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Current Account Imbalances, House Prices, and Institutions

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Current account imbalances and housing price boom-bust cycles have become the defining characteristics of the pre-global financial crisis period. In the same period, it is observed that even though the developments of the economies show similar trends in many countries (e.g. an increase in credit supply, a decrease in interest rates), they have distinct characteristics (e.g. the volatility of house prices, and level of current account imbalances). Additionally, their final impacts on the economy vary to a significant degree from country to country. The institutional features of the markets (e.g. accessibility of credit information, protection of investors) have the potential to contribute to this differentiation. However, there are no studies on the effect of institutional features on the relationship between house prices and current account imbalances. The aim of this study is to examine the relationship between house prices and current account imbalances as well as the role of institutions in this relationship for 14 EU countries. To do so, a simultaneous equations model is used. The results of the empirical analysis show that in the 2007-2008 global financial crisis, there is a positive and significant relationship between house prices and current account imbalances, and institutional features have a potential role in the strength of this relationship.

Keywords

Current account imbalances, House prices, Credit channel, Institutions, European Union

1. Introduction

With the latest wave of financial liberalisation that started in the 1980s, many countries have mitigated or removed the obstacles in capital movements. Since then, capital movements have gained further momentum due to advanced technologies and the globalisation of capital. Thus, international capital movements have reached one-sixth of the world income as of 2007.[1] As a result of financial liberalisation, economies are increasingly integrated into international financial markets and the mutual dependency between economies has increased.

Financial liberalisation has presented some advantages for domestic markets, such as increasing foreign capital inflows, reducing the cost of capital, raising credit availability for borrowers, mitigating information asymmetry, decreasing adverse selection and moral hazard, and creating a more competitive environment in the domestic financial markets (Eichengreen et al, 2011; Broner and Ventura, 2016). However, in spite of its advantages, financial liberalisation has also raised some issues because it has an effect on both the pricing of domestic and global assets (e.g. housing, equities) and their production, excessive debt accumulation, and intensified and exacerbated contagion effects (Edelstein and Edelstein, 2020). For instance, with irreversibly integrated real and financial markets, an unprecedented increase in current account imbalances has occurred starting in the 1990s. It is accepted that current account imbalances are an economic problem.

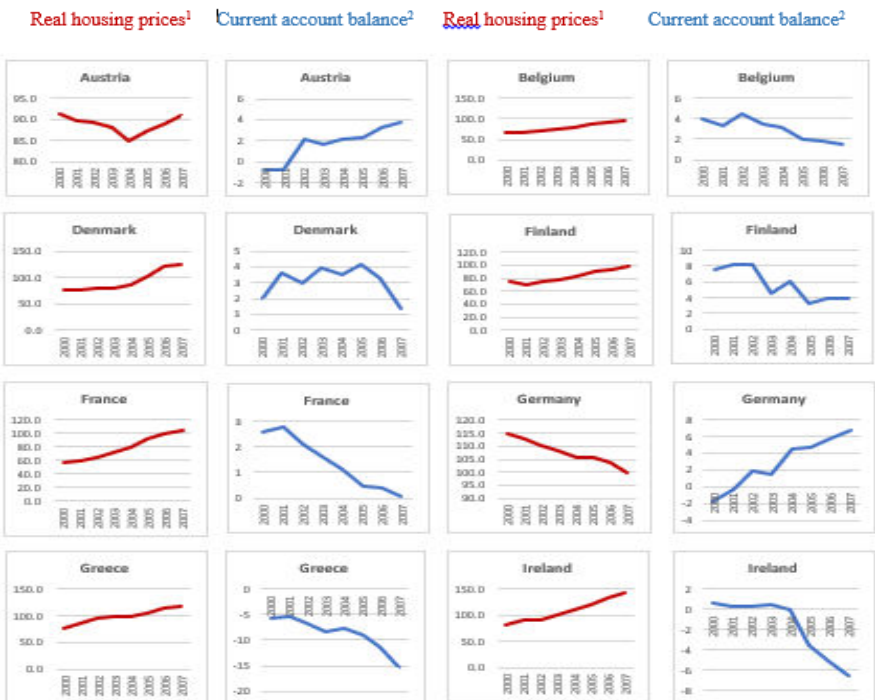
In addition, there has been a large increase in asset prices, especially house prices within the same time period. From 2000 to 2007, many economies experienced a house price boom, commonly defined as a period in which the price of an asset exceeds its fundamental value, (Xiong, 2013; Zhu and Milcheva, 2016). Igan and Loungani (2012) find that in this period of time, house prices rose 50% in real terms in the median advanced economies while they were up by almost 30% in the median developing countries.

Thus, current account imbalances and house price booms have become the defining characteristics of the period before the recent global financial crisis (i.e. the 2007-2008 crisis). The case of the European Union (EU), which is an example of the most advanced economic integration in the world, proves this because most of the EU member countries have experienced both house price booms and current account imbalances in the same period of time (Figure 1). This situation has led many researchers to question whether there is a correlation between house prices and current account imbalances. A literature review shows that many studies have focused on this relationship after the crisis by using different theoretical approaches, which include savings glut, banking

[1] As of 2007, the international capital movements were 11.8 trillion USD and the GDP (PPP) of the world was 65.4 trillion dollars (see International Monetary Fund, 2008).

glut, demand shock, and financial liberalisation hypotheses. In fact, if the degree of financial openness of economies had not increased to that extent especially since the beginning of the 1990s, and if capital had not globalised to such a level, and thus if monetary expansion had not increased in domestic markets to such a level, neither the savings glut, banking glut nor demand shock could have happened to such an extent, and then the two imbalances (i.e. house price boom and current account imbalances) might not have concurrently reached such a high level in many countries. Due to this, it can be suggested that financial liberalisation is one of the main reasons for the monetary expansion in domestic markets as well as for the increasingly close relationship between house price and current account dynamics. However, there are very few studies that examine this relationship by following the financial liberalisation approach. This study only finds one (Favilukis et al., 2012). Thus, there is a research gap on using the financial liberalisation approach to investigate the correlation between house price movements and current account imbalances.

Figure 1 Current Account Imbalances vs. Real Housing Prices (2000-2007)



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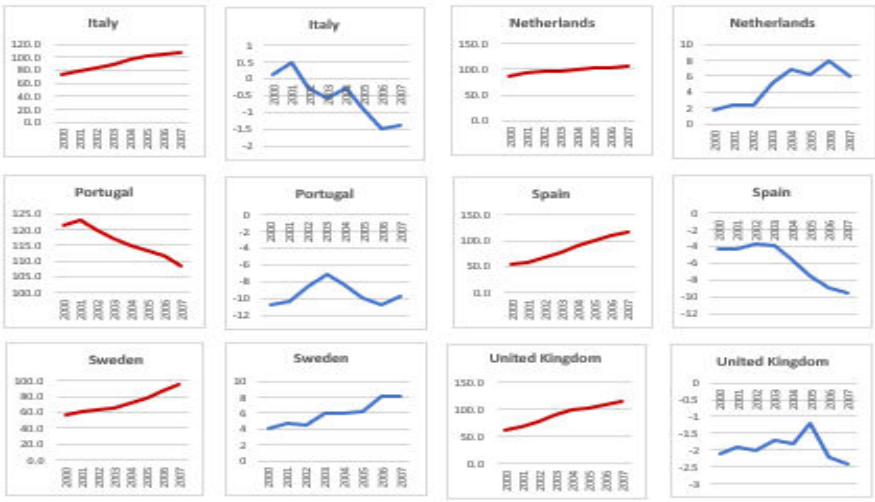


Source: International Monetary Fund (2017) and Organisation for Economic Co-operation and Development (2018).
(1) 2010=100
(2) As a percentage of GDP

With an increase in the degree of financial liberalisation, it is expected that monetary expansion and hence credit supply is increased in domestic markets and thus, interest rates decline and the credit affordability of households is increased. These developments are reflected in housing markets as an increase in housing demand results in an increase in house prices as well. Moreover, albeit similar in trends, they show different features. For example, in the EU, the volatility of prices changes from country to country and the degree of imbalance is also significantly different country by country. Between 2000 and 2007, the current account surplus to GDP ratio of the Netherlands and Sweden went up from 1.8% and 4% in 2000 to 6% and 8.2% in 2007, respectively, while the current account deficit to GDP ratio of Spain and Ireland declined from -4.4% and 0.6% in 2000 to -9.6% and -6.5% respectively in 2007 (International Monetary Fund, 2017). In the same period of time, real house prices went up 95% in Spain, 65.7% in Sweden and about 60% in Ireland (Organisation for Economic Co-operation and Development, 2018). Additionally, the final effects of these developments on the economy have varied to a significant degree. Some of the countries which had both a house price boom and current account imbalances faced a deep crisis (e.g. Ireland, Spain). Other countries meanwhile experienced a crisis but could mitigate its effects and recovered in a relatively shorter amount of time (e.g. the United Kingdom (UK)) (De Grauwe, 2012).

The institutional features of the countries (e.g. accessibility of credit information, protection of investors and regulation quality) can contribute to this difference. According to North (1990, p. 3), "Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction". Thus, regardless of which theoretical approach (e.g. conflict institutionalism, behavioural institutionalism, or structure-agency institutionalism) is taken, institutions influence the economy and produce differences among countries by affecting the distribution of resources and economic performance (North, 1994, Acemoğlu et al., 2005). It is assumed that with financial liberalisation, a country with more stable and market-friendly institutions can attract more foreign capital in the domestic market, and increase the accessibility of funds with a lower cost in the international markets (Okada, 2013; Mishkin and Eakins, 2016). In addition, capital inflows can be used more efficiently due to the higher quality of the institutional environment. For example, the features of governance (e.g. political quality, corruption, and law and order) and the institutional characteristics of the credit markets (e.g. property rights, investor protection and transparency) affect the volume of foreign capital inflows into the country and then magnitude of the monetary expansion and amount of credit supply as well as their distribution in the domestic markets (Klein and Olivei, 2008). Additionally, the institutional environment has an impact on mitigating or removing the negative effects of increased credit supply on the economy, such as the disruptive effects that large fluctuations in house price cause on the economy (e.g. current account imbalances). However, the existing literature shows that there are no studies on the effect of institutional features on the relationship between house price cycles and current account imbalances among the studies that focus on these two dynamics.

Thus, the aim of our study is to investigate the role of the institutional environment in the relationship between house prices and current account imbalances after exploring this relationship. For this purpose, two hypotheses are tested in this study. The first is that there is a relationship between house price cycles and current account imbalances largely via monetary expansion which is increased by increasing the degree of financial liberalisation. The second is that the institutions play a role in the relationship between both of these dynamics by affecting the extent to which monetary expansion will influence the domestic credit markets.

To test the hypotheses, a simultaneous equations model is used with the three-stage least squares (3SLS) technique. The findings show that there is a strong and positive relationship between house prices and current account imbalances, and that the institutional features cause the differentiation of this relationship.

The contributions of our study to the literature are an assessment of the effect of institutional features on the relationship between the house price and current account dynamics, and credit is identified as the main channel through which house prices may affect current account imbalances.

The paper is structured as follows: Section 2 provides a literature review and Section 3 presents an explanation of the theoretical framework. Sections 4 and 5 cover the methodology and data description, respectively. Section 6 discusses the main findings of the empirical analysis while Section 7 draws the main conclusions.

2. Literature Review

The current literature explains the relationship between house prices and current account imbalances by using different theoretical approaches: the savings glut, banking glut, demand shock and financial liberalisation hypotheses.

According to the global savings glut hypothesis, the saving levels in developing and emerging countries increased in the aftermath of the 1997-1998 Asian financial crisis, and a rise in oil prices increased the revenue of oil exporting countries (e.g. Bernanke 2005; Aizenman and Jinjarak, 2014; Sa and Wieladek, 2015; Maas et al., 2018; Miles, 2019; Ban, 2022). As a result, the current accounts of these countries have been in surplus. However, since the financial markets of these countries were not deep enough, and the volume of their secure investment instruments was not large enough to supply this demand, this 'surplus' was invested in the developed economies (e.g. the US). The foreign capital coming into these countries brought down interest rates in the domestic markets, which then led to the availability of more loans. An increase in loan availability for housing increased the demand for housing. The result was rapid house price movement.

The global banking glut hypothesis, which analyses the relationship between house prices and current account imbalances, speculates that foreign capital flows from various sources affect the credit terms in the US (e.g. Shin, 2011, 2012; Punzi and Kakuo, 2015). During the period preceding the global financial crisis, foreign banks made serious investments in long-term US. assets, but many of these assets were bought by European banks instead of China or the oil exporting countries.[2] Therefore, contrary to the argument posed by the savings glut approach, a predominant inflow of funds by European banks provided the grounds for the decline in interest rates and the relaxation of credit standards in the US financial markets. Shin (2011) first argues with the 'global banking glut' approach (i.e. cross border lending) that the significant role of European banks invalidates the global savings glut which falls short of explaining current account imbalances not only in the US, but also in other

[2] The sum of US assets held by foreigners was 7.8 trillion dollars in 2006 and 2007. It was as high as 9.8 trillion dollars. Of this number, European banks bought 3.2 trillion in 2006 and 4.2 trillion dollars in 2007. China, on the other hand, bought 699 billion dollars and 922 billion dollars worth of assets respectively within the same time frame (see Bario and Disyatat, 2011).

countries (e.g. Germany, Ireland and Spain).[3] His findings indicate that with the introduction of bank capital requirements in the Basel II Accord of the Eurozone and the use of a common currency (Euros), cross- border transactions have grown in the number and amount of loans lent by the surplus countries to the banking sector of the deficit countries. A similar situation exists in the US.[4]

Justiniano et al. (2014) and Punzi and Kauko (2015) have analysed the savings glut together with the banking glut to test their impact on markets. Using different methods, they reach similar conclusions which show that the volatility of house prices can be explained with capital that flows in through banking rather than securities issuance. In addition, some studies claim there was no savings glut before the 2007-2008 global financial crisis. Chinn and Ito (2007), Taylor (2008), Jinjarak and Sheffrin (2009) and In't Velt et al. (2011), all argue this point and claim that the instability in both current account and house price dynamics came about as an outcome of the economic policies in effect at the time.

A third approach - the demand shock hypothesis - explains the correlation between house prices movements and the dynamics of current account imbalances through domestic factors, such as credit and preference shocks (e.g. Laibson and Mollerstrom, 2010; Ferrero, 2015). A demand shock happens when the total demand in an economy increases (or decreases) suddenly and impacts the total spending levels and price of goods in the economy. As a result, an increase in total spending in the domestic markets triggers an increase in the price of goods, especially non-tradable goods, such as housing. According to this approach, the main drivers behind the house price boom and decline of the current account balance are domestic factors, with monetary factors only playing a minor role.

The fourth approach explains the relationship between the two dynamics by using a financial liberalisation hypothesis (e.g. Favilukis et al., 2012), which suggests that financial liberalisation provides the opportunity to easily reach funds in international markets and in a less costly way. This reflects on domestic markets as an increase in monetary expansion and a decrease in interest rates. Thus, these developments cause home buyers to more easily obtain less costly mortgage loans, and then housing demand and the borrowing of mortgage loans increase. The result is an increase in house prices driven by a constrained housing supply that cannot concurrently meet demand.

[3] In 2000, the ratio of current deficit/GDP of Ireland was -0, 4%, while that of Spain was -4%. By the end of 2007, the ratio for Ireland became -5, 3% and -10% for Spain. Within the same time frame, the current account /GDP ratio in Germany was -1.7% and 6.9% respectively (European Commission, 2011).

[4] The findings of Bertaut at al. (2012) show that European investors who were looking for a higher return bought personal assets rather than US treasury securities and by way of reducing the yield of U.S. assets, they affected the credit conditions.

In summary, the existing literature comprises many studies that have investigated the correlation between house prices and current account imbalances. Although different theoretical approaches are used, they reach a largely similar conclusion: that there is a negative and/or strong correlation between house prices and current account balance. However, based on the literature review, no study has yet examined the effect of institutions on the relationship between house price and current account dynamics.

3. Theoretical Framework

In light of the above, the aim of this paper is to explore the relationship of house price with current account imbalances strengthened by financial liberalisation. We show that the credit channel is the main channel that transmits the effect of house price changes to current account balance because there is a close relationship between house prices and credit supply.[5] After economic systems in the 1980s started to shift towards more deregulated systems, the degree of financial liberalisation increased. These developments, especially since the 1990s, have contributed to a large increase in monetary expansion and hence credit supply in the domestic markets of many countries (e.g. Milesi-Ferretti and Tille; 2011; McQuade and Schmitz, 2017; Burger et al., 2018). Thus, the relationship between credit and house prices has been significantly strengthened with an increasing degree of financial liberalisation (e.g. Wolswijk, 2006; Oikarinen, 2009). In this section, first, the occurrence of current imbalances in the economy is explained and then the effects on the current account imbalances of house price increases are presented.

'Current account balance' is important as an indicator of the economic and financial credibility of a country.[6] When the current account becomes unbalanced (i.e. a deficit or a surplus in the current balance), it is called 'current account imbalance'. With increased degree of liberalisation, current account imbalances are manifested as a 'deficit' rather than a 'surplus' in many countries. In the literature, it is generally accepted that a current account deficit becomes a threat when it exceeds 5% of the GDP (see Calvo, 1998; International Monetary Fund. Research Dept., 2000). In fact, the current account deficit threat threshold considered by the European Commission (EC) is lower (-4%). After the sovereign debt crisis in the Eurozone, the EC has considered the use of the "Macroeconomic Imbalances Procedure Scoreboard" (a publication on

[5] The findings of many empirical studies show that there is a strong linkage between credit and house price (e.g. Goodhart and Hoffmann, 2008; Anundsen and Jansen, 2013; Banti and Phylakti, 2019).

[6] The current account balance is the sum of net exports of goods and services, receipt or payment wages and interest earned on assets abroad (net primary income) and current payments for development aid to international organizations (net secondary income) (International Monetary Fund, 2008). It includes four major components: goods, services, current transfers and income.

the most recent indicators for identification of macroeconomic imbalances) for economic stability in the region since 2011. Its aim is to capture the internal and external macroeconomic imbalances. To achieve this, the EC determined the two current account threat thresholds (the deficit and surplus thresholds) for economic stability in addition to thresholds for other macroeconomic indicators (e.g. unemployment, activity rate, private credit debt). The EC accepted -4% and 6% as the threat thresholds for current account deficit and surplus, respectively (see European Commission, 2012). When a current account deficit is high and long-term, happens alongside excessive credit growth in domestic markets, and triggers consumption rather than investment, its financing may become increasingly difficult and its sustainability an impossible task.

To explain the current account imbalances, we use the Dornbusch model,[7] which continues to dominate the policy field (Krugman and Obstfeld, 1994; Rogoff, 2002). In this model, when an increase in money supply occurs in the domestic markets, prices will change. First, a new short run equilibrium will occur in the market and then financial markets will gradually reach a new long run equilibrium. After this process, three markets (domestic money market, foreign exchange market, and goods market) will come to a general equilibrium.

Figure 2 shows the Dornbusch model with a two-way relationship between production and current account. The AE curve ($AE= Y- a (Y)$) shows the first relationship between total production (Y) and total expenditures ($a(Y)$). Assuming that the total propensity to consumption is less than 1, an increase in income leads to higher net savings and the current account is defined as net savings. The XM curve, on the other hand, shows the current account, now defined as net exports. Imports are based on domestic demand while exports are based on foreign demand and both are dependent on the real foreign exchange rate. An increase in total income increases the total expenditures. Under a widely accepted assumption (the Marshal-Lerner condition),[8] an appreciation in the real foreign exchange rate decreases imports and increases exports and hence impacts the current account balance. As a result, it causes a shift in the XM curve.

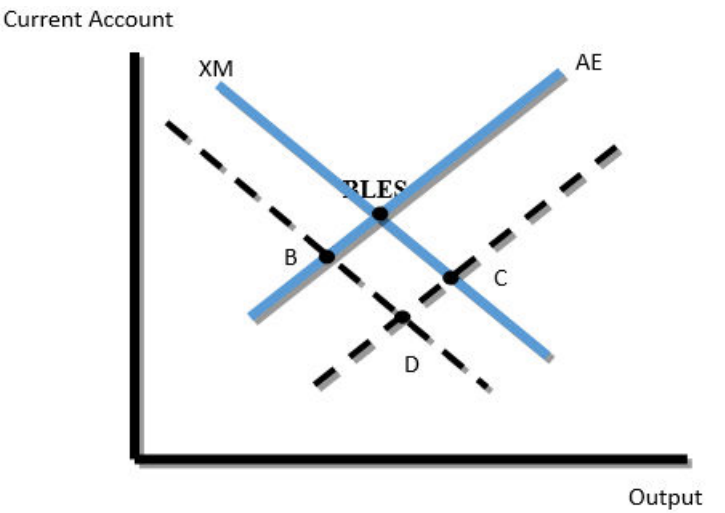
We can take Point A to represent the state of equilibrium of an economy. If a shock happens due to the external or domestic reasons, it can change this equilibrium point. For example, if a shock occurs for external reasons, the XM

[7] The Dornbusch model is based on balance sheet models (general equilibrium models) which have endeavored to understand how current account imbalances affect an economy as well as how other factors, such as microeconomic distortions, cause crises (IMF, 1999; and Rogoff, 2002).

[8] The Marshall-Lerner condition considers the impact of fluctuation on the balance of trade and refers to the condition where an exchange rate devaluation or depreciation will only cause a balance of the trade improvement if the absolute sum of the long-term export and import demand elasticities is greater than one.

curve shifts and the equilibrium of the economy changes. External shocks can come from developments in international markets (e.g. increasing money supply, decreasing the cost of borrowing) and cause increase in monetary expansion in domestic markets, thus strengthening domestic demand for goods even more via the credit channel. One of the main reasons for this can be increasing the degree of financial liberalisation[9] as seen in the pre-2007-2008 global crisis period. According to theory, financial liberalisation mitigates or removes government controls over financial markets and allows domestic financial markets to be more interconnected with international markets by increasing free capital movement from countries with fund surplus to countries with insufficient funds and increasing the cross border activities of financial intermediaries. The effect of increasing financial liberalisation on domestic markets has been an increase in credit supply, a decline in interest rates, and an increase in credit demand as well as demand for goods (see Obstfeld and Rogoff, 1996; Mishkin and Eakins, 2016). These developments may cause an increase in total consumption and investment, and a decrease in total savings in the economy. If the competitiveness of a country does not change (i.e. the net export curve remains as it is), the AE curve would shift, and the equilibrium point in the economy would shift from *A* to *C* (see Figure 2).

Figure 2 Dornbusch Model



[9] Financial liberalization was initially discussed in the 1970s by McKinnon (1973) and Shaw (1973). McKinnon (1973, p. 9) suggests that financial liberalization is an important ingredient in creating high saving rates and investment. Shaw (1973, p. 9) further argues that the subsequent real growth in financial institutions encourages domestic investors to borrow and save by lowering the cost of funding as well as allowing the accumulation of more equity.

Monetary expansion may also create shocks in the economy via housing markets by increasing the degree of financial liberalisation because of the importance of the housing sector in the economy and increasing house prices have quite different effects than increasing equity prices.[10] Thus, these can cause a shift of the equilibrium point in the economy by affecting house prices and then the current account balance. For example, a large increase in house prices may cause the AE curve (savings curve) or the XM curve (net export curve) or both to shift downwards and then, the new equilibrium point would be at Point B, C or D, respectively.

Increasing the money supply in domestic markets causes a decline in interest rates, an increase in the affordability of housing and an increase in credit demand for purchasing a house. Since housing supply cannot meet this increase in housing demand simultaneously, these developments can create house price increases. According to the financial accelerator mechanism, which suggests that there is a bidirectional relationship between credit and house prices (e.g. Bernanke and Gertler, 1995, Anundsen and Jansen, 2013), the occurrence of monetary expansion causes an increase in the credit supply of banks by affecting the level of interest rates as well as that of the external finance premium (the credit channel of monetary transmission). The credit channel changes the amount of credit in the economy by influencing both the overall lending of depository institutions and behaviour of households and firms, as well as the allocation of credit through two mechanisms: the bank lending channel and the balance sheet channel (i.e. the net worth channel). Both channels can play significant roles in housing markets by affecting the financial positions of both households and firms, which in turn, affects investment and spending decisions. When credit supply increases, households can choose to buy durable goods (e.g. housing), while firms choose to invest or buy more inventory.[11] An increase in low cost credit supply encourages an increase in housing demand and hence inflates house prices because housing supply cannot meet this increase in housing demand concurrently. Increasing house prices also encourages firms to invest in housing and raises the value of collateral secured against credit. Thus, the borrowing capacity of both households and firms will rise.

Thus, these developments may affect current account balances in many ways: house price increases create welfare and collateral effects which can transfer

[10] The housing sector has a privileged position in the economy among other sectors. It is important to note that, from a theoretical point of view, rising house prices have quite different effects than rising equity prices. Since the housing sector has several functions as consumer and investment goods in many economies, it is among the sectors that create a significant level of employment and added value in many economies. In addition, housing is not only just an asset, but also a large portion of the wealth of an average household. Moreover, housing represents the highest share among the total expenditures of households as well as a significant share of their future expenditure burdens in many countries (Meen, 2001; Fratzscher et al., 2010; Nenji et al. 2013).

[11] In this study, firm behavior will not be analysed in detail.

the change in house prices to current account balance by increases in their expenditures and the credit borrowing capacity of households. With increasing house prices, housing values increase, which facilitates borrowing of households more since housing is considered as a secure collateral for lenders (Iacoviello, 2005; Muellbauer and Murphy, 2008). They will be able to increase their expenditures for consumer goods. Consumption is increased by encouraging households to purchase locally produced goods as well as imported goods. Previous studies confirm the positive effect of house prices on consumption (e.g. Miles, 1992; Dong et al., 2017). On the other hand, increasing demand for consumer goods pave the way for less savings and widening the saving-investment gap and then current account deficits. As a result, rising house prices would cause homeowners to feel safer, save less, borrow more and spend more.

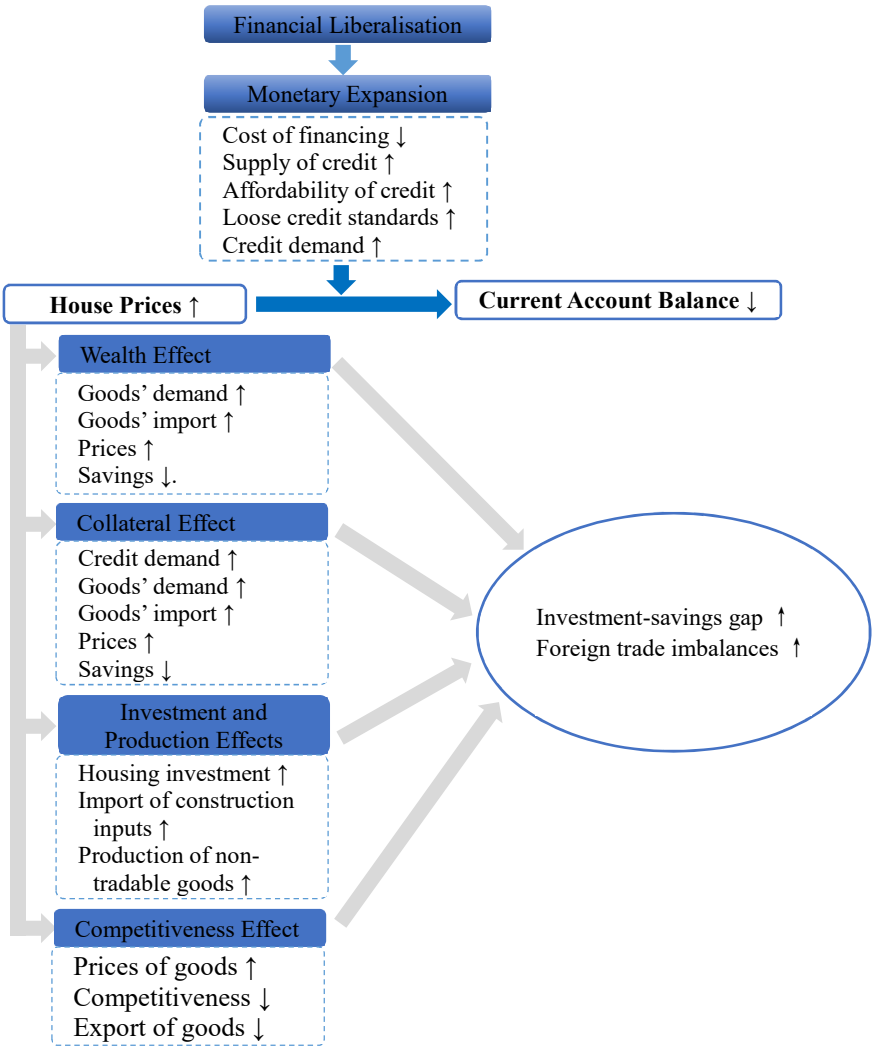
Another way of transferring the change in house prices to the current account is also through housing investment. This can be done in two ways. First, if the increase in housing construction costs is lower than the house price increases, constructing new housing is more profitable for home builders and they invest in housing more. Second, the collateral effect of housing can support new business investments. This effect of housing is not only created by the households but also by the home builders. The collateral value of housing including the land gives home builders the opportunity to enhance their credit borrowing capacity and finance other investments. In fact, Bernanke and Gertler (1995) show that the net assets of firms used as collateral are important to increase their credit borrowing capacity. Increasing both housing and other business investments may also lead to an increase in the import of construction inputs. Additionally, the increased profitability of housing investments can create a production-shifting effect and encourage the production of non-tradable goods (e.g. housing) by making them attractive to tradable goods producers (production effect) (Malliarapulos and Anastasatos, 2011).

On the other hand, the increasing demand for consumer goods means that their prices may go up, which may negatively influence inflation and then the competitiveness of the country in international markets (competitiveness effect) (Wyplosz, 2012). The result is a decrease in exports of the country. If prices increase simultaneously with foreign exchange appreciation, this negative effect can also be stronger.

In summary, with increasing degree of financial liberalisation, permanent monetary expansion in domestic markets can cause the credit channel to strengthen the wealth and collateral effects of housing as well as its other effects (e.g. investment and production effects). Thus, with the support of the credit channel, developments in the housing sector can have a strong shock on total consumption and investment and hence on total production and inflation in the economy. The consequences of all of the effects contribute to an increase in the investment-savings gap and foreign trade deficits, and therefore, a decline in current account balances (i.e. increase in current account imbalances). Figure 3

provides a broad picture of the effects of increasing house prices on current account balances supported by increasing credit supply. However, the effects on the current account balance of house price increases will depend on the magnitude of house price increases and the strength of the relationship of house prices with credit lending in addition to other factors (e.g. economic structure, the vulnerability of the economy to developments in the international markets, and institutional environment).

Figure 3 Relationship Between House Prices and Current Account Imbalances



4. Methodology

When testing the relationship between house prices and current account imbalances, it is argued that their relationship is largely created via a monetary expansion in the mortgage credit markets, which is itself created by financial liberalisation, and institutions have a role in this relationship.

In our empirical analysis, which covers the period between 1990Q1 and 2016Q4, the sample consist of 14 EU countries -Austria, Belgium, Denmark, Germany, Greece, Finland, France, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the UK.[12] Three of them -Denmark, Sweden and the UK – are non-Eurozone countries while the others are in the Eurozone. EU member countries are selected for the sample because most of them faced house price booms and current account imbalances concurrently.[13] To test the long term relationship between house price and current account dynamics, a simultaneous equation model with panel data is used given their potentially endogenous nature. Credit channel is also added to the model because this channel has played an important role in transmitting the developments in the housing markets to the macroeconomy (see Bernanke and Gertler, 1995; Taltavull De la Paz and White, 2012; Cesa-Bianchia et al., 2018). The size of credit lending for housing can be changed in the economy by influencing the overall credit supply and allocation of credit and then its effect on the macroeconomy.

Thus, our model consists of three equations: house price, credit, and current account balance equations. In a simultaneous equations model, every equation must be suitable *a ceteris paribus*, for causal interpretation in systems of equations to be considered. According to the assumptions of this model, some exogenous variables are also added to the system to ensure identification. We employ the 3SLS technique in the model, which yields a better estimation than the 2SLS method (Kennedy, 2008; Brooks, 2008).

The empirical analysis comprises two stages. The first stage explores the relationship between house prices and current account imbalances. The second stage investigates the role of institutions in this relationship.[14]

The first step of the first stage estimates the model according to the different periods. For this, three sample periods are considered: the entire period (1990-

[12] Although the UK officially withdrew from the EU on 31 January 2021, our sample includes the UK because the UK was still a member of the EU in the pre-and post- 2007-2008 global financial crisis periods.

[13] Data availability has limited the number of the EU countries considered in the empirical analysis.

[14] In this study, the house price effects on current account balance is focused examining the relationship between house prices and current account balance, and the examination of the effect of monetary movements (e.g. foreign capital inflows or credit supply) on current account imbalances was excluded.

2016), pre-crisis period (2000-2007) and post-crisis period (2008-2016). Thus, it is possible to compare the results before and after the 2007-2008 global financial crisis. The second step estimates the model by grouping the sample countries according to their current account balance/GDP ratio. In the grouping, we set the value regarded as the threat threshold of the current account deficit accepted by the EC for economic stability (European Commission, 2012) because our sample covers only the EU countries. If the current account deficit/GDP ratio of a country exceeds -4%, the EC considers this to be a threat to the economy. [15] The EC calculates this ratio based on the three-year backward moving average of the current account balance in GDP percentage.[16] According to this threshold, countries are divided into two groups; those with a proportion higher than the threshold value and those with a proportion equal to the threshold and sub-threshold values (see Appendix 1). The first group consists of four countries: Greece, Ireland, Portugal and Spain while the second group covers the rest of the EU countries in our sample.[17]

In this stage, we expect that there is a negative relationship between current account balance and both house prices and credit size in our model while credit size should show a positive relation with financial liberalisation and house prices.

In the last stage, the role of institutions in the relationship between house prices and current account imbalances is tested by taking into account our benchmark model which covers the entire period of 1990-2016. To do so, we consider the institutional characteristics that have an impact on the functioning of credit markets as well as governance. One assumption is that with financial liberalisation, a country with more stable and market-friendly institutions (i.e., high quality institutional environment) can attract more foreign capital in the domestic markets and increase the accessibility of funds with lower cost to the international markets and hence, increase monetary expansion in the domestic markets and then credit supply. Another assumption is that since a high quality institutional environment can positively contribute to the development of the economy and thus, the development of the credit markets, this institutional

[15] To address the sovereign debt crisis, the EU introduced the macroeconomic imbalance procedure (MIP) in 2011. The aim of the MIP is to prevent and address the emergence of potentially harmful macroeconomic imbalances that could adversely affect the economic stability in a particular EU country or the EU as a whole including the Eurozone as well as the non-Eurozone. In order to detect potentially harmful imbalances, a scoreboard has been implemented which consists of a combination of stock and flow indicators. One of them is the current account balance to GDP ratio (%). This criterion is applied to all the EU countries, and not only the countries in the Eurozone. For more information see European Commission (2012).

[16] While grouping the countries according to the deficit criterion, the arithmetic mean of their current account balance /GDP ratio for the period of 2005-2007 is taken into account in the calculation of the threshold value of the deficit (see Appendix 1).

[17] The second group covers 10 countries which consist of Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Sweden and the UK.

environment can mitigate and /or reduce the negative effects on current account balances from increasing house prices that are caused by a greater housing demand with increasing credit affordability of home buyers.

In last stage of the analysis, first, our benchmark model is estimated through the classification of countries according to the quality of the institutional environment, which affects the performance of the credit markets. To do so, we use the Institutional Index produced by the World Economic Forum (WEF).[18] This index covers the features of legal and administrative frameworks that reflect the behaviours of both public and private stakeholders and their efficiency. Then, the sample countries are divided into two groups by considering the EU (28) average:[19] countries with a high institutional quality (i.e. EU average or above) and countries with a low institutional quality (i.e. below the EU average). In our sample, four countries have a low institutional quality: Greece, Italy, Portugal and Spain, while the rest have a high institutional quality (see Appendix 2).

Secondly, the institutional features related to the governance of a country are incorporated into the analysis. Governance entails the traditions and legislations that are used to ensure law and order in order to maintain a society (Aidt et al., 2008; Kaufmann et al., 2010). Mechanisms that are used to enable governments to create and implement logical and fair principles that foster socio-economic development and an efficient public sector are involved. The governance variables of the World Bank are used as is the case in previous studies (e.g. Bekaert et al., 2005; Klein and Olivei, 2008). They are in the indices produced by Kaufman et al. (2020). The institutional variables are included in the credit equation of our model because the impact of institutions on the relationship of house prices with current account imbalances transmits to this relationship via the credit channel. We consider six governance indices which are separately handled as exogenous variables in the model. They are regulation quality, the rule of law, government effectiveness, control of corruption, voice and accountability, and their average. Thus, it becomes possible to infer whether different institutional features may differentiate the relationship between house prices and current account imbalances.

To the best of our knowledge, this is the first study that investigates the role of the institutions in the relationship between house prices and current account imbalances. In addition, it is the second study that explains this relationship through a financial liberalisation approach (after Favikulus et al., 2012). Nonetheless, although the study is built on the same theoretical framework, it is different from Favikulus et al. (2012) in some respects because the credit channel is included. In addition, a different financial liberalisation indicator -

[18] The Institutional Index is one of the sub-indices developed by the WEF (see Schwab, 2016).
[19] During the pre-crisis period, the number of EU member countries was 28, and became 27 after the UK officially withdrew from the EU on January 31, 2020.

the financial openness index in Chinn and Ito (2006) is employed. Finally, we also improve the estimation procedure by using a simultaneous equation model and 3SLS estimation procedure.

4.1. Model Specification

As aforementioned, we investigate our proposition by examining a model with three equations. They are the house price, credit and current account balance equations. To investigate the relationship between house prices and current account imbalances, it is assumed that other variables remain constant under the assumptions of the simultaneous equations model. The equations that aim to estimate the long-term relations are given below.

House Price Equation
In the house price equation, our cross-country approach is based on the housing demand-supply profile. The neo-classical framework points out that house prices are determined by the interaction of housing supply and demand. House prices can be determined from the reduced form equilibrium function derived from demand and supply functions. The literature review shows that there is a consensus on the variables that affect house prices. Price determinants on the demand side of housing are household income, credit availability, interest rates and demographic factors, land and construction costs, existing house stocks, and residential construction while land costs, housing depreciation, transaction costs, credit availability and financing cost exist on the supply side (see Meen, 2001; Bahmani-Oskooee and Ghodsi, 2018).

Thus, the house price equation of the model covers the most explained variables of the determinants of house prices and shows the long- run linkages among house prices, economic growth rate, long-term interest rates, and private credit to GDP and actual residential construction to GDP.[20] This equation is:

$$hprice_t = \alpha_1 gdpgrowth_{t-1} + \alpha_2 credit_{t-1} + \alpha_3 lint_{t-1} + \alpha_4 resconstgdp_{t-1} + U_1 \quad (1)$$

where real house prices (*houseprice*) are positively related to economic growth (*gdpgrowth*), credit size (*credit*) and residential construction (*resconstgdp*) while house prices have a negative relationship with long-term interest rate (*lint*).

Credit Equation
The credit equation which shows the determinants of the credit size in domestic markets is the second equation in our simultaneous equations model. By following Bernanke and Gertler (1995) and Calza et al. (2003), our credit model is built on the standard model, which covers the financing cost of lenders and economic activity.

[20] Data availibility as long time series have affected the selection of the supply indicator.

The degree of the financial liberalisation (or financial openness) of an economy, house price and current account variables are also included in the credit equation to test our hypothesis. Thus, our credit equation shows the long-term relationship of credit size with economic growth rate, short term interest rates, house prices, degree of financial liberalisation and current account balance. The credit equation of the simultaneous equations model is:

$$credit_t = \alpha_1 gdpgrowth_{t-1} + \alpha_2 hprice_{t-1} + \alpha_3 sint_{t-1} + \alpha_3 kaopen_{t-1} + \alpha_4 curacc_{t-1} + U_2 \quad (2)$$

where the size of credit lent in the economy proxied by private credit to GDP ratio (*credit*) is positively related to the economic growth (*gdpgrowth*), house prices (*hprice*) and financial openness (*kapoen*) while negatively related to short term interest rates (*sint*) and current account imbalances (*curacc*).

Current Account Balance Equation

The third equation of the model is a current account balance equation which includes the determinants of the current account balance in the economy. The literature review indicates that there is no single theoretical model to explain the determinants of the current account balance. The estimation strategy of the determinants of the current account balance is built on an intertemporal current account model[21] by following previous studies (e.g. Chinn and Prasad, 2003; Gossé and Serranito, 2014; Brumm et al., 2019). According to the intertemporal approach, international funds are under free capital mobility and, directed to locations where higher returns are offered. Free capital mobility serves to maximise resource utilisation and financial accounts serve as buffer stock. We follow the intertemporal approach because the sample covers developed countries[22] and adapt the specifications proposed by Chinn and Prasad (2003) as in previous studies (e.g. Gruber and Kamin, 2007; Cheung et al., 2013).

We differ from Chinn and Prasad (2003) with the inclusion of private credit to GDP ratio instead of money supply (M2) to GDP ratio as an indicator of financial development as found in Cheung et al. (2013) and Dybka (2017). Another difference is that house prices are added to the current account balance model like Ban (2018) in order to test our hypotheses. In contrast to all previous studies on current account balance model specifications, our model includes

[21] Other models are commonly based on the 'portfolio approach' and 'development approach'. According to the portfolio approach, the growth of foreign assets held by a country and the scope of this portfolio will have an impact on current account balance through two effects (i.e. portfolio growth and portfolio rebalancing effects) (see Kraay and Ventura, 2000; Ventura, 2001) The stages of the development approach for less developed countries generally need more external sources on the way to shift to a more developed category and, therefore, import more foreign capital, causing such countries to have a larger current deficit (see for e.g., Chinn and Prasad, 2003; Ca Zorzi et al., 2012).

[22] Empirical studies confirm the intertemporal approach for developed countries and show that financial accounts serve to finance current accounts (see Wong and Carranza, 1999; Yan and Yang, 2012).

only the strongest explanatory variables of current account balance.[23] They are economic and population growth, government fiscal balance and financial development. The current account equation is:

$$curacc_t = \alpha_1 gdpgrowth_{t-1} + \alpha_2 fiscalbalance_{t-1} + \alpha_3 propgrowth_{t-1} + \alpha_4 credit_{t-1} + \alpha_5 houseprice_{t-1} + U_3 \quad (3)$$

where the long-term relationship that links current account (*curacc*) is positively related to economic growth (*gdpgrowth*) and government fiscal balance (*fiscalbalance*) while negatively related to population growth rate (*popgrowth*), financial development (*credit*) and house prices (*hprice*).

The endogenous variables of our model are house prices, credit size and current account balance, while the others are treated as exogenous variables. All of the variables included in the model are in real terms deflated by the consumer price index (2010=100) and all exogenous variables are lagged by one year. In addition, the level variables (i.e. house prices) are considered in their logarithmic form.

Our first testable hypothesis is that there is a relationship between house prices and current account imbalances, which is largely due to the monetary expansion that is increased by financial openness. If this hypothesis is correct, one of our expectations is that there is a positive relationship between credit size and both house prices and financial openness. An increasing degree of financial openness will make it easier for domestic institutions to access financial markets and facilitate foreign capital inflows. As a result, monetary expansion and hence credit supply can increase in domestic markets and financing cost will decrease. With low interest rates, the affordability of borrowers will increase. Such a situation can trigger demand for housing and therefore, push house prices upwards while increasing house prices lead to more borrowing by home buyers.

Another expectation is a positive relationship between current account imbalances and house prices. In other words, it is expected that there is a negative relationship between house prices and current account balances. Increasing house prices may lead to current imbalances in five channels: the welfare, collateral, production, competitiveness and investment channels (see Figure 3).

[23] For this aim, we apply a panel regression method as is the case in most previous studies (e.g. Chinn and Prasad, 2003; Ca'Zorzi et al., 2012; Brumm et al., 2019) by considering the determinants of current account balances in the current literature. The estimation results are statistically consistent with those of previous studies in relation to the signs of the estimated coefficients and their significance. Then, four of them are chosen as the determinants of current account balances because they are the strongest explanatory variables.

4.2. Data Description

In the empirical analysis for the period between 1990 and 2016 (yearly), the main data resources are: the World Bank, International Monetary Fund (IMF), European Central Bank (ECB), *statistical office* of the *EU* (Eurostat) and the Organisation for Economic Co-operation and Development (OECD) (Chinn, and Ito, 2006; Kaufmann et al., 2010). The yearly panel dataset with both their notation and sources are included in Appendix 3. All of the variables are included in the model as endogenous or exogenous variables during the estimation of the model except for the consumer price index. The consumer price index (2010=100) is used for converting the variables at nominal values to real values. The descriptions of the variables in the model are reported below.

House prices: House prices are one of three endogenous variables in the model. The house price index (2010=100) is used to represent house prices. The house price index shows the changes in annual house prices. Increasing house prices are expected to cause house buyers to borrow more and reduce the current account balance. The sign of the coefficient of the house price variable is expected to be positive in the credit equation and negative in the current account balance equation.

Current account balance: The second endogenous variable is current account balance in the model. The ratio of the current account balance to GDP is taken as an indicator of this variable. This ratio is the measurement for the balance of trade, factor income or net primary income. The current surplus shows that the net assets of a country exceed its liabilities, while current deficit indicates the opposite. It is expected that current account balance has a negative relationship with both house prices and credit size (i.e. financial development).

Credit size: The third endogenous variable of the model is the amount of credit lent to the private sector (i.e. households and companies). This indicator is also widely accepted in the relevant literature as a measure of the financial development of an economy (King and Levine, 1993; Beck, 2007; Yao, 2011). Financial development is one of the determinants of current account balance because it has a potential effect on determining saving-investment balance apart from conventional macroeconomic ones. Thus, the share in the GDP of the credit to the private sector through deposit money banks and other financial institutions is taken into account as an indicator of credit size and in the financial development variables. The expected sign of this variable is positive and negative in the house price and current account equations respectively.

Financial liberalisation: Financial openness is one of the determinants with a potential effect on investment-saving balance in an economy. Financial openness indicates the extent to which a country is open to financial cross-border transactions (e.g. foreign capital inflows and outflows). Since increasing financial openness can facilitate the accessibility of domestic financial institutions to international markets and increase foreign capital inflows, it is

expected to pave the way for an increase in monetary expansion and hence, the credit supply in domestic markets. Financial openness is measured by the financial openness index in Chinn and Ito (2006). This index is based on binary dummy variables. The variables codify the tabulation of restrictions on cross-border financial transactions reported in an IMF publication, the *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).* It is expected that the coefficient of this variable will be positive in the credit equation.

Interest rates: Our model covers both short and long term interest rates. The long term interest rate in the house price equation is the indicator of the borrowing cost for home buyers while the short-term interest rate in the credit equation indicates cost of obtaining funds for financial intermediaries. As long term interest rates for mortgage loans cannot be found as a long time series for all of the countries considered in the analysis, 10-year government bond interest rates are taken into account. Short term interest rate in the credit equation includes the interest rates through which short term borrowings (overnight, 1–12 months) between financial institutions are realised in the markets or the rates through which short-term government securities are issued or traded in the financial markets. The expected signs of the coefficients of the interest rate variables are negative.

Housing supply: In the model, the share of the actual housing construction in the GDP is taken as an indicator of housing supply. Actual housing construction (not sales) is part of gross fixed capital formation. As increasing house prices can encourage housing investment, there is a positive relationship between house prices and housing construction. Thus, the expected sign is positive.

Economic growth: One of the determinants of the three endogenous variables of the model is economic growth. Economic growth shows the change in the amount of goods and services produced at a given time in the economy. It is also an indicator of the change in total income as well as the economic activity in a country. More production may increase the volume of export and improve the current account balance. Thus, economic growth is included in the three equations of the model. The expected sign of the coefficient of the economic growth variable is positive.[24]

Fiscal balance: Gross government budget to GDP ratio is taken as the measurement of financial balance. Decreasing deficit of the public sector budget and hence, improved financial balance, positively affects the current

[24] In fact, in the current account balance equation, the sign of this variable can change in relation to the sources of economic growth. If there is economic growth, the increase in export of goods is larger than that in import of goods. We expect that this improves trade balance and positively affects the current account balance in the future. In this case, the expected sign of the coefficient of this variable is positive in the current account equation, otherwise negative.

account balance. Otherwise, it will be the opposite. The expected sign of the variable is positive.

Demographic factor: Another factor that determines the current account balance is the demographic changes in a country. Demographic factor, i.e. population, affects the differences between investment and savings in an economy. It is expected that an increase in population increases consumption and decreases savings. The expected sign is negative.

Institutional index: This index shows the quality of the institutional environment in the economies in 2016. The Institutional Index is one of the sub-indices of the Global Competitiveness Index developed by WEF. It covers 21 institutional features, such as property rights, judicial independence, strength of investor protection, ethical behaviour of firms, efficacy of corporate boards, strength of auditing and accounting standards, etc. (see Schwab, 2016).

Regulation quality: This reflects the ability of a government to establish strong policies and make regulations that govern the private sectors, and put them into force. The expected sign is positive.

Rule of law: The rule of law measures the extent of confidence in the quality of the legal arrangements and societal perception of law and social order. The expected sign is positive.

Control of corruption: This variable measures social perceptions of the extent that public power is used for personal gain and different forms of corruption. The expected sign is positive.

Government effectiveness: This variable measures the perceptions of society of the quality of public and civil services and the reputation of the government in framing and implementing policies. The expected sign is positive.

Voice and accountability: These reveal how society perceives for example, the freedom to participate in elections, freedom of speech and the presence of free media. The expected sign is positive.

Institutional average: This shows the arithmetic average of the five governance indicators (i.e. regulation quality, rule of law, control of corruption, government effectiveness, and voice and accountability). The expected sign is positive.

5. Empirical Analysis and Main Findings

5.1. Relationship Between House Prices and Current Account Imbalances

The first stage of the empirical analysis covers an investigation of the relationship between house prices and current account imbalances.[25] First, this relationship is tested in three different periods of time. Thereafter, the relationship is examined by grouping the countries in accordance with their current account imbalance level. The estimation results of both can be seen in Tables 1 and 2 respectively. In these tables, Panels A, B and C show the house price, credit and current account balance equations, respectively.

In Table 1, Model 1 covers the entire period (1990-2016). Models 2 and 3 refer to the pre-crisis (2000-2007) and post-crisis (2008-2016) periods respectively. The test results confirm a relationship between house prices and current account dynamics largely by increasing the credit supply due to financial liberalisation. In Model 1, the signs of the coefficients of all of the variables are as expected. They are also statistically significant except for two variables, that is, short-term interest rates (*sint*) and economic growth (*gdpgrowth*) in Panels B and C respectively.

In Panel A of Model 1, house prices have a positive relationship with economic growth, credit and housing construction, but a negative relationship with long term interest rate. The predictive results are statistically significant. A 1% increase in housing investment, income and credit demand causes an increase in house prices by 0.5695%, 0.2408% and 0.0018%, respectively. A 1% decline in credit interest rates increases house prices by 0.01600%. The economic growth and housing construction variables account for most of the variance in the house price equation. The same results are true for pre-crisis (Model 2) and post-crisis (Model 3). However, although the direction of the relationship between house prices and credit size in the Model 3 is as expected, it is not statistically significant. This can be due to the deterioration in the financial structure of the institutions, particularly due to the substantial increase in delinquencies and foreclosures in many of the EU countries (e.g. Spain, the UK), as in the US (International Monetary Fund, 2011).

Panel B of Model 1 shows that a 1% increase in the economic growth, financial openness and house prices would lead to an increase in credit size by 2.3902%, 1.3596% and 15.27255% respectively. A 1% drop in short-term interest rates positively influences the amount of credit lent by financial intermediaries, thus leading to an increase of 0.48304%. On the other hand, the predictive results indicate that among the determinants of credit lending, the effect of change in house prices on credit size is much higher than the other variables (15.27255%).

[25] Stata statistical software package (2015 version) was used for the empirical analysis.

This finding is consistent with previous studies (e.g. Goodhart and Hofmann, 2008 and Jordà et al., 2015) and shows that there is a strong relationship between house prices and credit supply.

Nevertheless, in Panel B of Models 2 and 3, the anticipated impact of the short term interest rates over credit size seems to have disappeared. This may be due to the disconnection from some of the fundamentals that drive housing demand and supply if house price increase or decrease occurs significantly as seen during the pre- and post-global crises. In fact, this is also possibly valid for the expected impact of financial liberalisation on the credit supply in the post-crisis period (Panel B of Model 3).

Table 1 Estimation Results According to Different Periods

		Entire Period (1990-2007)	**Pre-crisis (2000-2007)**	**Post-crisis (2008-2016)**
		Model 1	**Model 2**	**Model 3**
Panel A: House Price	$gdpgrowth_{t-1}$	.24081***	.20073**	.34289***
		(0.000)	(0.000)	(0.000)
	$credit_{t-1}$	.00180***	.00290**	.00028
		(0.000)	(0.000)	(0.281)
	$lint_{t-1}$	-.01600***	-.02138	-.00836**
		(0.001)	(0.465)	(0.023)
	$resconsgdp_{t-1}$	.05695***	.04259***	.02757***
		(0.002)	(0.000)	(0.000)
	cons	.01553***	.02090***	.00755***
		(0.000)	(0.000)	(0.000)
	Chi2	950.38	168.61	360.23
	R-sq	0.7703	0.5740	0.7566
	P-value	0.000	0.000	0.000
Panel B: Credit Market	$gdpgrowth_{t-1}$	2.39022***	1.64447	3.27164
		(0.025)	(0.373)	(0.322)
	sin_{t-1}	-.48304	2.47316	4.80714
		(0.694)	(0.341)	(0.105)
	$kapoen_{t-1}$	1.35968***	2.78135***	-.44961
		(0.010)	(0.004)	(0.765)
	$hprice_{t-1}$	15.27255***	37.87644***	21.12862
		(0.004)	(0.006)	(0.417)
	$curacc_{t-1}$	-1.51615***	-.39245	-.83154
		(0.000)	(0.574)	(0.207)
	cons	-.60023	-3.16159**	1.43531
		(0.305)	(0.019)	(0.393)
	Chi2	50.04	22.92	12.01
	R-sq	0.0848	0.1134	0.0826
	P-value	0.000	0.000	0.000

(***Continued…***)

(Table 1 Continued)

		Entire Period (1990-2007)	Pre-crisis (2000-2007)	Post-crisis (2008-2016)
		Model 1	**Model 2**	**Model 3**
Panel C: Current Account Balance	gdpgrowth $_{t-1}$	.06992	.26236	.06207
		(0.483)	(0.165)	(0.676)
	popgrowth $_{t-1}$	-.02742***	-.03386***	-.01097
		(0.000)	(0.000)	(0.152)
	fiscalbalance$_{t-1}$	.51181***	.88287***	.58328***
		(0.000)	(0.000)	(0.000)
	credit $_{t-1}$	-.01748**	-.01316	.01110
		(0.014)	(0.255)	(0.290)
	hprice$_{t-1}$	-4.73671***	-7.72205***	-5.90322***
		(0.000)	(0.000)	(0.001)
	cons	.27873***	.43978***	.28866***
		(0.000)	(0.000)	(0.000)
	Chi2	163.61	185.85	57.33
	R-sq	0.3635	0.6031	0.3343
	P-value	0.000	0.000	0.000
	Observations	277	112	111

Notes: *p*-values are provided in parentheses. (***), (**) and (*) indicate statistical significance at 1, 5 and 10 percent, respectively.

Panel C of Model 1 shows the expected signs of the coefficients of the determinants of the current account balances. Government fiscal balance and economic growth have a positive effect on the current account balance while population growth has a negative impact on it. The effect of government fiscal balance is also higher than that of population growth and economic growth. In addition, the estimation results are statistically significant except for economic growth. The sign of the coefficient of the credit size variable, which is also regarded as an indicator of financial development, is negative and statistically significant. In this case, it can be argued that the developed financial sector can negatively affect the investment-savings balance by reducing precautionary savings in the developed economies of the EU. This result is consistent with previous studies that cover the developed countries (e.g. Chinn and Ito, 2008; Gruber and Kamin, 2007). Furthermore, Model 3 shows that the relationships of both financial development and population growth with current account balance are not statistically significant although their coefficients are as expected. Additionally, the greater impact of fiscal balance on the current account balance does not change in the shorter periods of time– i.e. 2000-2007 and 2008-2016 (see Panel C of all three models).

The estimation results of the benchmark model (Model 1) show a significant relationship between the three endogenous variables (i.e. house price, current

account balance and credit supply). A 1% increase in real house prices leads to a decline in the current account balance by 4.73671% while a 1% increase in the house prices positively affects the credit size and leads to an increase in the credit size by 15.27255%. Panel B of Model 1 shows that a 1% increase in the credit supply positively affects house prices but causes a decline in the current account balance by 1.51615%. This is also the case for the financial development variable (i.e. private credit to GDP ratio) in Panel C.

Overall, increasing house prices cause an increase in current account imbalances. Additionally, as expected, there is a positive relationship between credit supply and house prices as well as financial openness. Moreover, Model 2 shows that the relationship between the endogenous variables is stronger in the pre-crisis period. A 1% increase in house prices affects the amount of credit supply and a much more steeper decline in the current account balance by about 70% and 63% respectively (see Panels B and C). This result is expected and shows that in the pre-crisis period, which has the largest increase in credit supply in the domestic markets, the relationship between credit and house prices is stronger than before. Model 3 shows that the signs of the coefficients of these three endogenous variables remain consistent as those of the other periods.

Table 2 shows the estimation results of countries grouped by their current account imbalance levels. Model 4 includes the estimation results for countries with current account imbalances within or below the threat threshold (-4%) whereas Model 5 includes those over the threat threshold.

The results of both Models 4 and 5 are largely similar to each other in respect to the signs of the variables and their significance. There is a negative and significant relationship between house prices and current account balances in both groups while financial openness has a positive effect on the size of the credit supply in the domestic markets. However, the impact of financial openness on the credit markets is more powerful in countries over the threat threshold than in the other group (i.e. Panel B of Model 5). Financial openness increases the credit supply in these countries 60% more than it does in the countries with current account imbalances within or below the threshold (-4%). One of the reasons may be differences between the countries related to other factors, such as the structure of economy, sensitivity to external developments and the institutional environment. For example, the sovereign debt crises have shown that the economies over the threat threshold (e.g. Greece and Spain) are more vulnerable than others.

This reflects the relationship between house prices and the current account balance in Panel C. The group which has a higher credit supply also has higher current account imbalances. Thus, the findings show that despite the group that falls within or below the threshold (i.e., Model 4), increasing house prices have a less detrimental impact on current account balance than the group over the threat threshold (Model 5). A 1% increase in house prices negatively affects the

current account balance in the countries that do not exceed the threat threshold by -1.08272% in Panel C of Model 4, while the other group has more negative effects, which is more than eight folds (i.e., -8.89089%).

From this, it can be concluded that financial liberalisation has similar effects on the domestic markets of both groups in Panel B. That is, financial liberalisation causes an increase in the credit supply of the domestic markets, but differences in their current account balance/GDP ratio separate the effects of increasing credit supply on the economy. Another similarity between the two groups of countries is that the relationship between interest rates and credit size is not as expected and statistically insignificant. One of the reasons for this may be the exceptional circumstances of the sample period, such as the existence of house price and credit booms-busts and current account imbalances together.

Table 2 Estimation Results for Different Levels of Current Account Imbalances

		Countries with CAB ≤-4%	**Countries with CAB >-4%**
		Model 4	**Model 5**
Panel A: House Prices	$gdpgrowth_{t-1}$	.27212***	.19514***
		(0.000)	(0.000)
	$credit_{t-1}$	.00228***	-.00168
		(0.000)	(0.144)
	$lint_{t-1}$	-.03727***	-.00819
		(0.000)	(0.397)
	$construc_{t-1}$	.08453***	.05394***
		(0.000)	(0.000)
	constant	.01108***	.02437***
		(0.000)	(0.000)
	Chi2	751.44	296.36
	R-sq	0.7775	0.7925
	P-value	0.000	0.000
Panel B: Credit Market	$gdpgrowth_{t-1}$	3.97599***	.87742
		(0.009)	(0.481)
	sin_{t-1}	.68987	1.00254
		(0.687)	(0.522)
	$kapoen_{t-1}$	1.11598	1.79971***
		(0.273)	(0.002)
	$hprice_{t-1}$	55.46009***	21.82826**
		(0.000)	(0.017)
	$curacc_{t-1}$	-.85607	-1.68815***
		(0.253)	(0.007)
	constant	-1.51772	.63981
		(0.191)	(0.235)
	Chi2	34.98	51.56
	R-sq	0.0779	0.3628
	P-value	0.000	0.000

(***Continued…***)

(Table 2 Continued)

		Countries with CAB ≤-4%	Countries with CAB >-4%
		Model 4	**Model 5**
Panel C: Current Account Balance	gdpgrowth $_{t-1}$	.00286	.62147***
		(0.978)	(0.000)
	popgrowth $_{t-1}$	-.02801***	.00494
		(0.000)	(0.503)
	fiscalbalance$_{t-1}$	.35109***	-.07618
		(0.000)	(0.460)
	credit $_{t-1}$	-.00347	-.02991*
		(0.574)	(0.089)
	hprice$_{t-1}$	-1.08272	-8.89089***
		(0.170)	(0.000)
	constant	-1.66201**	.39978***
		(0.024)	(0.000)
	Chi2	50.09	63.59
	R-sq	0.2116	0.4275
	P-value	0.000	0.000
	Observations	200	77

Notes: *p*-values are provided in parentheses. (***), (**) and (*) indicate statistical significance at 1, 5 and 10 percent respectively. The estimation results cover the entire period. Model 4 covers Austria, Belgium, Denmark, Germany, Finland, France, Italy, the Netherlands, Sweden, and the UK. Model 5 includes Greece, Ireland, Portugal, and Spain.

Compared to the other group that fall within or exceed the threat threshold, countries that do not exceed the threat threshold (Model 4) show a stronger relationship between house prices and credit supply in Panel B. However, in these countries, the change in house price and the effect of the decline on the current balance are less than countries that exceed the threat threshold (Model 5). Thus, Panel C of Model 4 indicates that there is a stronger relationship between house prices and the credit supply in the group with current account deficits within or below -4%, than the group with current account deficits above -4%, and house price increases lead to less decline of the current account balance. However, the opposite is true in the case of Model 5. In this case, one suggestion can be that the differences between the countries related to their institutional environment (e.g., law enforcement, protection of investors, cultural factors) may produce different results in the economy in addition to the economic structure, sensitivity to external developments, etc.

One of the conclusions reached is that the estimation results of the simultaneous equations model largely confirm the first hypothesis and find that there are relationships among the three endogenous variables (i.e. house prices, credit

size and current account imbalances). These results are consistent with the results of Favilukis et al. (2012), who also use a financial liberalisation approach. Another conclusion is that there is a positive and strong relationship between current account imbalances and house prices. Again, there is a positive and strong relationship between credit supply and house price, and this relationship is stronger than that of house prices with current account balance. This result shows the importance of the monetary policy that was implemented to stabilise both the housing markets and economy, and in agreement with the findings of Lang et al. (2022), which focus on the real estate cycle in European regions for a period of over 25 years. Their study indicates that monetary policy measures play a considerable role in 29 major European cities during the 2007-2008 global financial crisis. In this case, it can be argued that with monetary expansion largely caused by financial liberalisation, an increase in the credit supply in the domestic markets enhances the possibility of preparing the grounds for strengthening the deterioration impact of house prices on the current account balance through the effects of increasing house prices (e.g. welfare, collateral, and investment effects).

In addition, the findings are in line with those of previous studies on the relationship between house prices and credit size (e.g. Goodhart and Hofmann, 2008; Jordà et al., 2015). They are also very much consistent with the findings in the empirical literature on current account balance (e.g. Chinn and Prasad, 2003; Ca'Zorzi et al., 2012), house price (e.g. Meen, 2001; Agnello and Schuknecht, 2011) and credit (e.g. Kutlukaya and Erol, 2016; Nobili and Zollino, 2017) determinants.

5.2. Role of Institutions in Relationship Between House Prices and Current Account Imbalances

The second part of the empirical analysis tests the second hypothesis: that is, whether the institutional features affect the relationship of house prices with current account imbalances. For this, we follow the approach in North (1990, p.3), who says, "Institutions are the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction…" Thus, institutions can exert influence on the economy and how resources are distributed by determining the rules of the game in a society and an economy as well as the allocation of resources in the economy. With financial liberalisation, the institutional environment can have an impact on the extent to which foreign capital will enter domestic markets as well as on how they are allocated after entry. A country has a high quality institutional environment can obtain more foreign capital inflow for the domestic markets (i.e. monetary expansion), more effectively direct the inflow, and also either mitigate or eliminate the negative effects of increasing credit supply on the economy, such as the disruptive effects of very large fluctuations in house price on the economy (e.g. current account imbalances).

To test our hypothesis and thus capture the role of institutions in the relationship between house price and current account dynamics, the estimation of our benchmark model is repeated by considering institutional features.[26] To this end, the institutional characteristics that affect the performance of the credit markets (e.g. property rights, protection of investors and ethical behaviour of firms) are taken into consideration, as well as characteristics related to the governance of a country (e.g. regulation quality, rule of law and effectiveness of government), which play a role in attracting foreign capital and obtaining inexpensive and easy access to funding from international financial markets, and using them in efficient ways in the domestic markets.

We first consider the Institutional Index as an indicator of the institutional characteristics that affect the credit markets. Our sample countries are grouped according to their position in this index: countries which have credit markets with high institutional quality (i.e. EU average and above) and countries which have credit markets with low institutional quality (i.e. below the EU average). Then, the benchmark model is estimated again by using the 3SLS method.

Table 3 presents the test results of our model that considers the Institutional Index. Model 6 shows the results for those which have credit markets with high institutional quality (e.g. Finland, Sweden and the UK) whereas Model 7 shows the estimates for those which have credit markets with low institutional quality (e.g. Greece, Italy and Portugal). Higher institutional quality is also used as an indicator for the development of the credit markets.

The estimation results of Models 6 and 7 support our second hypothesis. That is, the institutional environment has an impact on the relationship between house price and current account imbalances by affecting both the lending of financial intermediaries (e.g. banks) and the behaviour of households and firms through the credit channel, which uses two mechanisms: bank lending and balance sheet (i.e. the net worth). Both banking lending and balance sheet can play significant roles in housing markets because they influence the financial positions of both households and firms, which in turn, affects investment and spending decisions. For example, with monetary expansion, the credit supply increases and the financing cost decreases, so households can prefer to buy durable goods, such as housing. However, since housing supply cannot meet the housing demand simultaneously, an increase in housing demand can cause house price increases and the effects of house prices increases (e.g. wealth and collateral effects) may occur in the economy and produce negative impacts on the economy (e.g. on the current account balance).

The findings are largely consistent with the institutional theory, which suggests that institutions can influence the performance of economy and produce different outputs in the economy (North, 1990; Williamson, 2000; Acemoğlu et al., 2005).

[26] For the contents of the institutional indices, see Section 4.2: Data Description.

Table 3 Estimation Results for Institutional Quality

		Countries with high institutional quality (≥ EU average)	Countries with low institutional quality (< EU average)
		Model 6	**Model 7**
Panel A: House Prices	$gdpgrowth_{t-1}$	.29647***	.23524***
		(0.000)	(0.000)
	$credit_{t-1}$	.00234***	-.00124
		(0.000)	(0.211)
	$lint_{t-1}$	-.05130***	-.00628
		(0.000)	(0.459)
	$construc_{t-1}$	.06065***	.03919***
		(0.000)	(0.002)
	constant	.01007***	.02024***
		(0.000)	(0.000)
	Chi2	805.82	290.20
	R-sq	0.7914	0.7819
	P-value	0.000	0.000
Panel B: Credit Market	$g\ gdpgrowth_{t-1}$	2.99654**	1.25071
		(0.038)	(0.383)
	sin_{t-1}	.93783	.39775
		(0.598)	(0.784)
	$kapoen_{t-1}$	1.12418	1.03291*
		(0.260)	(0.052)
	$hprice_{t-1}$	45.54554***	43.30938***
		(0.000)	(0.052)
	$curacc_{t-1}$	-1.90552***	-4.74940***
		(0.008)	(0.000)
	constant	-1.30624	1.57823***
		(0.247)	(0.003)
	Chi2	43.49	84.03
	R-sq	0.1017	0.3556
	P-value	0.000	0.000

(*Continued…*)

(Table 3 Continued)

		Countries with high institutional quality (≥ EU average)	Countries with low institutional quality (< EU average)
		Model 6	**Model 7**
Panel C: Current Account Balance	gdpgrowth $_{t-1}$	.05763	.18029
		(0.467)	(0.334)
	popgrowth $_{t-1}$	-.03408***	-.01894*
		(0.000)	(0.062)
	fiscalbalance$_{t-1}$	.27928***	.22148
		(0.000)	(0.146)
	credit $_{t-1}$	-.01273**	-.08140***
		(0.038)	(0.089)
	hprice$_{t-1}$	-1.36475*	-4.75541***
		(0.055)	(0.001)
	constant	.12830***	.29617***
		(0.024)	(0.000)
	Chi2	98.63	62.86
	R-sq	0.3049	0.3351
	P-value	0.000	0.000
Observations		199	78

Notes: *p*-values are provided in parentheses. (***), (**) and (*) indicate statistical significance at 1, 5 and 10 percent respectively. The estimation results cover entire period. Model 4 covers Austria, Belgium, Denmark, Germany, Finland, France, Ireland, the Netherlands, Sweden and the UK. Model 5 includes Greece, Italy, Portugal and Spain.

According to the estimation results, there is a negative relationship between house prices and current account imbalances, but increasing the institutional quality weakens this relationship. In Model 6 which includes countries with credit markets that have a high institutional quality, a 1% increase in house prices causes an increase of 1.36475% in current imbalances (see Panel C). This increase is also approximately four times smaller than that in Model 7 including the countries with low institutional quality, which is 4.75541% for the coefficient of house prices. This means that a high institutional quality affects the functioning of the credit markets in a positive way and reduces the strength of the relationship of house prices with current account balance, even if the relationship between house prices and credit is stronger in the markets with high institutional quality. In other words, in these credit markets, market participants (lenders, borrowers, financial intermediaries) can easily access information, rules and regulations are applied more efficiently, and investors are better protected, and thus the negative impact of house price increases on the current account balance is lower than in the countries with credit markets that have a low institutional quality.

In addition, the findings indicate that the institutional environment can differentiate the effects of the increased credit supply on housing markets and then on the economy, but the change in house prices in the markets with high institutional quality is much less detrimental to the current account balance than in the credit markets with low institutional quality (see Panel C in Models 6 and 7). Therefore, one suggestion can be that a high quality institutional environment creates well-functioning credit markets and then mitigates the negative effects of volatile house prices on the economy, which is caused by monetary expansion with increasing degree of financial openness.

The estimation results show that both groups have some common features. One of them is that financial openness has a positive effect on the size of the credit supply in the domestic markets as expected (Panel B in Models 6 and 7), but the positive effect is higher in countries with a high institutional quality. Another common feature is that the house prices have a significant effect on determining the size of the credit supply, yet the effect of house prices is lower in countries with a low institutional quality. Nevertheless, house price increases have a less detrimental effect on the current account balance of countries with high institutional quality. Therefore, it can be argued that with financial liberalisation, a high quality institutional environment contributes to strengthening the relationship between credit supply and house prices much more in the economy, but reduces the impact of changes in house prices on current account balance.

From these findings, we conclude that the institutional characteristics of credit markets influence the strength of the relationship between credit and housing markets as well as that between house prices and current account imbalances. Markets with a high quality institutional environment reduce the strength of the relationship between house prices and current account balance and smooths the effects of increasing house prices on the current account balance as well as financial liberalisation.

In this stage of the empirical analysis, the second step is the inclusion of variables related to the governance of a country in the model.[27] Governance features included in the model are regulation quality (*iregqual*), control of corruption (*icorrup*), voice and accountability (*iaccount*), government effectiveness (*igoveff*), and law of order (*irulelaw*). They are separately integrated into the model with their lagged (one year) values and logarithmic form as the other explanatory variables of the model. In addition, the model is re-estimated by adding the average of the governance variables (*iaverage*).

In a financially open economy, it is expected that an increase in the quality of governance brings more foreign capital from the international markets and

[27]As the governance variables are available from 1996, the estimation results cover the period between 1996 and 2016 instead of 1990 to 2016. In addition, 1997, 1999 and 2000 are not included due to the lack of data.

smooths the effects of monetary expansion and hence, increases the credit supply which positively influences the effect of house prices on current account imbalances. For this reason, governance variables are added to the credit equation of our benchmark model (i.e., Panel B).

Table 4 presents the estimation results after the governance variables are included in the model. Model 8 includes the estimation results after adding the regulation quality variable while Model 9 includes the government effectiveness variable. Models 10, 11, 12 and 13 show the estimation results with other governance variables - control of corruption, accountability, rule of law, and the average of these governance variables respectively. The signs of the coefficients of all the governance variables are as expected, except for the rule of law (Model 12) and are also statistically significant. The coefficient of financial liberalisation indicates that the governance features positively affect the degree of monetary expansion and hence, the amount of credit as well as the strength of the relationship of credit with house price. The findings also show that the features of the governance structure of the economy have an impact on the relationship of house prices with current account balance.

In Model 8, regulation quality is observed to be the most important variable among the governance variables to influence the credit supply (Panel B). A 1% quality improvement in regulations increases credit supply by 1.565% (Panel B). Moreover, the improvement in regulation quality also weakens the relationship between credit size and house prices. In this case, it can be argued that higher regulation quality smooths the effect of financial liberalisation on the credit supply as well as the relationship between credit supply and house prices. In Panel B of Model 8, a 1% change in both house prices and degree of financial liberalisation has an impact on the credit size of 1.40185% and 1.05083% respectively. At the same time, even though the sign of house price is positive, it is not statistically significant. The findings of Model 8 are also confirmed by other models with all of the governance variables positively affecting credit size except for rule of law (i.e., Model 12). When rule of law is added to the model, there is no expected relationship between credit size and rule of law. This finding is in line with previous studies (e.g. Chinn and Ito, 2008; Gruber and Kamin, 2007; Yan and Yang, 2012). Yet, one of the reasons for this result may stem from the features of their legal system because the countries in our sample have different legal systems. For example, Portugal, Spain and Italy have civil law of French origins while Sweden and Austria have civil law of Scandinavian and German origins, respectively. Ireland and the UK use common law (see La Porta et al., 1998). When the average of these institutional variables is added to Model 13, similar estimates are obtained.

Table 4 Estimation Results for Governance Features

		Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Panel A: House Price	$gdpgrowth_{t-1}$	.26370***	.26417***	.26403***	.26443***	.26861***	.26477***
		0.000	0.000	0.000	0.000	0.000	0.000
	$credit_{t-1}$	.00129***	.00137***	.00136***	.00142***	.00161***	.00146***
		0.000	0.000	0.000	0.000	0.000	0.000
	$lint_{t-1}$	-.01667***	-.01678***	-.01668***	-.01674***	-.01707***	-.01688***
		0.002	0.001	0.002	0.002	0.001	0.001
	$resconsgdp_{t-1}$	.04691***	.04679***	.04681***	.04673***	.04639***	.04669***
		0.000	0.000	0.000	0.000	0.000	0.000
	cons	.01419***	.01407***	.01409***	.01399***	.01336***	.01391***
		0.000	0.000	0.000	0.000	0.000	0.000
	Chi2	877.72	878.30	878.17	879.02	891.57	879.75
	R-sq	0.7703	0.574	0.7566	0.7703	0.7566	0.7566
	P-value	0.000	0.000	0.000	0.000	0.000	0.000

(*Continued…*)

(Table 4 Continued)

		Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Panel B: Credit Market	gdpgrowth $_{t-1}$	1.72637	3.24621**	2.86093**	15.27255*	4.51323***	3.21745**
		0.190	0.013	0.028	0.066	0.001	0.024
	sin_{t-1}	1.27722	2.34061	1.97594	2.17356	-3.18608*	2.25120
		0.432	0.156	0.229	0.196	0.058	0.193
	$hprice_{t-1}$	1.40185	13.86035	11.10756	9.49248	26.33793***	15.25923
		0.889	0.162	0.261	0.378	0.008	0.159
	curacc $_{t-1}$	-2.94363***	-2.56025***	-2.60404***	-2.38176***	-1.03627*	-2.06598***
		0.000	0.000	0.000	0.000	0.066	0.001
	$kapoen_{t-1}$	1.05083	1.78626**	1.71349***	1.78259***	2.28219	1.87949***
		0.114	0.017	0.009	0.008	0.001	0.006
	iregqual $_{t-1}$	1.56507***					
		0.000					
	igoveff $_{t-1}$		.91184***				
			0.001				
	corrupt $_{t-1}$			.81596***			
				0.000			
	iaccount $_{t-1}$				1.10252***		
					0.005		

(*Continued…*)

(Table 4 Continued)

		Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Panel B: Credit Market	irulelaw $_{t-1}$					-.02547	
						0.441	
	iaverage $_{t-1}$						.51576*
							0.073
	cons	-5.51054***	-2.75323**	-2.28487**	-3.61133**	1.18869***	-1.03428
		0.000	0.023	0.014	0.037	0.005	0.419
	Chi2	64.06	50.00	54.77	45.63	41.08	41.04
	R-sq	0.1964	0.1397	0.1595	0.1252	0.0914	0.1045
	P-value	0.000	0.000	0.000	0.000	0.000	0.000

(*Continued*…)

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(Table 4 Continued)

		Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Panel C: Current Account Balance	gdpgrowth $_{t-1}$	.03521	.03645	.03359	.03746	.04817	.03829
		0.765	0.757	0.774	0.750	0.681	0.745
	popgrowth $_{t-1}$	-.02622***	-.02646***	-.02642***	-.02647***	-.02651***	-.02663***
		0.000	0.000	0.000	0.000	0.000	0.000
	fiscalbalance$_{t-1}$	.61237***	.61115***	.61121***	.61139***	.61059***	.61125***
		0.000	0.000	0.000	0.000	0.000	0.000
	credit $_{t-1}$	-.00912	-.01125	-.01044	-.01067	-.01137	-.01089
		0.259	0.163	0.196	0.160	0.157	0.177
	hprice$_{t-1}$	-4.80059***	-4.78716***	-4.80014***	-4.78392***	-4.84625***	-4.77615***
		0.000	0.000	0.001	0.000	0.001	0.001
	cons	.27459***	.27641***	.27607***	.27564***	.27921***	.27561***
		0.000	0.000	0.000	0.000	0.000	0.000
	Chi2	136.97	138.66	138.10	138.14	141.27	138.43
	R-sq	0.3836	0.3816	0.3824	0.3821	0.3869	0.3819
	P-value	0.000	0.000	0.000	0.000	0.000	0.000
	Observations	222	222	222	222	222	222

Notes: *p*-values are provided in parentheses. (***), (**) and (*) indicate statistical significance at 1, 5 and 10 percent respectively. The estimation results cover the entire period.

Considering the effect of governance variables on the relationship between house price and current account dynamics, we find that a 1% change in governance variables indirectly has an impact on this relationship of 4.77615% to 4.84625% (see Panel C). Additionally, when we compare these estimation results with those of the benchmark model, the results of the models with governance variables show that the features of the governance structure of the economy have an impact on the relationship of house prices with current account balance.

In summary, the findings show that institutional characteristics can influence the strength of the relationship between house price and current account dynamics. For example, if the credit markets have low institutional quality, the relationship between these two types of dynamics is stronger. A high institutional quality environment reduces the detrimental effect of increasing house prices on the current account balance. In credit markets with a high institutional quality, financial liberalisation provides the grounds for increasing the credit supply more so than in the countries with lower institutional quality.

6. Robustness Check

In this section, robustness tests of the benchmark model are presented. The model is re-estimated with different variables; that is, we use different variables in the model instead of only financial liberalisation and credit size. These include domestic credits (*domescredit*) and issues of debt securities (*intdebt*). Domestic credits show all credits lent to the private sector by all participants in the financial sector (i.e. monetary authorities, deposit money banks, finance and leasing companies, money lenders, insurance corporations, pension funds, and foreign exchange companies). Issues of debt securities cover the amount of both outstanding public and private debt securities, long term bonds and notes, and money market instruments placed on the international markets.

First, we include real domestic credit (*domescredit*) in all three panels of the model as an alternative for credit size (*credit*). It is added to the model as both an endogenous variable in Panel B and exogenous variable in Panels A and C and then the model is re-estimated.

Secondly, we include issues of debt securities (*intdebt*) in our model to replace the financial liberalisation index because after financial liberalisation, it is expected that domestic institutions will easily gain access to the international markets and thus, monetary expansion (and credit supply) will increase in the domestic markets. One way to obtain funds from the international markets is through debt securities (*intdebt*) issued by both the public and private sectors. Thus, we add this variable to Panel B as an exogenous variable and repeat the model prediction process.

Finally, we include issues of debt securities and domestic credits together in the model and then the model is re-estimated. The estimation results of these models show a negative linkage between current account balance and house prices as well as between these two variables and credit supply, and that there is a positive relationship between house prices and credit supply as shown in Table 5. Both variables are added to the model with their one year lagged values when they are included as an exogenous variable, but not as an endogenous variable. Domestic credits included in the model are in real terms deflated by the consumer price index (2010=100). Table 5 shows the estimation results of Model 15, which include domestic credits; Model 16, which include the issues international securities and Model 17, which include both variables. These results confirm the robustness of the previous findings of our simultaneous equations model. In all three models, there is a negative and strong correlation between house prices and the current account balance, and the estimated coefficients of these two variables are statistically significant. The house prices in all three models are the main determinant of credit size and change in house prices positively affects credit supply.

Table 5 Estimation Results for Robustness Check

		Model 14	**Model 15**	**Model 16**
Panel A: House Price	$gdpgrowth_{t-1}$	.26747***	.24040***	.26743***
		(0.000)	(0.000)	(0.000)
	$credit_{t-1}$		.00172***	
			(0.000)	
	$domescredit_{t-1}$	.00128***		.00128***
		(0.000)		(0.000)
	$lint_{t-1}$	-.01715***	-.01601***	-.01723***
		(0.000)	(0.002)	(0.000)
	$resconsgdp_{t-1}$	.04279***	.05702***	.04285***
		(0.000)	(0.000)	(0.000)
	cons	.01404***	.01564***	.01404***
		(0.000)	(0.000)	(0.000)
	Chi2	982.80	948.65	983.00
	R-sq	0.8094	0.7709	0.8094
	P-value	0.000	0.000	0.000

(*Continued…*)

(Table 5 Continued)

		Model 14	Model 15	Model 16
Panel B: Credit Market	gdpgrowth $_{t-1}$	2.9860**	1.7371	2.3991*
		(0.033)	(0.117)	(0.099)
	sin_{t-1}	3.9925**	-1.8917*	3.68107**
		(0.021)	(0.090)	(0.033)
	$kapoen_{t-1}$	1.1859		
		(0.116)		
	$intdebt_{t-1}$		.05131	.11086
			(0.351)	(0.127)
	$hprice_{t-1}$	24.70411***	23.60359***	27.42078***
		(0.010)	(0.002)	(0.004)
	curacc $_{t-1}$	-.46233	-1.4041***	-1.1567***
		(0.578)	(0.001)	(0.008)
	cons	-3.16159**	.51029	.35735
		(0.019)	(0.154)	(0.428)
	Chi2	43.60	39.48	40.32
	R-sq	0.1166	0.0754	40.32
	P-value	0.000	0.000	0.000
Panel C: Current Account Balance	gdpgrowth $_{t-1}$	.05581	.07308	.05333
		(0.570)	(0.464)	(0.589)
	popgrowth $_{t-1}$	-.01813***	.07308***	-.01836***
		(0.001)	(0.000)	(0.001)
	$fiscalbalance_{t-1}$	.64191**	.51288***	.64539***
		(0.041	(0.000)	(0.000)
	credit $_{t-1}$		-.01465**	
			(0.045)	
	domescredit $_{t-1}$	-.01979**		-.01499*
		(0.014)		(0.290)
	$hprice_{t-1}$	-5.7015***	-4.7389***	-5.90322***
		(0.000)	(0.000)	(0.064)
	cons	.32346***	.27589***	.32278***
		(0.000)	(0.000)	(0.000)
	Chi2	165.29	160.95	162.28
	R-sq	0.4066	0.3660	162.28
	P-value	0.000	0.000	0.000
	Observations	229	277	229

Notes: *p*-values are provided in parentheses. (***), (**) and (*) indicate statistical significance at 1, 5 and 10 percent respectively. All models cover the entire period.

7. Conclusion

This study aims to explore the relationship of house prices with current account imbalances and investigates whether the institutional environment plays a role in this relationship. For this purpose, the EU countries are taken into consideration. In the empirical analysis, a simultaneous equations model is used.

The findings of the empirical analysis support our hypotheses. They can be summarised into four main points. First, there is a positive and significant relationship between house prices and current account imbalances. Second, this relationship is strengthened by increased monetary expansion and then credit supply. Third, the relationship between house price and current account dynamics is stronger in the pre-global financial crisis period than in the post-crisis period for both groups with current account imbalances both above and below the threat threshold (i.e. -4%). In addition, the relationship is much stronger in the group with countries above the threshold (Greece, Ireland, Portugal and Spain). Fourth, the strength of the relationship of house price with current account relationship is affected by institutional characteristics. For example, the relationship between house price and current account dynamics is weaker in countries which have credit markets with higher institutional quality. The same is found in relation to the governance features of the economy (e.g. regulation quality, control of corruption, voice and accountability, government effectiveness and law of order). Regulation quality has the most impact on this relationship among the governance variables and its improvement weakens this relationship. In this case, it can be suggested that with monetary expansion largely caused by financial liberalisation, an increase in credit supply in the domestic markets strengthens the impact of the decline in the current account balance on house prices through the effects of increasing house prices (e.g. welfare, collateral, and investment effects) in an environment with a lower institutional quality.

The results of the empirical analysis confirm the results of previous studies on the relationship of house prices with current account imbalances, and show a positive and strong relationship between the two dynamics (e.g. Favilukis et al., 2012). In addition, the findings are largely in line with previous studies on current account balance determinants (e.g. Ca'Zorzi et al., 2012).

From these findings, the following inferences can be made. Monetary expansion supported by financial liberalisation can strengthen the relationship of house prices with credit supply and then the link between house prices and current account imbalances. Additionally, aside from other factors (e.g. the structure of the economy, sensitivity of the economy to external developments), the institutional environment can contribute to variations in the outcomes of these impacts and create differentiations between countries.

The findings of the study also have important policy implications for the EU and at the individual-country level. If policy makers are more aware of the link between house price and current account dynamics, they could do more to reduce the risk of instability in the economy over the long term. In determining macroeconomic policies, specifically in the context of addressing large current account imbalances with the view to stabilise the economy, they are advised to account for the interaction between credit and housing markets.

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