The size of the rental market and housing market fluctuations

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Abstract

The paper investigates whether the size of the rental market affects house prices fluctuations or the volatility of construction sector activity over the business cycle. For that purpose we construct a rich database of variables describing the housing sector in a group of twelve euro area countries over the years 1995-2013 and conduct a series of panel regressions. We find that a developed rental market attenuates fluctuations in the housing sector. We claim that differences among monetary union countries in terms of rental market developments can be destabilizing as they might lead to heterogeneous response to common shocks.

Keywords: Rental market, hosing sector, panel data, monetary union.
JEL classification:

Introduction

The relationship between the situation in the housing sector and the macroeconomic stability is the subject of numerous studies (Agnello, Schuknecht 2009; Catte et al. 2004; André, Girouard 2008). According to Leamer (2007) fluctuations in the housing market activity are the core cause of the business cycle and the data on residential investment can be successfully used as an early warning sign of an oncoming recession. For that reason a lot of effort has been devoted to analyze the impact of house price fluctuations on different aspects of the economy: the volume of consumption and investment (Case et al. 2005), the allocation of means of production (OECD 2005) or the supply of credit in the banking sector (Bernanke et al. 1996). The importance of the housing market is also discussed in studies on monetary integration, especially in the context of asymmetric responses of individual economies to demand shocks affecting the real estate market (Maclennan 1977) or in the context of the impact of interest rate cuts on the creation of imbalances in the housing markets in Spain and Ireland after euro accession (Conefrey, Gerald 2009). There are also some overview analyses on the importance of the housing market structure and its dynamics for the transmission of monetary policy impulses to the economy (Iacovello, Minetti 2008) as well as for the efficiency of countercyclical monetary, fiscal and macroprudential policies (Crowe et al. 2013).

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Even though the literature on the role of the housing market in the economy is extensive, the number of studies analyzing the role of the rental market is scarce. A few papers, which focus on individual countries, show that the development of the rental market affects the flexibility of the housing market, and consequently is important for the resistance of the entire economy to macroeconomic shocks (Kofner 2014; IMF 2009). There are few cross-country econometric analyses that focus on the relationship between rental market characteristics and boom-bust cycles in the housing sector. For example, Arce and López-Salido (2008) build a theoretical model to show that the availability of rental housing reduces the risk of a house price bubble. Their results are empirically confirmed by Czerniak (2014), who uses a panel logit model for a group of developed countries to show that institutional and socio-cultural factors influence the probability of a housing bubble. More insight on this matter has been provided by Cuerpo et al. (2014), who analyze how private rental market regulations (i.e. different aspects of rent controls and tenant-landlord regulations) influence the response of house prices to four socio-economic determinants: growth of population, income, housing investment, as well as fluctuations in real long-term interest rates. They indicate that stricter rent controls increase the response of house prices to changes in all the explanatory variables. On the other hand, their results point that tenant-landlord regulations do not influence the sensitivity of house prices to fluctuations in socio-economic indicators.

Another strand of the literature focuses on the relationship between the structure of the rental market and labor mobility. For example, Caldera Sánchez and Andrews (2011) find that an increase in the availability of rental housing leads to higher population mobility, hence to more efficient allocation of the labor force. Similarly, Barceló (2006) estimates that at an individual level labor mobility, defined as a change in the employment status, is considerably smaller for an owner than for a private tenant. Furthermore, he shows that tenants in social housing are less mobile in comparison to tenants in the private market. These results would indicate that the effective rental market should decrease the vulnerability of an economy to demand fluctuations, and in the long-term horizon should also diminish the level of structural unemployment. This hypothesis has been empirically tested by Blanchflower and Oswald (2013), who run a panel data regression to explain the differences in the unemployment rate across US states. They find that a rise in the homeownership rate is a good predictor of the subsequent increase in unemployment. As indicated by the authors, the potential reasons of this relationship are not limited to the lower level of labor mobility, as in Barceló, but also due to greater commuting times (areas with more homeowners experience greater transport congestion) and fewer new businesses in states with larger owner-occupation ratio, which is due to resistance of homeowners against new factories in their neighborhood.

In this study, we contribute to the above literature by testing whether the size of the rental market has an impact on house prices fluctuations and the variability of construction sector activity. In particular, we investigate if differences in rental housing availability influence how the housing sector reacts to demographic, demand or monetary shocks across European Monetary Union (EMU) countries. For that purpose we construct a rich database for twelve EMU member states over the years 1995-2013 and run a set of panel regressions. Our main result is that the size of the rental market is an important factor for house price dynamics and

the volatility of construction sector activity. We complement the empirical results with discussion on how heterogeneous developments in the rental market across member states of the euro area might affect the stability of the entire region.

The rest of the paper is organized as follows. In the first section we describe the structure of the housing market across EMU member states, with special attention given to rental housing availability and its characteristics. In section two we look at correlations between the share of houses for rent and selected indicators of macroeconomic stability. Section three presents the results of panel data regression for EMU countries. The last section concludes and provides some interpretation of the results in the form of possible policy interpretation.

1. Rental market in EMU countries

This section aims at presenting data related to size of the rental market in EMU countries. We start by defining rental housing (in line with the definition within European Union Statistics on Income and Living Conditions, EU-SILC) as all houses that are occupied by non-owners, which pay a market rent, a reduced rent or can use the accommodation for free (e.g. the accommodation comes with the job or is provided rent-free from a private or public source). In this sense the definition of rental housing includes different forms of social housing but exclude co-operatives. For this kind of definition it can be noticed that the availability of rental housing differs largely across the twelve EMU countries. According to Eurostat EU-SILC data[3], which are presented in Figure 1, the average size of the rental market over the period 1995-2013 was the highest in Germany, where 47% of households were tenants, and lowest in peripheral countries like Spain (15%), Greece (18%) and Ireland (21%). The dispersion of this ratio between the countries was almost three times larger than its time dispersion within individual countries: the average standard deviation in time for each country is equal to 3.4 p.p. and the average standard deviation across EMU states in each period amounts to 9.4 p.p. One can therefore conclude that the size of the rental market usually changes only gradually, which would indicate that the observed differences across EMU member states will most likely prevail in the forthcoming decades. In this context it is worth noting, however, that after the global financial crisis and the bursting of housing market bubbles across European countries the diverging tendencies in the size of the rental market have reversed. The main reason are the developments across peripheral countries, where a large fraction of households was cut-off from credit financing and wasn't able to satisfy their

[3] There are large discrepancies between different sources of tenure status data (up to over 10 pp. for rental housing share for EMU countries). The most reliable data are provided within national censuses, which cover the largest share of population. However they are of limited usefulness for panel regressions due to very low frequency of dissemination (on average once every decade). Higher frequency data with the largest coverage for EMU countries are provided by Eurostat within the EU-SILC. This database contain statistics describing the share of population living in rental housing. However, these statistics have data gaps for years 1995-2013. For the sake of our analysis, which requires balanced panel data, we decided to interpolate the EU-SILC database and extrapolate it with the use of other data sources – i.e. OECD Housing Market questionnaire (Andrews et al. 2011) and national censuses data as provided by the United Nations Statistics Division. This method is justified as the size of the rental market has very small variance in time (the average standard deviation among EMU countries between 1995 and 2013 is 3.41 pp.).

housing needs through acquiring a real estate. For example, in Ireland the share of tenants grew rapidly from 23% in 2008 to 30% in 2011 and stabilized at this value afterwards.

Looking closely at the composition of rental housing supply, which is illustrated in Figure 2, one can observe that in EMU countries about two thirds of tenants pay market rent and one third of them pay reduced rent (20% versus 10% of all households in 2013). The only exceptions are Finland and Portugal, where more people enjoy below-market rents (16% and 15%, respectively) than regular ones, which is an effect of relatively high availability of social housing and rent subsidies in both countries.

2. Rental markets and economic fluctuations in EMU countries

Let us start by noticing that houses play a dual role: they are an investment vehicle and at the same time they provide utility from housing services. Renting allows to separate these roles. For a landlord a house is an investment and for a tenant it provides utility. Given that rental housing is an alternative to homeownership in satisfying housing needs (Kieżel 2000; Calmfors et al. 2005; Sinai, Souleles 2003), the size of the rental market should affect economic dynamics. For that purpose, we put forward two theses.

Thesis 1. An increase in the size of the rental market diminishes the effect of aggregate demand fluctuations on house prices. For example, in the case of a demographic boom the rental market can absorb a part of the increase in demand for housing that would otherwise translate into a sharp swing in real estate prices fueling a housing bubble (Czerniak 2016). This claim is especially relevant if a part of the increase in the demand for houses is already discounted in house prices, but not in the level of rents. This is not a strong assumption, because mispricing and its correction occurs mainly through prices not rents (Ambrose et al. 2013). In such a case, according to the portfolio model of tenure choice (Mills 1990), the relative demand for owner-occupied houses should be attenuated. However, the necessary condition is that renting is a feasible alternative. Furthermore, rental housing can also diminish the effects of monetary or financial shocks. Without a developed rental market, there could be a large fraction of households that are financially constrained and cannot adjust the size of their apartment to their needs: they do not have sufficient funds to make a down-payment or their creditworthiness is too low to take a mortgage. These households are forced to limit the size of their owned house or cohabit until financial conditions are more favorable. Eventually, when monetary policy eases and housing credit affordability increases a large amount of buyers rush simultaneously to the housing market, boosting demand, which fuels large price increases (Favara, Imbs 2010). For that reason an effective rental market should serve as a factor attenuating the impact of monetary shocks on house prices. Households living in rented houses are less constrained in fitting the size of the occupied apartment to their needs, hence the number of households that try instantly to switch to homeownership or increase the size of their apartment when their creditworthiness increase is lower. This reduces the risk of large fluctuations in house prices over the business cycle, as inelastic housing supply has more time to adjust to a gradual increase in housing demand (Caldera Sánchez, Johansson 2011).

Thesis 2. The size of the rental housing should attenuate fluctuations in construction sector activity over the business cycle. It might be argued that a large rental housing sector can even induce the existence of countercyclical swings in real estate activity. The reason is that the behavior of landlords and homeowners is different. For landlords buying a house for renting is treated as an investment and the decision based predominantly on expected rate of return and perceived risk. For that reason it might be the case that price increases in times of a housing boom discourage investors from buying houses and price decreases after a bust, especially when they are accompanied by interest rate cuts, are motivating investors to enter into the rental market. This process is also supported by a change in households' preferences on tenure choice as relatively more people are willing to rent than to buy during recessions, because private ownership of mortgaged property is less available and deemed more risky (Wellisz 2012; Godofsky et al. 2011).

Apart from the above two theses, the literature review from the Introduction indicates that a larger rental market fosters higher labor mobility, which in turn might reduce structural unemployment. Moreover, lower volatility of the housing sector due to the existence of the efficient rental market can contribute to lower volatility of investment and aggregate output.

In Figures 3-8 we present scatter-plots, which illustrate that for twelve EMU economies over the years 1995-2013 countries with developed rental market were in general more stable than the remaining economies. Let us start by looking at Figure 3, which point to a negative correlation between the size of the rental market and house price volatility, which somewhat confirms thesis 1. It should be emphasized, however, that there is a large number of other factors that make the housing market more prone to boom-bust cycles, which are not taken into account in the simple scatter-plot analysis. For example Czerniak (2014) identified over 30 distinct economic, institutional, demographic or cultural factors that are important in analyzing housing bubbles. A natural question arises, whether the size of the rental market influences the level of house prices? Figure 4 shows that this is not the case: the average EUR price of squared meter seems to be independent from the tenure structure of the housing market. Next, Figure 5 indicates that the size of the rental market is negatively related with the volatility of construction sector activity. This result supports thesis 2. As in the case of house prices, we did not find a significant relationship between the size of the rental market and the share of the construction sector in total value added. That would suggest that supporting rental housing availability through appropriate residential policy most likely won't lead (in a medium-run) to a decrease in the size of the construction sector, as some politicians tend to believe. As regards correlations between the share of rental houses and investment fluctuations or output volatility, their values were negative (Figures 6-7). This informally indicates that larger availability of rental housing can act as an automatic stabilizer for the economy as it attenuates business activity fluctuations resulting from swings in aggregate demand.

3. Panel regressions

In the previous section we have illustrated that correlations between the size of the rental market and both real house prices volatility and the variability of construction sector activity are negative. It should be noted, however, that these relationships could be distorted by other factors, which cannot be accounted for in a simple correlation analysis. In this section we address this issue by using panel data regressions, which allow to control for other factors that affect the housing market. In particular we estimate the parameters of the following models:

$$\Delta hp_{it} = \alpha_1 gap_{it} + \alpha_2\, rms_{i,t-1} + \alpha_3\, interst_{it} + \alpha_4 demo_{it} + \gamma\, inter_{it} + \phi_i + \epsilon_{it} \quad (1)$$

$$vac_{it} = \beta_1 gap_{it} + \beta_2\, rms_{i,t-1} + \beta_3\, interst_{i,t} + \beta_4 demo_{i,t} + \delta\, inter_{it} + \psi_i + \eta_{it} \quad (2)$$

where *i* and *t* are country and time indices, ϕ_i and ψ_i denote country fixed effects, whereas ϵ_{it} and η_{it} stand for the error terms. Model (1) describes the dynamic of log real house prices (*hp*) as a function of output gap expressed as a percentage of GDP (*gap*), the share of households living in rented apartments (*rms*), a monetary policy stance indicator (*interest*), demographic factors (*demo*) and an interaction variable that captures the indirect effects of rental housing availability (*inter*). The specification of model (2) is identical the specification of model (1) up to the dependent variable, which is the ratio of the nominal value added in the construction sector to the total value added in the economy. The estimates of parameters γ and δ are the main focus of our analysis, as they measure whether the size of the rental sector amplifies the impact of a given variables on the dependent variables. Models (1) and (2) are estimated in its static and dynamics form, where the latter also includes the lagged dependent variable in the set of regressors.

The choice of explanatory variables is generally based on the previous literature (Agnello, Schuknecht 2009; Czerniak 2014). In particular we use the following series:

Monetary policy stance indicators (interest):

a. short-term nominal interest rates measured by 3-month interbank lending rate (sn) and its first difference (Δsn),
b. short-term real interest rates measured by 3-month interbank lending rate deflated by current HICP inflation (sr) and its first difference (Δsr),
c. long-term real interest rates measured by 10-year bond yield deflated by current HICP inflation (ir) and its first difference (Δir).

Demographic indicators (demo):

a. total population growth rate (Δpop),
b. growth rate of population in household formation age of 20-34 years (Δpop_20_34),
c. net annual immigration as a percent of total population (*imigrant*).
d. the share of population in household formation age ($popsh$),
e. the share of population living in urban areas (*urban*).

Interaction variables (inter):

a. the product of rental market share and the output gap ($rms_{-1} \times gap$), which describes how rental housing availability amplifies the effect of cyclical fluctuations on the real estate market dynamics,

b. the product of rental market share and a monetary policy stance indicator ($rms_{-1} \times interest$), which describes whether the rental housing availability affects the response of the housing market to financial conditions changes,
c. the product of rental market share and a demographic indicator ($rms_{-1} \times demo$), which describes how the rental housing availability affects the reaction of the real estate market indicators on demographic shocks,
d. the product of the rental market share and the lagged dependent variable ($rms_{-1} \times \Delta hp_{-1}$ or $rms_{-1} \times \text{vac}_{-1}$), which describes the influence of the rental housing availability on the persistence of the housing market dynamics.

3.1. Data

The parameters of regression (1) and (2) are estimated on the basis of annual data from the period 1995-2013 covering twelve EMU economies. Most of the series are taken from Eurostat and OECD databases. The other data sources that were used include UN Statistics, ECB, EMF, BIS and the World Bank. A detailed list of data sources and series names is provided in the Appendix.

3.2. Estimation strategy

The estimation procedure consist of three steps. First, we run standard fixed effects (FE) panel data regressions for a static model to determine the optimal set of regressors and check for the statistical significance of the interaction variables. Second, we run regressions for a dynamic model (with lagged dependent variable and a set of regressors defined in the first step) using standard FE estimator. In this way we check whether the statistical significance of interaction variables holds in a dynamic model. Third, we take our preferred dynamic specification and perform a sensitivity analysis by comparing various estimation procedures: FE estimator with bootstrap standard errors (FE-BS), FE estimator corrected for the Nickel bias as proposed by Bruno (2005) (FE-BC), first-difference instrumental variable estimator proposed by Anderson-Hsiao (1982) (AH) and the Arellano-Bond GMM estimator (1991) (AB). We will describe these methods in detail in subsection 3.5, which describes the results of this sensitivity analysis.

The next problem we have to tackle relates to the way how the interaction variables are introduced into the model. In this respect two issues are important. Frist, the strong-heredity principle, which states that the use of an interaction variable $x_1 \times x_2$ requires also the use of both variables x_1 and x_2 among the set of control variables, needs to be respected (Nelder 1998). Otherwise restrictions imposed on regression parameters are often unjustifiable and the conditions required to have unbiased and effective estimators are very restrictive. Second, respecting the strong-heredity principle often means that one has to tackle the problem of multicollinearity, especially if one of variables x_1 or x_2 is relatively stable in time. Unfortunately, for the rental market size (rms) the time variability is rather low, as it has already been indicated in Section 1. This diminishes the precision of estimators and makes standard *t*-statistics unsuitable to assess the statistical significance of parameters for independent variables (Farrar, Glauber 1967). To overcome this problem we test whether the

extended model is significantly better fit to the data than the baseline specification without the interaction variable. For that purpose we use the likelihood ratio (LL-ratio) test in which the rejection of the null hypothesis means that introducing the interaction variable adds new information to the model and makes the specification better fit to data (Gruszczyński 2012).

3.3. Results for house prices

Table 2 presents the estimation results of model (1). In stage 1 of our estimation procedure, which we describe in subsection 3.2, we have found that real house price dynamics is best described by changes in the real long-term interest rates (Δir) compared to other monetary indicators, and by net immigration (*imigrant*) compared to other demographic factors. The estimated parameters for both of these variables have the expected sign, but the latter is statistically insignificant. The other two core variables that have significant impact on house price changes are: the output gap (*gap*) in the static model and lagged house price growth (Δhp_{-1}) in the dynamic model.

In line with the discussion from previous sections, the results in Table 2 indicate that the size of the rental market has no direct effect on the real house price growth rate, but alters the strength of house prices reaction to changes in external financing conditions. We find that including the interaction variable $rms_{i,t-1} \times \Delta ir_{it}$, which captures how rental housing availability alters the effect of changes in long-term interest rates on house prices, improves the fit of the model to the data. The adjusted R^2 increases from 0.376 to 0.386, and according to the LL-ratio test this improvement is statistically significant at 7% significance level. This two statistics provide some evidence supporting thesis 1, which indicates that the increase in the size of the rental market decreases the impact of financing conditions on the pace of house price growth. The value of the estimated parameter indicates that the influence of interest rate changes on house price dynamics slowly decreases with the size of the rental market and vanishes when the share of rental housing reaches around 30%. This means that in countries with developed rental market such as Germany, Austria, France or the Netherlands, changes in interest rates might not significantly influence house price dynamics. It is worthy to point out that according to estimation results long-term interest rates are better fitted to explain changes in house prices than short-term rates. This outcome is in line with other research on monetary policy and housing markets (Miles 2014), which shows that long-term rates have independent and usually greater impact on housing prices than short-term rates. Moreover, in times of real estate busts short-term interest rates have almost no influence on the condition of the housing sector (Nneji et al. 2013). This feature of the housing market might be explained by the large share of fixed-rate mortgages in many developed countries (Lea 2010).

The inclusion of the interaction variable with the output gap ($gap \times rms_{-1}$) also improves the fit to the data in the static model as indicated by the LL-ratio test results (*p*-value below 5% level). The estimated parameter has the right sign – an increase in the size of the rental market decreases the reaction of house prices to demand shocks, hence the volatility of house prices over the business cycle. As regards demographic interaction variable ($imigrants \times rms_{-1}$), the parameter estimate has the right sign but is statistically insignificant and the improvement in the model fit is significant only at a 9% significance level. Given that the log-

likelihood and adjusted-R^2 statistics are highest for the with the interest rate interaction variable, we choose this specification for further analysis.

3.4. Results for the activity in the construction sector

Table 3 presents the estimation results of model (2). In stage 1 of our estimation procedure, which we describe in subsection 3.2, we have found that the best specifications for the static model describing the size of the construction sector (*vac*) are those that include real long-term interest rates (*ir*) and the share of population in the household formation age (*pop_sh*), even though the estimated parameter for the latter variable is statistically insignificant. The econometric analysis also shows that the size of the rental market has no direct impact on the construction sector value added, as already mentioned in Section 2, and output gap is significant in all regressions.

Panel data estimation results provide strong support for thesis 2, which states that a larger rental housing sector leads to the existence of countercyclical swings in real estate activity, hence to lower sensitivity of the construction sector to business condition. Regression results show that adding the output gap interaction variable ($gap \times rms_{-1}$) to the set of regressors improves the fit of the model to the data at any reasonable significance level, both in the static and dynamic specification. The relevant parameter estimates are of expected sign and their values indicate that in countries with the rental market share above 40% the impact of the output gap on the size of the construction sector becomes negligible or even negative. It can be noted that Germany is the only member state that has such a large rental market that the swings in the output gap have no effect on the share of the construction sector in total value added.

As suggested by the literature, changes in monetary policy that translate into swings in house prices also influence real estate demand and supply. The results in Table 3 support the above: the long-term real interest rate has a negative impact on the share of the construction sector in total value added, both in the static and in the dynamic model specification. Furthermore, the size of the rental market significantly diminishes the transmission of mortgage market conditions on the housing sector: including the real long-term interest rate interaction variable ($ir \times rms_{-1}$) increases the fit of the static and dynamic model at a 1% significance level. The estimated parameter for this regressor has the right sign and implies that the negative impact of interest rates level on the size of the construction sector vanishes at rental housing share of just over 35%.

3.5. Sensitivity analysis

It is widely known that a standard FE estimator of the autoregressive parameter in dynamic panel models is downward biased (Nickell 1981). A simple solution to take into account the Nickel bias is to apply the bias corrected FE estimator of Bruno (2005, BC-FE). A more sophisticated way to tackle the Nickel bias is to differentiate both sides of model equation to remove the fixed effects. The transformed model on first differences can be estimated with instrumental variable estimator, as proposed by Anderson and Hsiao (1982, AH), or using

GMM estimator, as proposed by Arellano and Bond (1991, AB). In both cases, however, the estimators might be ineffective if instruments are weak. Finally, we add to the suite of estimation methods the standard FE estimator with bootstrap standard errors, to check whether standard errors for the other methods are reliable.

The results of this sensitivity analysis with respect to the estimation method are presented in Table 4. Its left part shows that parameter estimates of model (1), in which we include the interaction variable $\Delta ir \times rms_{-1}$, are very similar across estimation methods. In all cases, but for AH estimator, tighter financing conditions are significantly diminishing the pace of house prices growth (if $rms = 0$), but the dependence is diminishing with the size of the rental market. All estimates also indicate that for countries in which the share of tenants is around one third ($rms = 33\%$) the impact of real interest rate changes on house prices becomes close to zero. Similarly, the right part of Table 4 shows that parameter estimates of model (2), in which we include the interaction variable $gap \times rms_{-1}$, are very similar across estimation methods. In most cases the share of the construction sector in value added is procyclical (if $rms = 0$), but this procyclicality diminishes with the size of the rental market. The value of rms at which there is no relation between vac and gap is in all cases around 40%, which would indicate that in countries with this scale of rental market development the construction sector is not amplifying business cycle fluctuations. What is more, in countries characterized by very high share of tenants, exceeding 40%, the construction sector might even stabilize macroeconomic fluctuations, due to reasons that were discussed in Section 2. Overall, we claim that sensitivity analysis confirms our baseline results obtained with FE estimation procedure.

Summing up, the results in Table 2 partially confirm thesis 1, whereas the results in Table 3 strongly support thesis 2. In turn, Table 4 shows that these findings are robust with respect to the choice of the estimation method. A bird's view on the results points that the size of the rental market makes the reaction of the housing market less responsive to changes in the level of real long-terms rates and business cycle fluctuations. It also seems that a developed rental market stabilizes the supply of housing to a larger degree than it stabilizes house prices. Finally, our results also show that in the long-run, rental housing does not affect the level of house process or the share of the construction sector in the value added.

Conclusions and policy implications

In this paper we have investigated whether the size of the rental market affects fluctuations of house prices and the activity in the construction sector over the business cycle. We have found that there is a statistically significant relationship between the size of the rental market and the responsiveness of the housing sector to demand fluctuations and macroeconomic shocks.

A straightforward implication of our results for the economic policy would be to support the expansion of the rental market, so that the housing market becomes more stable and immune

to business cycle fluctuations and external shocks, interest rates swings for instance. Our results would even indicate that an increase of the rental market share to levels exceeding 40% might lead to a situation in which the housing sector becomes a stabilizer of the economy. This is partially confirmed by observation that Austrian and German economies, which are characterized by relatively developed rental markets, have been amongst the most stable EMU economies for the last two decades.

Our results also suggest that stimulating growth of the rental market, in contrast to a common believe, does not necessarily lead to a slower growth of the construction sector. A standard policy approach is that the government usually counteracts economic contraction by stimulating the demand for owner-occupied houses. We claim, that it is justified to consider stimulating the rental market expansion as a part of governments' anti-crisis policies, given that private investment in the rental market is likely to be countercyclical.

Our research also provides some important implications for economic policy at EMU level. In particular, they indicate that differences among monetary union countries in terms of rental market size might lead to heterogeneous response to common shocks or common monetary policy. This, in turn, might lead to business cycle divergences between the member states. This claim is well illustrated by the developments in the housing market in Ireland and Spain –joining the EMU and the subsequent decline in the level of interest rates triggered housing booms, which turned into a harmful bust during the recent crisis. Our analysis suggests that if rental houses in those countries were more popular the volatility of the economies would be lower.

Our results could be extended in many directions. The first route would be to analyze the exact channels and mechanisms through which the rental market influences macroeconomic fluctuations within general equilibrium framework. Second, this paper opens a field for discussion on what segments of the rental market – social houses, private rental from individual landlords, private rental from institutional investors, etc. – are stabilizing the housing market and the economy most effectively? Third, an interested field of further research would be to investigate how monetary policy transmission mechanism to the entire economy depends on the size of the rental market. Finally, an interesting topic relates to a question about the most effective methods to stimulate the rental houses sector. We leave all these questions for further research.

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Table 1:Data sources

Variable name	Variable description	Data source
rms	Share of rental houses in total occupied housing units (%)	Eurostat SILC/UN Statistics
pop	Total population as of 1 of January	Eurostat
pop_20_34	Population in the age of 20 to 34 as of 1 of January	Eurostat
popsh	Share of population in the age of 20 to 34 as of 1 of January (% total population)	Eurostat
hp	Index of real house prices (2005=100)	OECD/BIS
mortgage_GDP_ratio	Stock of mortgage credits at the of the year (% GDP)	EMF/Eurostat/ECB
GDP_cs10	GDP in constant prices from 2010	Eurostat
invest_cs10	Gross fixed capital formation in constant prices from 2010	Eurostat
u_rate	Unemployment rate for the 16-64 years old cohort	Eurostat LFS
nairu	NAIRU unemployment rate (%)	OECD
ir	Real long-term bond yields (ca. 10 years) deflated by HICP inflation	OECD/Eurostat
imigrant	Annual net immigration (immigration minus emigration) as a share of total population (%, interpolated from 5-year data)	World Bank WDI
gap	Output gap (% of actual GDP)	OECD
sn	Short-term interbank interest rates (3-month LIBOR rates)	OECD
sr	Real short-term interbank interest rates (3-month LIBOR rates) deflated by HICP inflation	OECD/Eurostat
vac	Share of value added in the construction sector (% total value added in current prices)	Eurostat
urban_pop_s	Share of total population living in urban areas (%)	World Bank (WDI)

Table 2: Real house price growth regression results

	Dependent variable Δhp								
	Static regressions				Dynamic regressions				
Δhp_{-1}					0.776***	0.768***	0.767***	0.769***	0.957***
					(0.053)	(0.058)	(0.047)	(0.055)	(0.177)
gap	0.841***	1.669**	0.848***	0.836***	0.0297	0.439	0.0457	0.0346	0.0371
	(0.175)	(0.696)	(0.178)	(0.169)	(0.0659)	(0.293)	(0.0554)	(0.0657)	(0.0687)
$imigrant$	4.558	4.317	10.44	4.774*	-0.165	-0.233	3.424	0.00941	-0.694
	(2.665)	(2.941)	(6.200)	(2.635)	(0.739)	(0.847)	(2.282)	(0.724)	(0.887)
Δir	-0.004***	-0.004***	-0.004***	-0.020***	-0.004***	-0.004***	-0.004***	-0.014**	-0.004***
	(0.0011)	(0.0010)	(0.0017)	(0.0056)	(0.0011)	(0.0010)	(0.0011)	(0.0057)	(0.0010)
rms_{-1}	-0.154	-0.138	-0.009	-0.118	-0.103	-0.0955	-0.0163	-0.0820	-0.0460
	(0.280)	(0.285)	(0.320)	(0.277)	(0.107)	(0.108)	(0.104)	(0.117)	(0.132)
$gap \times rms_{-1}$		-3.257				-1.580			
		(2.810)				(1.123)			
$imigrant \times rms_{-1}$			-29.29				-17.58		
			(30.44)				(12.91)		
$\Delta ir \times rms_{-1}$				0.0632***				0.0374**	
				(0.022)				(0.0239)	
$\Delta hp_{-1} \times rms_{-1}$									-0.672
									(0.719)
N	201	201	201	201	200	200	200	200	200
$Adj.R^2$	0.363	0.373	0.369	0.370	0.640	0.641	0.642	0.642	0.640
F-statistic	14.09	23.31	17.49	16.61	90.17	120.4	349.8	72.31	126.3
Log-likelihood	332.3	334.3	333.8	334	387.9	388.7	388.7	388.9	388.4
LL-ratio test probability	n/a	0.0433	0.0892	0.0644	n/a	0.196	0.182	0.147	0.279

Notes: Panel robust standard errors in brackets. Asterisks ***, ** and * denote 1%, 5% and 10% significance level, respectively. Δhp stands for log growth in real house prices, *gap* is output gap (as percent of GDP), *imigrant* is the net immigration ratio, Δir is the change in real long-term interest rates and *rms* is the share of households living in rented apartments.

Table 3: Real construction sector regression results

	Dependent variable *vac*								
	Static regressions				Dynamic regressions				
vac_{-1}					0.761***	0.752***	0.767***	0.749***	0.946***
					(0.079)	(0.071)	(0.087)	(0.073)	(0.210)
gap	0.154**	0.384***	0.154**	0.144*	0.066*	0.241***	0.064*	0.064*	0.064*
	(0.067)	(0.083)	(0.067)	(0.070)	(0.030)	(0.077)	(0.031)	(0.029)	(0.031)
$popsh$	0.175	0.165	0.185	0.131	0.029	0.023	0.163	0.020	0.029
	(0.111)	(0.107)	(0.272)	(0.100)	(0.049)	(0.047)	(0.156)	(0.053)	(0.050)
ir	-0.169***	-0.140***	-0.169***	-0.517**	-0.057***	-0.036**	-0.048**	-0.152**	-0.048**
	(0.030)	(0.025)	(0.027)	(0.191)	(0.013)	(0.015)	(0.018)	(0.066)	(0.017)
rms_{-1}	-0.024	-0.020	-0.0164	-0.058**	-0.024	-0.021	0.077	-0.033	0.022
	(0.032)	(0.038)	(0.188)	(0.020)	(0.018)	(0.021)	(0.093)	(0.019)	(0.049)
$gap \times rms_{-1}$		-0.861***				-0.655**			
		(0.219)				(0.212)			
$popsh \times rms_{-1}$			-0.033				-0.445		
			(0.894)				(0.413)		
$ir \times rms_{-1}$				1.331*				0.358	
				(0.681)				(0.240)	
$vac \times rms_{-1}$									-0.693
									(0.627)
N	214	214	214	214	214	214	214	214	214
$Adj.R^2$	0.553	0.569	0.551	0.572	0.827	0.836	0.828	0.827	0.828
F-statistic	21.05	22.56	36.53	203.7	158.6	613.6	202	148.4	326.3
Log-likelihood	727.1	731.5	727.1	732.2	829	835.6	830.6	829.9	830.6
LL-ratio test probability	n/a	0.0031	0.9350	0.0014	n/a	0.0003	0.0759	0.1800	0.0751

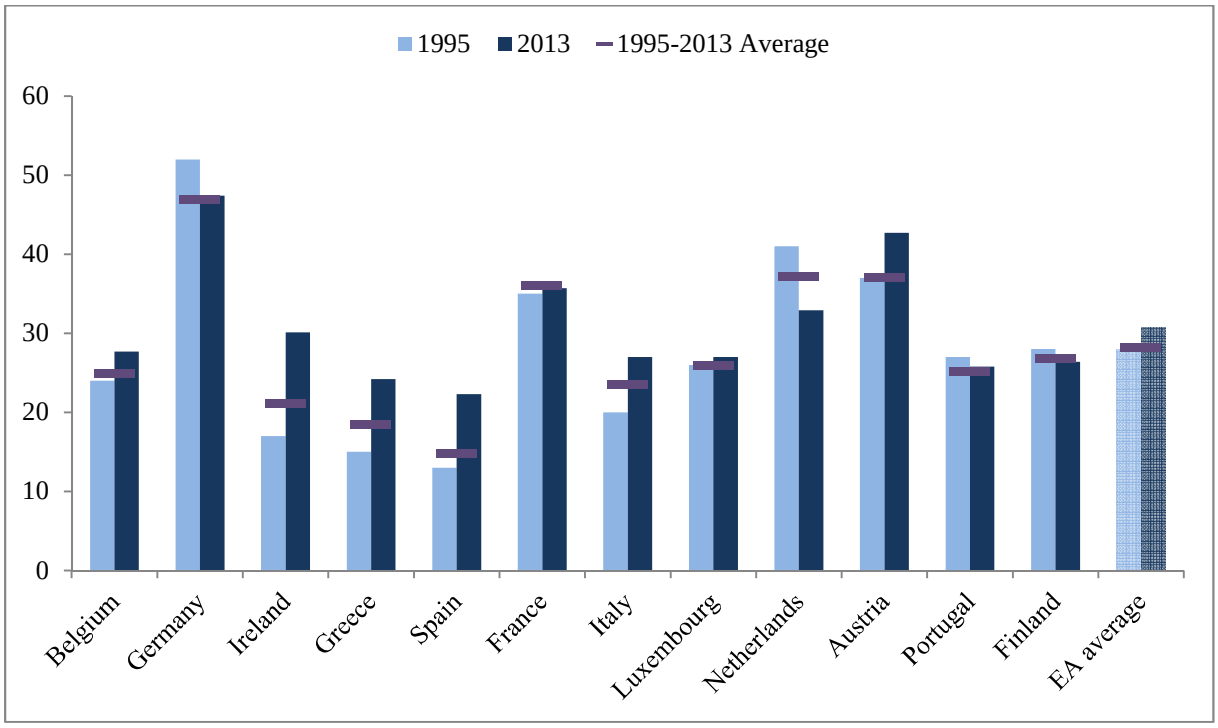
Notes: Panel robust standard errors in brackets. Asterisks ***, ** and * denote 1%, 5% and 10% significance level, respectively. *vac* stands for the share of value added in construction in aggregate value added, *gap* is output gap (as percent of GDP), *popsh* is the share of population aged 20-34 years in total population, *ir* is long-term interest rate deflated by HICP inflation and *rms* is the share of households living in rented apartments.

Table 4: Sensitivity analysis

Dep. variable	Δhp						va				
Estimation method	FE	FE-BT	FE-BC	AH	AB		FE	FE-BT	FE-BC	AH	AB
Δhp_{-1}	0.769***	0.769***	0.769***	0.658***	0.801***	va_{-1}	0.752***	0.752***	0.798***	0.866***	0.674***
	(0.0545)	(0.0630)	(0.0780)	(0.0638)	(0.0621)		(0.0708)	(0.0763)	(0.0711)	(0.0427)	(0.0727)
gap	0.0346	0.0346	0.0215	0.205**	-0.0611	gap	0.241***	0.241***	0.234**	0.112***	0.296***
	(0.0657)	(0.0767)	(0.160)	(0.0958)	(0.0822)		(0.0774)	(0.0883)	(0.113)	(0.0297)	(0.0824)
$imigrant$	0.00941	0.00941	0.0319	0.615*	0.857	$popsh$	0.0232	0.0232	0.00613	0.0461***	0.0323
	(0.724)	(1.081)	(2.116)	(0.373)	(0.700)		(0.0470)	(0.0668)	(0.0672)	(0.0116)	(0.0542)
Δir	-0.0136**	-0.0136**	-0.0137	-0.0173***	-0.0140***	ir	-0.0360**	-0.0360*	-0.0355	-0.0498**	-0.0336***
	(0.00566)	(0.00585)	(0.0106)	(0.00433)	(0.00527)		(0.0146)	(0.0189)	(0.0505)	(0.0219)	(0.0115)
rms_{-1}	-0.0820	-0.0820	-0.0744	0.00822	-0.149	rms_{-1}	-0.0212	-0.0212	-0.0218	-0.00341	-0.0323
	(0.117)	(0.109)	(0.141)	(0.00563)	(0.122)		(0.0212)	(0.0221)	(0.0226)	(0.00474)	(0.0258)
$\Delta ir \times rms_{-1}$	0.0374	0.0374	0.0378	0.0519***	0.0395*	$gap \times rms_{-1}$	-0.655**	-0.655***	-0.644	-0.252**	-0.831***
	(0.0239)	(0.0243)	(0.0412)	(0.0186)	(0.0227)		(0.212)	(0.251)	(0.393)	(0.113)	(0.236)
N	200	200	200	188	188		214	214	214	203	202

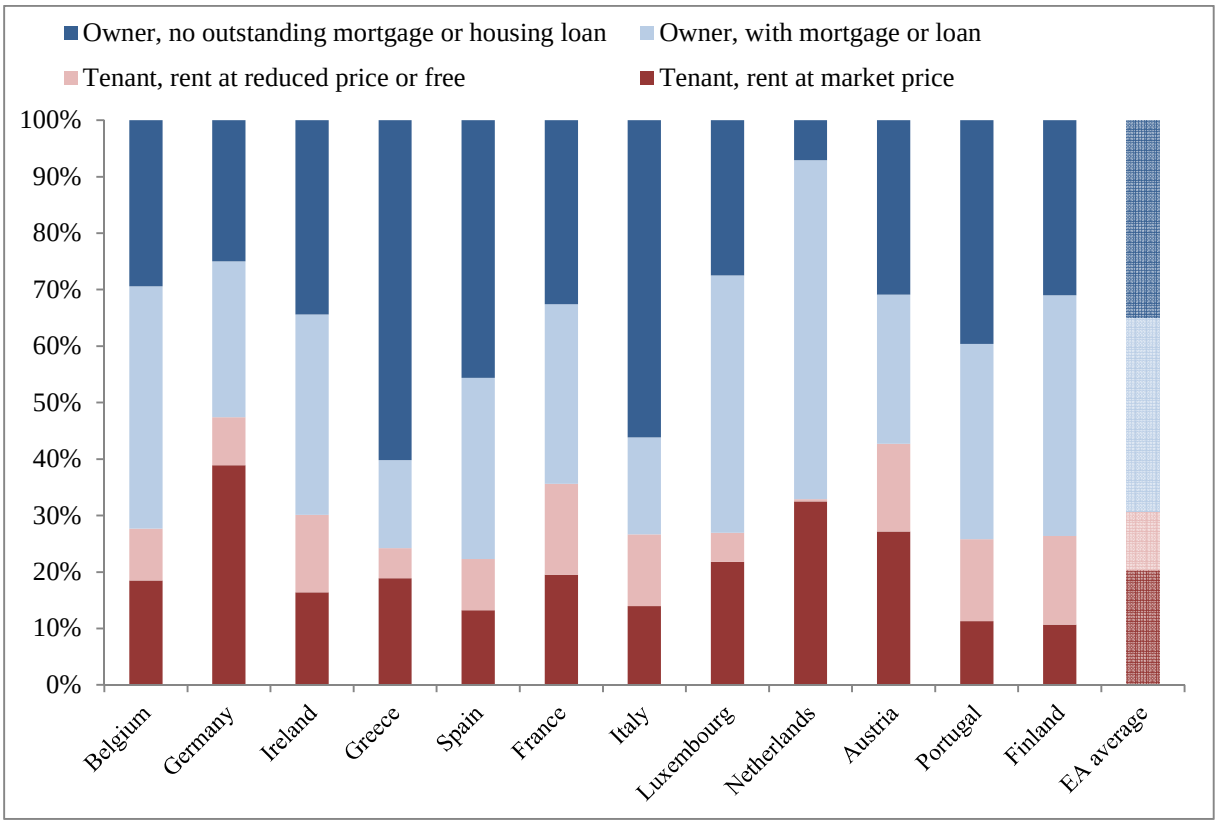
Notes: Panel robust standard errors in brackets. Asterisks ***, ** and * denote 1%, 5% and 10% significance level, respectively. For the AH model the set of instruments consists of Δhp_{-2} (or Δva_{-2}) and Δgap_{-1}. Δhp stands for log-growth of real house prices, *gap* is output gap (as percent of GDP), *imigrant* is the net immigration ratio, *popsh* is the share of population aged 20-34 years in total population, *ir* is long-term interest rate deflated by HICP inflation and *rms* is the share of households living in rented apartments. *FE* stands for fixed effects regression, *FE-BT* stands for fixed effects regression with bootstrap standard errors estimation, *FE-BC* for the model estimation procedure proposed by Bruno, AH stands for Anderson-Hsiao instrumental variables estimation and *AB* stands for the Arellano-Bond estimation procedure.

Figure 1: The share of rental market in EMU countries (%)



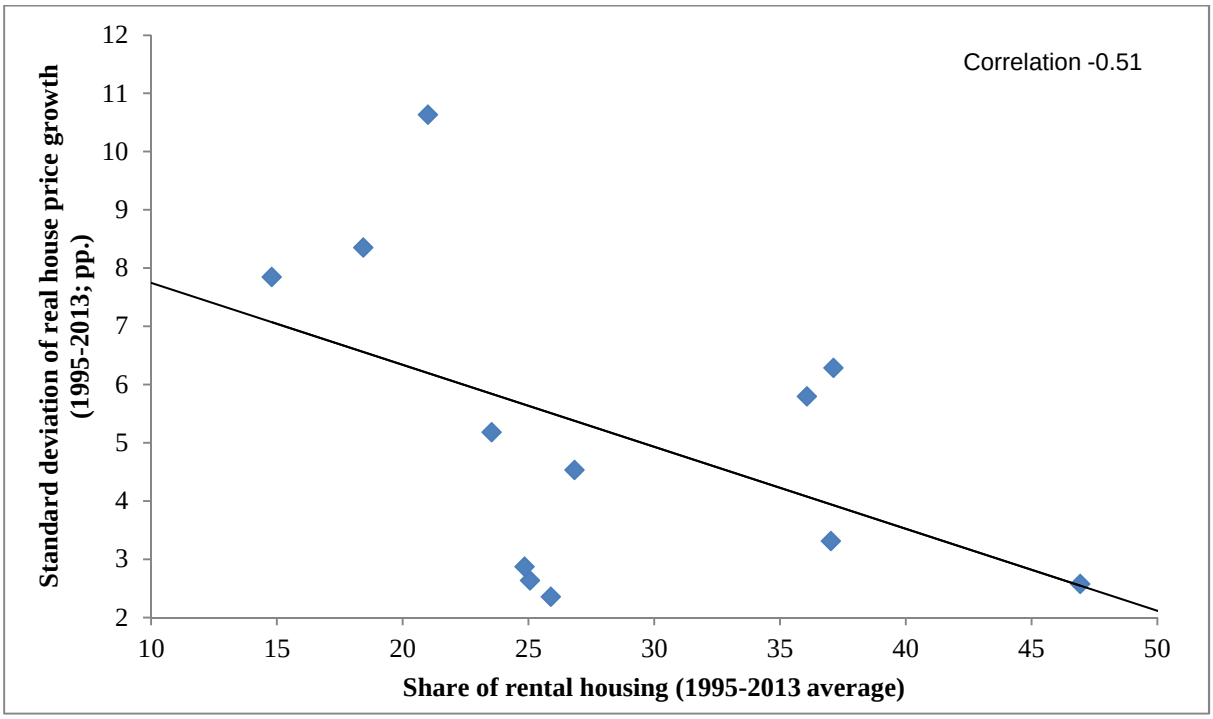
Source: Eurostat, OECD, UN, own calculations.

Figure 2: The structure of the housing market in EMU countries in 2013



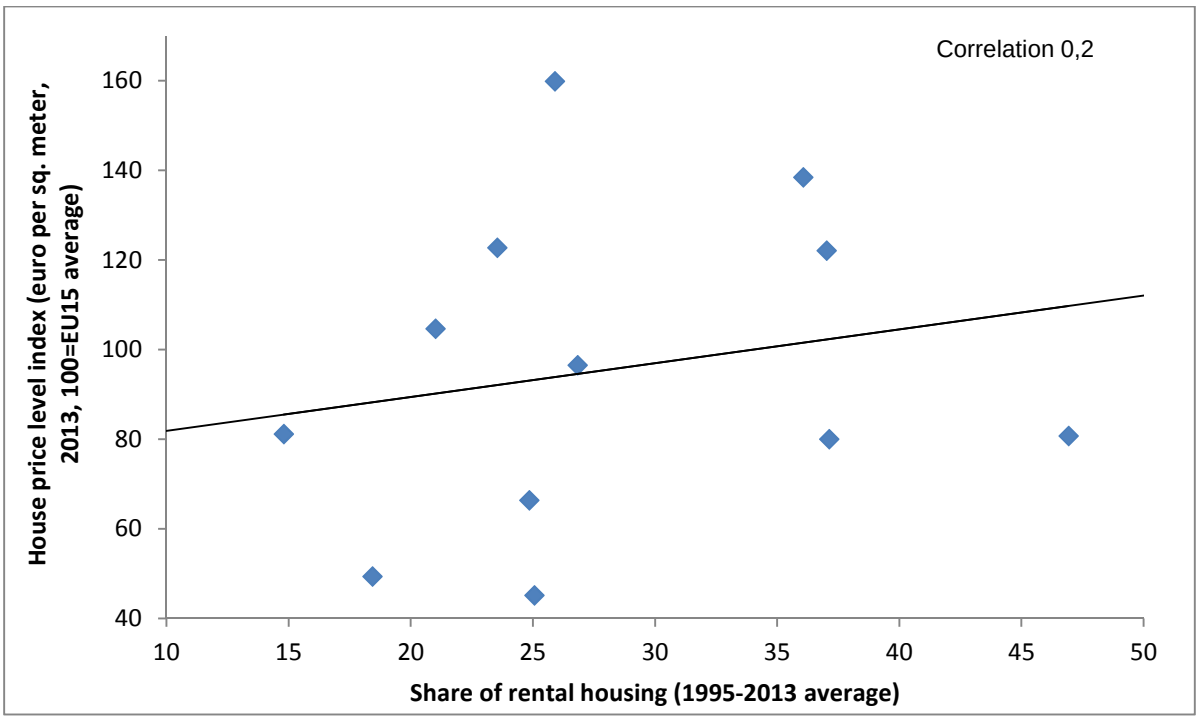
Source: Eurostat.

Figure 3: The size of the rental market and house price volatility in EMU countries



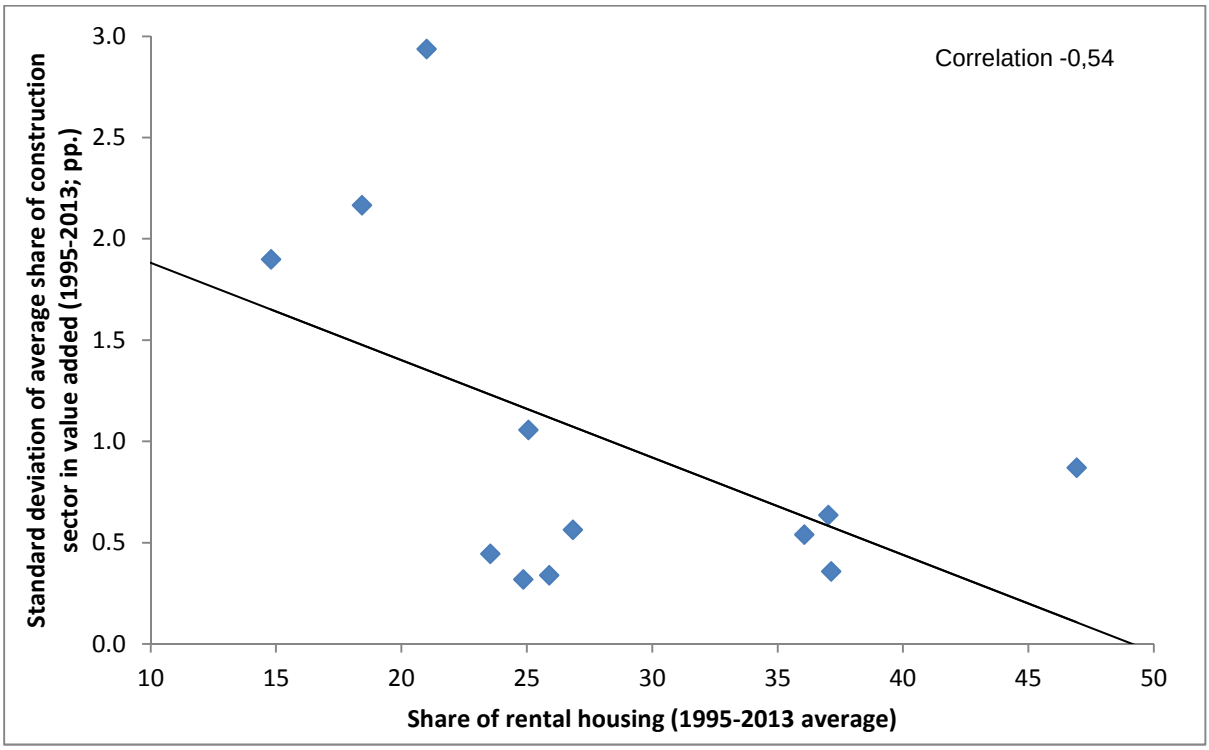
Source: See table 1.

Figure 4: The size of the rental market and house prices in EMU countries



Source: Own calculations.

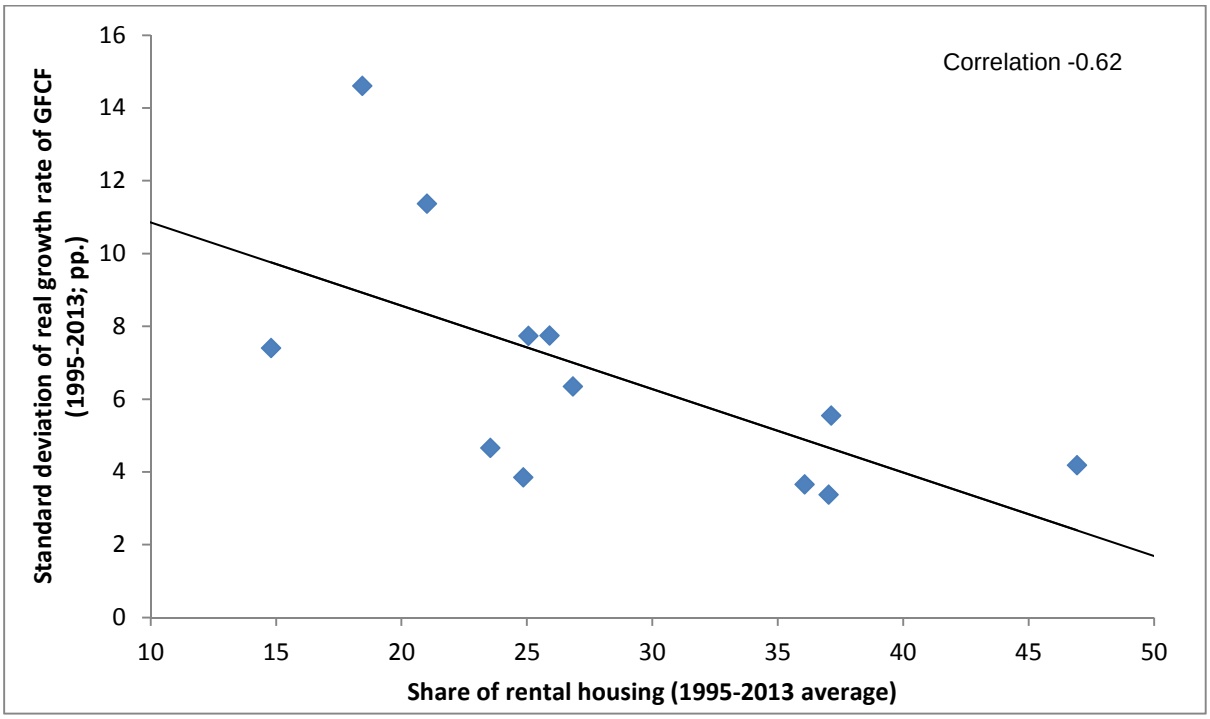
Figure 5: The size of the rental market and the stability of the construction sector in EMU countries



Notes: Value added of the construction sector (NACE Rev. 2.0 code: F).

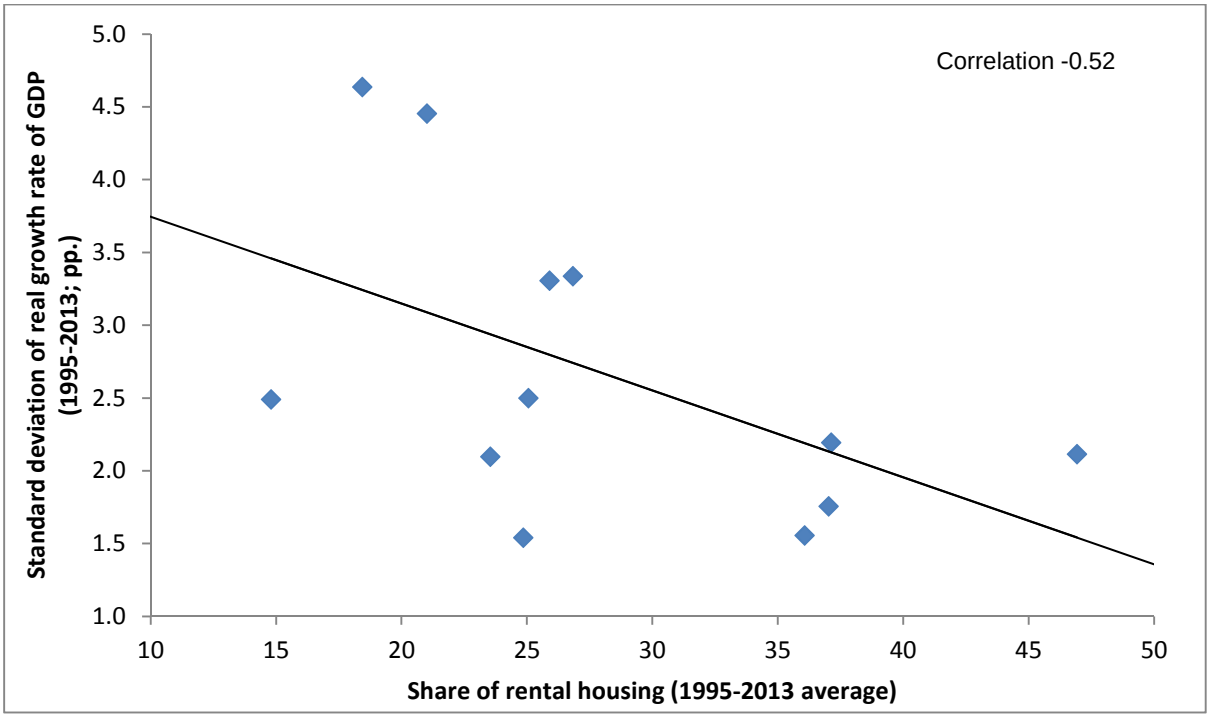
Source: See table 1.

Figure 6: The size of the rental market and investment fluctuations in EMU countries



Source: See table 1.

Figure 7: The size of the rental market and the stability of the economy in EMU countries



Source: See table 1.