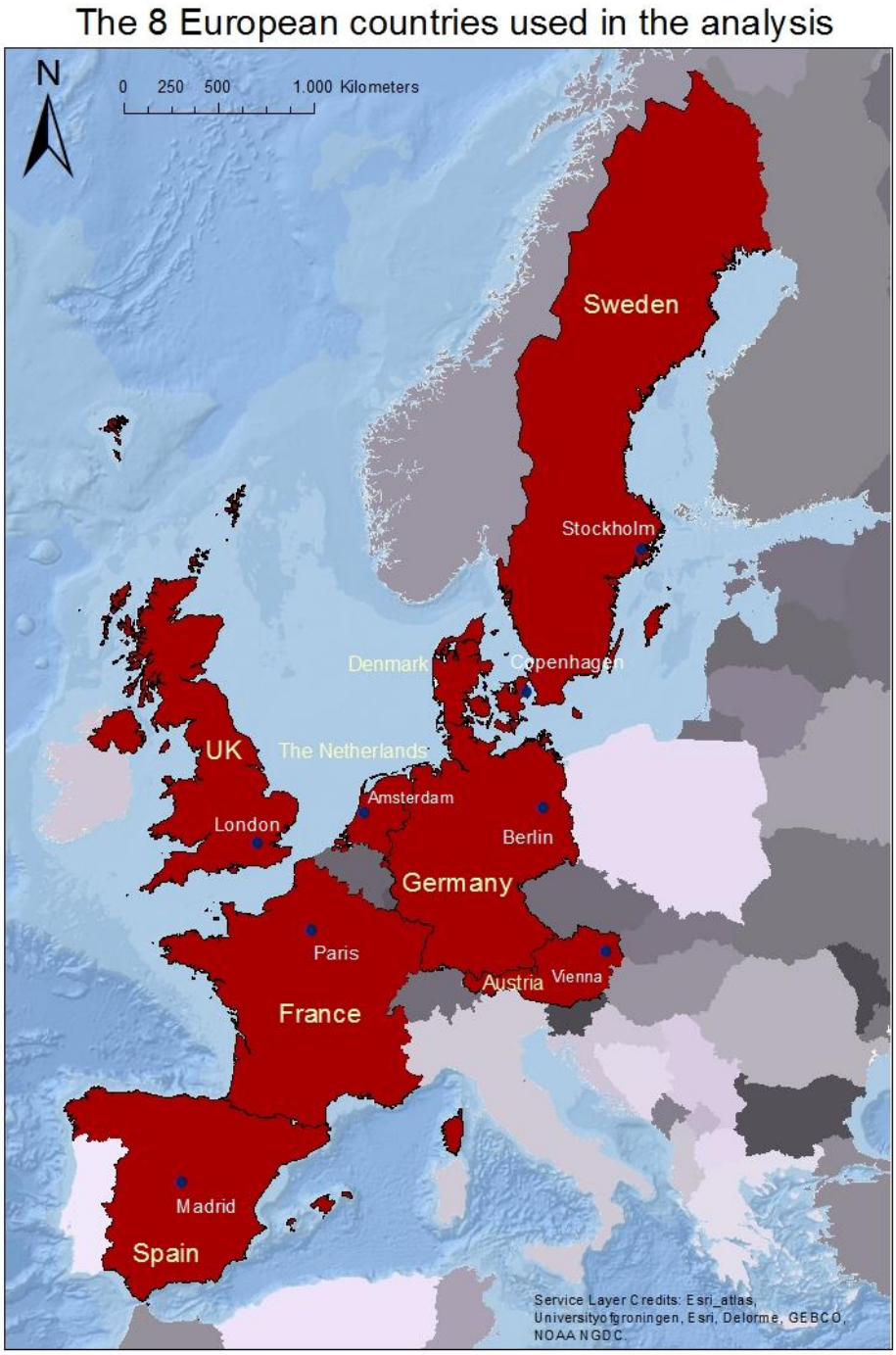

Figure 5: A more detailed overview of the countries in Europe that are part of the data analysis.