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Influence of migration policy risk on international market segmentation: analysis of housing and rental markets in the euro area

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ABSTRACT

This paper aims to discuss the influence of migration policy risk on market segmentation of housing and rental markets in the Euro Area. Policy risk is represented by the Migration Policy Uncertainty Index (MPUI) and Migration Fear Index (MFI) of Germany and the United Kingdom; in this study, whether these indexes influence the interaction between the housing and rental markets of the two countries and euro-area countries was examined. The empirical results showed that the influence of the United Kingdom's migration policy risk on the euro-area countries is higher than that of Germany. The United Kingdom's MPUI and MFI significantly contribute to the influence of the United Kingdom's housing market on other markets except for Belgium and Spain. Compared with housing market connectedness, the rental market connectedness is less influenced by migration policy risk and migration fear. This may be because variables related to short-term residence policies influence the rental market. The high policy risk is more likely to influence decisions related to long-term house purchase, but not those related to short-term residence. Finally, this study found that the higher the uncertainty of the migration policies of the United Kingdom and Germany is, the higher the house market segmentation is.

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1. Introduction

Various studies have provided evidence of the negative influence of economic policy uncertainty (EPU) on national development or market returns (e.g., Arouri et al., 2016; Brogaard & Detzel, 2015). However, few studies have investigated the influence of increasing migration policy uncertainty or migration fear on international market integration or market segmentation. In addition, while there has been a wealth of literature in the past discussing the global integration of different asset markets (e.g., Bley, 2009; Dimic et al., 2021; Guesmi et al., 2014; Juhro et al., 2021), there is minor

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literature on the international market segmentation of housing and rental markets. Previous studies have found that policy risk could influence housing and rental markets (Christou et al., 2017; Diamond et al., 2019). In addition, the policy risk related to migration had even more influence (Donadelli et al., 2020). Research has also showed that policy uncertainty influences the connectedness between asset markets (Fang et al., 2017; Gao & Zhang, 2016). Consequently, the goal of this paper is to discuss the influence of migration policy risk on market segmentation of housing and rental markets in the Euro Area (Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, and the United Kingdom).

In recent years, market consolidation in the European region has often faced different facilitation or resistance. For example, the launch of the Euro or the increase of the European economic integration might raise the market connection in the European housing markets (Simionescu, 2019; Tsai, 2018; Yunus & Swanson, 2012). Nonetheless, the problems associated with the United Kingdom's withdrawal from the European Union as well as the problem of trade wars among countries have influenced the policies of different countries and have increased the related risk of migration policies. These might result in people having lower acceptance and higher fear of migrants.

Especially, in Europe, more changes have been made in the migration policy of the United Kingdom and Germany. In 2016, Brexit was proposed by the United Kingdom. In 2015, Germany was extremely open to the immigration of Syrians, but there was also the problem of antirefugee violence (Benček & Strasheim, 2016). In addition, research has shown that the house prices in the United Kingdom and Germany have more influence on the house prices in Europe overall (Hirata et al., 2013; Tsai, 2018). Therefore, whether the increase in the migration policy risk of Germany and the United Kingdom increases the market segmentation of the two countries and other euro-area countries is still unknown and vital. Therefore, this paper aims to test whether the migration policy uncertainty and migration fear of Germany and the United Kingdom influence the interaction between the housing and rental markets of these two countries and the euro-area countries.

The theme of this study combines important topics in two aspects: the discussion of the housing market and immigration and the integration of the housing market. The discussion of these two topics is critical. Although some literature discusses these two topics separately, no literature focuses on immigration policy and cross-border housing market integration. First of all, in the research on the housing market and migration, although various studies have verified the relations between the housing market and migrants, most of the literature has focussed on the influence of housing price changes on population migration. Particularly, Ferreira et al. (2010), Valletta (2013), and Modestino and Dennett (2013) have discussed the 'lock-in effects' caused by the house price fall in recession. However, fewer studies have investigated the relations between variables in the opposite direction, namely, the influence of population migration on house price changes. Whether the increase in migration policy risk or fear increases the segmentation between transnational house markets is an urgent research requirement. Ordu-Akkaya (2018) stated that from 2000 to 2017, the total migration population increased by approximately 50%, however, given the Brexit

referendum in June 2016, reports by the New York Times in 2016, and Donald Trump's proposal to build a wall to prevent illegal Mexican migration, migration policy risk increased.

Baker et al. (2015) developed highly objective indexes that can measure the increase in migration policy risk or fear, namely, the Migration Policy Uncertainty Index (MPUI) and Migration Fear Index (MFI). The indexes are calculated by searching for the numbers of selected keywords in several newspapers in the United Kingdom, Germany, France, and the United States. In the MPUI and MFI indexes by Baker et al. (2015), the selected keywords focus on the issues related to migration policy risk. This study used these indexes to represent migration policy risk or fear.

On the other hand, the discussion on the integration of international housing markets is also an essential issue for the financial aspect. It can determine whether the regional economic development is unbalanced. Because the liquidity of real estate is lower than that of other assets, it is not easy for arbitrage transactions between countries to occur. Yunus (2015) proposed that the connections among international housing markets could be attributed to 'real' convergence. However, if the real estate markets between countries are entirely separated, once a single market has bubbles, the bubbles will likely last for a long time. Therefore, international market segmentation may induce inefficiencies in the housing market, raising risks for lending banks, property-related securities markets and global stock markets.

Migrants increase house prices (Degen & Fischer, 2017; Gonzalez & Ortega, 2013) and influence the rental market (Saiz, 2003; 2007; Tyrcha, 2019). Such influence is caused by high-income migrants (Tyrcha & Abreu, 2019). Mussa et al. (2017) also provided evidence that the increase in the immigration population causes an increase in the rent and house prices in cities and in neighbouring cities. Thus, the immigration population might have a spillover effect, and population movement increases the integration of the housing and rental markets of neighbouring cities. However, if political or economic policies are unfavourable for migrants, the integration between housing and rental markets can be reduced.

Numerous studies in the financial field have analysed the influence of transnational fund movement on the integration and segmentation of the transnational asset market. For example, Hattari and Rajan (2011) examined the influence of different types of transnational fund movements on the integration of the asset market. Carrieri et al. (2007) researched the influence of the limit of capital circulation and the substitution effect of the transnational market on the integration of the global capital market. However, literature related to real estate has rarely discussed the influence of the migration policy on the integration or segmentation of housing and rental markets. Ordu-Akkaya (2018) believed that migration policy risk influences companies' values and investors' emotions and thus studied fluctuation transmission between the Migration Policy Uncertainty Index of France, Germany, the United Kingdom, and the United States and investigated the stock markets of these countries. The study by Ordu-Akkaya (2018) was the first to analyse the relations between MPUI and the spillover effect of the transnational stock market. Research on the influence of migration policy risk on the integration of the transnational market is extremely insufficient.

The issue of the migration policy has become increasingly crucial. The antirefugee violence problem starting in 2015, trade wars among countries (particularly the trade war between China and the United States starting in 2018), and the COVID-19 pandemic in 2020 have all resulted in an increase in migration policy uncertainty. The increase in migration policy risk or fear resulting from such uncertainty might cause some effects that influenced the entire world. Consequently, this study investigated their influence on the housing market highly related to migrants. The empirical results of this study can provide some objective evidence on the extremely significant issue of the migration policy. Thus, subsequent research can examine other issues related to the increase in migration policy risk.

The remaining sections of this paper are as follows: In [Section 2](#), previous research on issues related to migration in the European region and the influence of policy risk on housing and rental markets is reviewed. In addition, this study reviewed the evidence of increasing EPU influencing the connectedness between asset markets proposed in the literature. Thus, the motive and research background of the analysis of the influence of migration policy risk on the connectedness of housing and rental markets are explained. [Section 3](#) illustrates the methodology of this paper. In [Section 4](#), the samples are introduced, and the results of the empirical estimation are explained. [Section 5](#) presents the conclusions, the evidence of this study, and the policy implications of the empirical evidence.

2. Literature review

2.1. *Issues related to migration in the European region*

Migration policy plays a vital role in the policies of many countries, especially in regions with high cultural and economic connectivity, for example, among European Union (EU) countries (Helbling & Kalkum, 2018). Because migration policy would affect other economic and social conditions in the local market, Martins and Strange (2019) proposed that the importance of migration policy is increasing year by year because the externality (the level of impact) of migration policy is rising substantially. Some studies have demonstrated the contribution of migration to the economy, such as Hajjighasemi and Oghazi (2022) showed that if the labour market is open enough for immigrants to provide labour quickly, immigration will help the economy's income increase. But still, some countries have policies that are increasingly hostile to immigration, perhaps because of concerns about the negative impact of immigration on the labour market (e. g., Stojanov et al., 2021) or the defence of national security. Although Treistman and Gomez (2021) presented evidence that the increase in immigration is not related to the rise in terrorism during the European crisis, news events and comments still question the safety of migration flows in Europe. This means that the public's fear of immigration has also increased in recent years in addition to the policy.

Although in addition to Europe, there is also literature focussing on the migration policies of other countries, such as Australia, Tani (2020), Japan (Yu et al., 2021), and Canada (Theoharides, 2020). These studies focussed on the relationship between migration and the labour market.

Most of the migration policy discussions from different perspectives are based on the European region, such as Martins and Strange (2019) discussed the ‘open-door’ migration and refugee policy pursued by the German government. Adam et al. (2021) discussed the impact of Germany’s refugee policy on housing and society. Asderaki and Markozani (2019) studied the effects of Brexit on EU-UK cooperation and changes in European migration policy in the context of migration control. Okhoshin (2020) discussed immigration policy before and after Brexit. Elliott (2019) showed that Ireland’s migration policy has tended towards EU norms, but the UK influenced it more than EU countries. Přívara (2021) used Slovakia to explain that the migrant population is mainly migrating to the neighbouring EU countries.

The above studies illustrated the importance of EU migration policies. Among them, Germany’s ‘open-door’ migration and refugee policy, the UK policy changes before and after Brexit, and the impact on EU countries have received more attention. Therefore, the current paper chooses to discuss the influence of migration policies of Germany and the United Kingdom, and the affected countries are the seven major countries in the euro area (Belgium, Finland, France, Ireland, Italy, the Netherlands, and Spain). Although there is also literature discussing immigration and housing market-related topics in these countries, such as d’Albis et al. (2019) studied the impact of immigration on house prices in France, Adam et al. (2021) and d’Albis et al. (2019) also showed that high housing prices hinder immigration, the correlation between migration policy and housing market connectedness remains an open question.

2.2. Influence of policy risk on housing and rental markets

In this study, the influence of migration policy risk on market segmentation was analysed. The MPUI and FMI indexes of Germany and the United Kingdom represented policy risk. Whether migration policy risk influences the segmentation of housing markets and rental markets among countries was evaluated. The significant effect of policy risk on housing and rental markets according to the literature is first described below.

Katz and Turner (2008) reviewed the rental policy of the United States and found that the policy influences or limits the development of the rental market and thus influences the employment and residence choices of the population. For example, the US Federal Government’s policy of assisting low-income renters may aggravate the racial segregation of residents. A new rent control policy was implemented in 1994 in San Francisco, and Diamond et al. (2019) studied the influence of this legal amendment on tenants and landlords. The results showed that rent control substantially limits the turnover of tenants and possibly increases the rent of the housing market.

Before the indexes proposed by Baker et al. (2015), there were few concrete indexes to measure the uncertainty and fear of migrants. Subsequently, no study investigated the relations between indexes related to migrants and housing and rental markets. Only a few studies have examined the relations between indexes related to migrants and macroeconomics. For example, Donadelli et al. (2020) studied the influence of changes in uncertainty and fear related to migrants on the actual economic

activities of four advanced economies (i.e., the United States, United Kingdom, Germany, and France). The results showed that the worsening uncertainty and fear of migrants have significant long-term influence on actual economic activities in the United States and the United Kingdom.

More studies have examined the relations between other types of policy-related indexes (such as EPU) and house prices. For example, André et al. (2017) examined whether the uncertainty index can predict the trend of the actual rate of return of house prices. Their samples included the actual house prices after CPI adjustment and the American EPU index constructed by Baker et al. (2016). The results showed that the EPU index not only covered information on house price trends but also captured the changes in house market risk. Antonakakis et al. (2015) examined the dynamic relations between the rate of return of house prices and the EPU index. The study period was 1987M1–2014M11. They found that the EPU index and the house price rate of return were negatively correlated. In addition, the negative correlation level was higher during depression. El-Montasser et al. (2016) examined the leading and lagging relations between the EPU index and house prices in seven developed countries. The study period was 2001Q1–2013Q1. They found that the actual house prices of the sample countries had two-way leading and lagging relations with the EPU index. Christou et al. (2017) investigated whether the EPU index can predict the rate of return of actual house prices, with 10 countries of the Organization for Economic Cooperation and Development as the study target. The study period was 2003Q1–2014Q4. They proved that including the EPU index in the empirical model is beneficial to the prediction of the rate of return of house prices.

Although the aforementioned findings verify the significant influence of policy risk on housing and rental markets, the relations between migrant-related policy risk and housing and rental markets are still unknown.

2.3. Influence of policy uncertainty on the connectedness between asset markets

The higher the policy uncertainty is, the higher the policy risk is. For example, Bernal et al. (2016) examined the influence of EPU on the internal risk spillover of the euro-area countries using the data for the period from 2008 to 2013. Bernal et al. discovered that the increase in EPU increases the transmission risk of the euro-area bond markets. The increase in risk caused by policy uncertainty may increase the segmentation between transnational markets. For example, Li and Peng (2017) discussed whether the EPU of the United States influences the comovement phenomenon between Chinese and American stock markets. The study sample comprised the weekly data for the period from January 4, 1993 to December 31, 2014. The results showed that increased (decreased) EPU has significantly negative (positive) influence on the stock market correlation between China and the United States. These results imply that the increase in policy risk decreases the correlation between transnational stock markets.

Studies have also found that when policy uncertainty increases, the interaction between stocks and other asset markets decreases. For example, Gao and Zhang

(2016) discussed the influence of the EPU of the United Kingdom on the correlation between the UK stock market and gold market. They found that when EPU is high, the gold demand increases, and the stock demand decreases. Thus, the correlation of the two markets decreases. By contrast, when EPU is low, both the gold demand and stock demand increase. Therefore, the correlation between the two markets increases. Fang et al. (2017) investigated the long-term dynamic correlation between the American stock market and bond market under the influence of EPU. Considering that the 1997 Asian financial crisis and the 2008 global financial crisis may cause structural changes in the correlation, Fang et al. (2017) included the virtual variables of those periods into the model for correlation estimation in different periods. They also found that EPU has a significantly negative influence on the long-term correlation between the American stock market and bond market. The results of Gao and Zhang (2016) and Fang et al. (2017) imply that the increase in policy risk may increase the segmentation between the local stock market and other asset markets.

The aforementioned studies indicate that policy risk influences housing and rental markets. In addition, the policy risk related to migration has even more influence. Research has also shown that policy uncertainty influences the connectedness between asset markets. Consequently, this study analysed the influence of migration policy risk on the connectedness of housing and rental markets.

3. Methodology

This study aims to analyse the influence of migration policy risk on market segmentation. The MPUI and MFI indexes of Germany and the United Kingdom represent the migration policy risk. We need to estimate the correlation and segmentation between the housing and rental markets of the two countries and euro-area countries to test whether these indexes influence the interaction between the housing and rental markets. For this purpose, the paper followed the systemic method of measuring connectedness proposed by Diebold and Yilmaz (2012, 2014) to calculate the indicators for market connectedness. This approach, combined with the development of new time series econometrics, can fully measure the various dynamic correlations between variables. Hence, many past studies have also used this method to measure correlations between international stock markets (Mensi et al., 2018), different kinds of financial markets (Xia et al., 2020; Zhang, 2017), and regional housing markets (Hwang & Suh, 2021; Tsai, 2019) or the international linkages among housing markets (Lee & Lee, 2018; Liow, 2014).

The method is simply illustrated as follows. First, a nine-variable vector autoregression (VAR) model was established to estimate market returns. The model can be written as the moving average representation expressed as:

$$Return_t = \sum_{i=1}^{\infty} \zeta_i \varrho_{t-i} \quad (1)$$

where the vector $Return_t$ represents housing market returns or the rental housing returns of the nine countries, and ζ is the coefficient matrix and ϱ is the residual matrix.

According to the generalised variance decomposition (GVD) framework, the GVD is robust to the ordering of the variables in the VAR model (Diebold & Yılmaz, 2014). And by the estimation of the GVD, the orthogonal shocks are obtained:

$$A(L)\epsilon_t, \quad A(L) = A_0 + A_1L + A_2L^2 + \dots, \quad E(\epsilon_t\epsilon_t') = I. \quad (2)$$

where the shocks followed an covariance-stationary datagenerating process. Contemporaneous aspects of connectedness are summarised in A_0 , which need not be diagonal. Dynamic aspects of connectedness are summarised in $\{A_1, A_2, \dots\}$.

Let a_{ij} denote the ij -th H -step generalised variance decomposition component; that is, the fraction of variable i 's H -step forecast error variance due to shocks in variable j . Hence, the forecast error variance (a_{ij}) can represent the impact of the influence from Country j on the housing market returns in Country i :

$$a_{ij} = \frac{\vartheta_{jj}^{-1} \sum_{h=0}^{H-1} (\theta_i' v_h \sum \theta_j)^2}{\sum_{h=0}^{H-1} (\theta_i' \delta_h \sum v_h' \theta_i)} \quad (3)$$

where ϑ_{jj} is the standard deviation of the error term for the j th equation. In the infinite moving-average representation of the VAR model, v_h denotes the coefficient matrix, which multiplies the h -lagged shock vector. θ_i is a selection vector with j th element unity and zeros elsewhere. \sum is the variance matrix for the error vector. Of particular note is that the forecast error variance (a_{ii}) represents the part of a country's market returns that is affected by its own factors. If this part is large, it means that the segmentation between a country's housing or rental market and other markets exists.

The table containing all the results of the variance decomposition components is 'the connectedness table'. It also shows the disaggregated connectedness measures suggested by Diebold and Yılmaz (2014). This table provides information on total directional and total connectedness measures. This paper can measure the degree of connectivity and segmentation between markets by observing the connectedness table and estimating the part of self-influence (a_{ii}), respectively.

4. Data and empirical results

4.1. Data

To analyse the influence of migration policy risk on market segmentation, the influence of the MPUI and MFI of Germany and the United Kingdom on the interaction between the housing and rental markets of these two countries and seven other euro-area countries was estimated in this study. Subsequently, the data of the actual house price and rent from the following nine countries were obtained: Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, and the United Kingdom. The period of data was 1981Q1–2019Q4, and the data source was the Organization for Economic Cooperation and Development (OECD) database.¹

Table 1. Descriptive statistics and unit root tests of housing price indices.

Housing prices (Index)	Belgium	Finland	France	Germany	Ireland
Mean	79.6983	86.1642	82.1433	101.1275	95.5508
Median	82.9500	93.1500	89.6500	102.1500	100.0500
Maximum	108.3000	104.8000	109.9000	124.3000	162.2000
Minimum	47.6000	54.7000	50.7000	87.7000	47.8000
Std. Dev.	20.6748	16.6249	22.9742	8.6697	34.1734
Phillips-Perron unit root test					
In level	−0.7029 (0.8411)	−1.0326 (0.7400)	−0.5489 (0.8763)	0.4697 (0.9850)	−1.3361 (0.6111)
In differenced	−11.4518*** (0.0000)	−4.4215*** (0.0005)	−2.9957** (0.0382)	−11.2517*** (0.0000)	−4.1695*** (0.0011)
Housing prices (Index)	Italy	Netherlands	Spain	UK	
Mean	109.0692	96.5767	104.1350	76.3733	
Median	106.9500	105.9000	98.6500	88.0500	
Maximum	136.3000	127.9000	165.9000	110.2000	
Minimum	85.1000	46.7000	69.1000	39.0000	
Std. Dev.	14.7866	26.7883	29.2040	26.0617	
Phillips-Perron unit root test					
In level	−1.2578 (0.6474)	−1.4405 (0.5602)	−1.2935 (0.6310)	−0.3575 (0.9116)	
In differenced	−7.1082*** (0.0000)	−5.6178*** (0.0000)	−3.4945*** (0.0098)	−3.7663*** (0.0043)	

Notes: Phillips-Perron unit root tests are adopted for testing the null hypothesis of a unit root in the series. The testing model for unit root includes intercept. The entry in parenthesis stands for the p -value. The symbols *** and ** respectively denote significance at the 1% and 5% levels.

Source: The results of the author's empirical test.

MPUI and MFI of Germany and the United Kingdom are indexes developed by Baker et al. (2015).² The data period was 1990Q1–2019Q4. Baker et al. (2015) consider that, in recent years, refugee flows from the Middle East and North Africa brought security challenges to Europe. In order to observe the impact of these issues on immigration policies, new quantitative indicators have been proposed to measure the intensity of fear associated with immigration in France and Germany, the United Kingdom and the United States and policy uncertainty. Baker et al. (2015) also examined the time-series behaviour of fear indexes and compared them with indicators of policy uncertainty related to immigration.

The method of compiling the two indexes is similar to that of Baker et al. (2016) compiling to measure other types of Economic Policy Uncertainty, except that the words used to search for relevant news are different. The following is a brief description of how it is compiled.³

First, Baker et al. (2015) selected five types of words representing different meanings: Migration (M), Fear (F), Economy (E), Policy (P), and Uncertainty (U). In order to construct the migration fear index, they count articles with at least one word in the M and F word sets and then divide by the total number of newspaper articles. To construct a migration policy uncertainty index is to calculate articles with at least one word in the sets of M, E, P, and U, and divide by the total number of newspaper articles.

Table 1 shows the simple statistics and unit root test results of the house price indexes of Germany, the United Kingdom, and the seven countries in the European

Table 2. Descriptive statistics and unit root tests of rental price indices.

Rent prices (Index)	Belgium	Finland	France	Germany	Ireland
Mean	83.1583	80.6217	82.6150	86.6375	82.0725
Median	82.9500	75.8000	81.8500	88.2000	72.7500
Maximum	104.8000	109.3000	101.0000	106.2000	137.4000
Minimum	55.7000	62.0000	55.8000	53.5000	49.2000
Std. Dev.	14.1227	14.4187	14.0035	12.9204	23.2716
Phillips-Perron unit root test					
In level	-2.8253 (0.0578)	1.3828 (0.9989)	-2.4720 (0.1249)	-4.5060*** (0.0003)	-1.3431 (0.6077)
In differenced	-7.4302*** (0.0000)	-4.1342*** (0.0013)	-3.8777*** (0.0030)	-8.7179*** (0.0000)	-4.1315*** (0.0013)
Rent prices (Index)	Italy	Netherlands	Spain	UK	
Mean	80.0258	75.9917	78.6975	76.2117	
Median	83.3000	76.4500	82.5500	75.7500	
Maximum	101.3000	109.6000	103.7000	104.2000	
Minimum	42.0000	43.8000	36.0000	37.9000	
Std. Dev.	18.6966	18.6419	21.7500	18.7739	
Phillips-Perron unit root test					
In level	-4.8021*** (0.0001)	0.4526 (0.9844)	-3.3866** (0.0133)	-3.7707*** (0.0042)	
In differenced	-2.5728 (0.1015)	-10.0857*** (0.0000)	-1.8226 (0.3680)	-6.6372*** (0.0000)	

Notes: Phillips-Perron unit root tests are adopted for testing the null hypothesis of a unit root in the series. The testing model for unit root includes intercept. The entry in parenthesis stands for the p -value. The symbols *** and ** respectively denote significance at the 1% and 5% levels.

Source: The results of the author's empirical test.

Union. Table 2 presents the simple statistics and unit root test results of the rent indexes of the nine countries. Figure 1 illustrates the time sequence of the house price indexes of the nine countries. Figure 2 shows the time sequence of the rent indexes of the nine countries. Table 1 and Figure 1 show that among the countries, the fluctuation amplitude of the house price index was smaller in Germany. For Spain, Ireland, and the United Kingdom, the house price indexes had extremely large differences in the data period. In addition, the fluctuation amplitudes of the house price caused by the global depression of 2008 were extremely large.

Table 1 shows that all the house price indexes were sequences of $I(1)$. Hence, for the following empirical estimation, the data of the house price index return were used in this study. Table 2 shows that few rent indexes were stationary. However, using only the data of the rent index return can conform to the condition of all the data being $I(0)$. Subsequently, for the rental market, the data of the rent index return were also used for estimation in this study. In addition, a comparison of Figures 1 and 2 shows that house price fluctuations were clearly larger than rent fluctuations in all the countries except for Ireland. Various studies have verified rent rigidity (Genesove, 2003; Shimizu et al., 2010). Thus, this phenomenon is expectable. The data of the house price and rent were used simultaneously in this study. Whether the different fluctuations of the two indexes are influenced to different degrees by policies was compared.

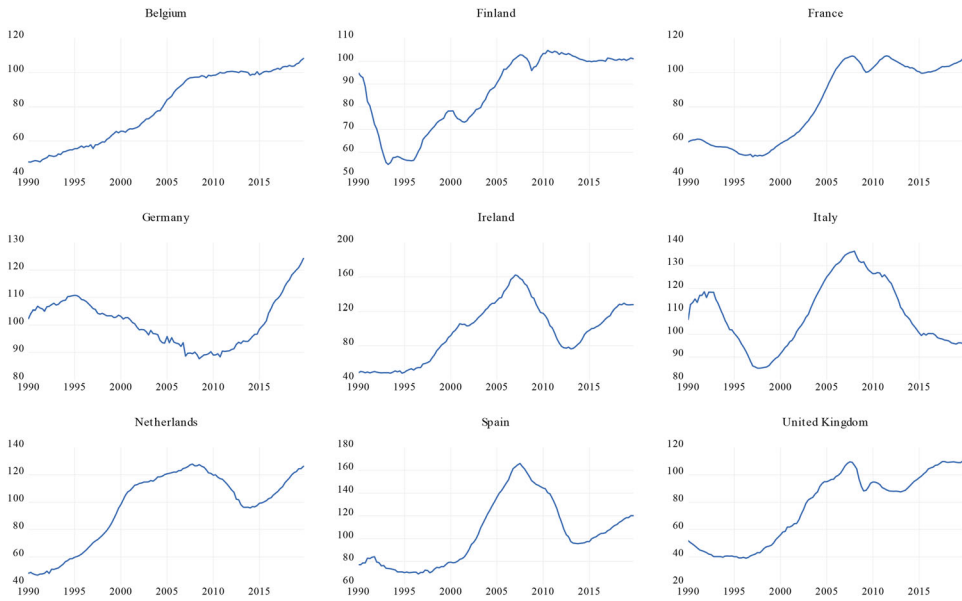


Figure 1. Time series of housing price indices.
Source: Tthe results of the author's empirical test.

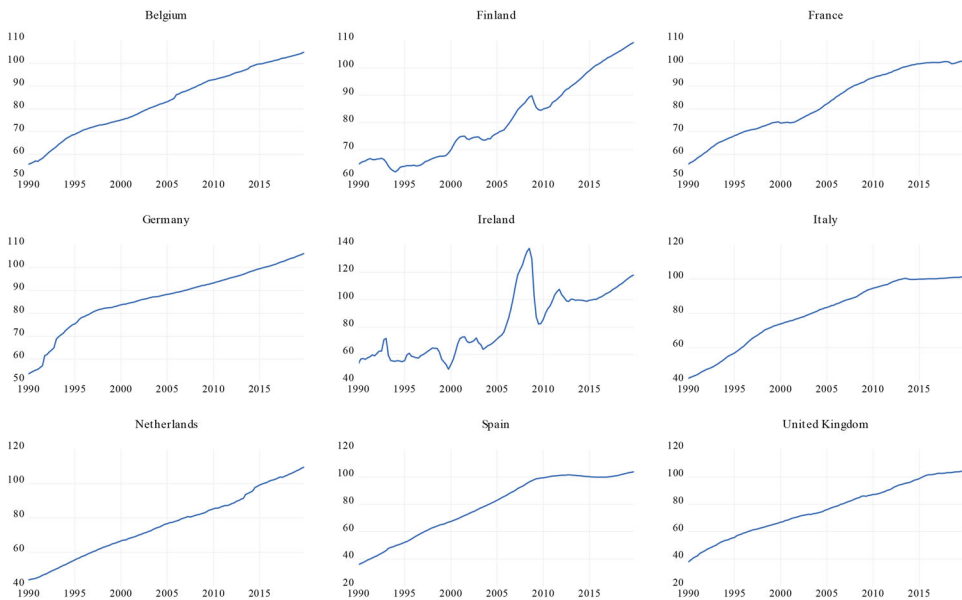


Figure 2. Time series of rental price indices.
Source: The results of the author's empirical test.

4.2. Measurement results of market connectivity and segmentation

To analyse the influence of migration policy risk on market segmentation, the correlation and segmentation between the housing and rental markets of these countries must first be estimated in this study. As mentioned in [Section 3](#), the table containing all the results of the variance decomposition matrix is ‘the connectedness table’,

Table 3. Housing market connectedness of the nine countries.

	Belgium	Finland	France	Germany	Ireland	Italy	Netherlands	Spain	UK	From others
Belgium	61.8	2	11.6	0.6	3.1	4.5	3.6	8.5	4.3	38
Finland	1.4	65	2.1	2.6	0.3	8.7	0.9	10.7	8.3	35
France	7.2	0.6	58.7	0.2	1.3	1	1.1	12.2	17.7	41
Germany	5.9	5	0.8	81.9	0.6	1.2	2.1	2	0.4	18
Ireland	1.3	0.5	1.9	2	69.5	1.8	7.7	5.4	9.8	30
Italy	4.3	2.1	8.4	0.8	1.8	64.3	0.6	10.1	7.7	36
Netherlands	1.5	0.5	0.4	1.2	11.9	1.5	71	7.4	4.6	29
Spain	0.2	1.6	5.2	0.8	2.6	1.2	0.7	75.4	12.2	25
UK	0.4	9.5	5.7	1.2	4.1	2.5	2.6	11.7	62.3	38
Contribution to others	22	22	36	9	26	22	19	68	65	290
Contribution including own	84	87	95	91	95	87	90	143	127	32.20%

Notes: Numbers in italic represent the directional contribution from/to other markets. The lower right end corner number in bold is the total return spillover index.

Source: The results of the author's empirical test.

Table 4. Rental housing market connectedness of the nine countries.

	Belgium	Finland	France	Germany	Ireland	Italy	Netherlands	Spain	UK	From Others
Belgium	62.8	1.7	10.1	6.1	1	4.4	4.7	6.2	2.9	37
Finland	4.6	64.8	13.1	1.7	7.3	0.3	7.4	0.1	0.5	35
France	16.8	4.3	63.6	1.8	1.2	0.9	6.7	3.2	1.5	36
Germany	2.1	2.9	1.8	77.3	5.7	2	3.9	1.4	2.8	23
Ireland	0.5	22.1	1.5	4.2	68.9	0.4	0.4	0.8	1.2	31
Italy	8.2	3.1	3.8	1.5	0.8	77	1.9	2	1.7	23
Netherlands	5.6	4.1	5.7	5.7	2.1	1.1	71.3	2	2.4	29
Spain	1.7	6.5	3.6	4.5	10.2	4.9	6.1	58.9	3.7	41
UK	3.1	3.3	10.3	2.8	1.9	4.2	6.4	2.9	65.1	35
Contribution to others	43	48	50	28	30	18	38	19	17	290
Contribution including own	105	113	114	106	99	95	109	78	82	32.30%

Notes: Numbers in italic represent the directional contribution from/to other markets. The lower right end corner number in bold is the total return spillover index.

Source: The results of the author's empirical test.

which shows the disaggregated connectedness measures and aggregates them in various ways can obtain total directional and total connectedness measures.

Tables 3 and 4 show the connectedness table using the housing returns among the nine countries, and the connectedness table using the rental housing returns among the nine countries, separately. Tables 3 and 4 are the connectedness tables of the different types of markets, showing the interactions between the market returns. The tables can represent the connectedness and segmentation between the different countries' markets. Since in the table, each element a_{ij} denotes the percentage of the market returns in country i that can be explained by country j , hence, each number in the table represents the effects of the vertical countries on their corresponding horizontal countries. In addition, the diagonal numbers in Table 3 represent the part where house market return was subjected to self-influence (a_{ii}). Because a_{ii} is the part of the market that is influenced by its own factors, the higher this ratio is, the higher the segmentation of the market is from other markets. The a_{ii} values of Germany and the United Kingdom were estimated and represent market segmentation. Thus, the index of the correlation and segmentation between markets was obtained from the estimation in Tables 3 and 4.

First, the comparison of the results of Tables 3 and 4 shows that the housing market correlations and rental market correlations of these countries were all approximately 32%. Next, in Tables 3 and 4, the correlations between Germany and the United Kingdom and other markets are marked in grey. Regarding market segmentation, the segmentation of housing and rental markets was higher in Germany than in the United Kingdom. Finally, the net influence on other markets was compared. For the housing market in Germany, the ratio of influencing other markets was 9, but the ratio of being influenced by other markets was 18. Consequently, the net influence was -9 . For the housing market in the United Kingdom, the ratio of influencing other markets was 65, but the ratio of being influenced by other markets was only 38. Hence, the United Kingdom had an extremely high influence on other markets (the net influence is 27). For the rental market, the net influence of Germany was 5 ($28 - 23$), and the net influence of the United Kingdom was -18 ($17 - 35$). Thus, the influence of Germany on other rental markets was higher than that of the United Kingdom.

Next, the rolling window estimation was used to obtain the dynamic total connectedness measures to determine the temporal changes in connectedness.⁴ Figure 3 shows the change in the connectedness of the nine countries with time. The connectedness of the housing market was the highest in 2008Q2 and the second highest in 2012Q3. Overall, the average level of connectedness was higher after 2010 than before. The high housing market connectedness in 2008 may be due to the high comovement phenomenon caused by the downward correction of the house markets in different countries resulting from the financial crisis. However, after 2010, the economy gradually recovered in different countries. The connectedness was still maintained at a higher level, indicating that these markets were gradually integrated. After 1994, the rental market showed substantial increases in connectedness until 2000. The connectedness increased from 51 to over 70. This may be because the exchange rate and interest rate of different countries gradually converged for the development of euro. After 2000, the currencies integrated into a single currency, and the rents were calculated using the same currency in the euro-area countries. If significant differences exist, the resident choices of people would be influenced.

Figures 4 and 5 show the dynamic segmentation indexes (a_{ii}) obtained from the estimation of rolling windows. Figure 4 shows the segmentation indexes of the housing and rental markets of Germany. Figure 5 shows the segmentation indexes of the housing and rental markets of the United Kingdom. Similar to the results of Table 3, Figure 4 shows that the segmentation of the housing market of Germany was higher than that of other housing markets of countries in the European Union. However,

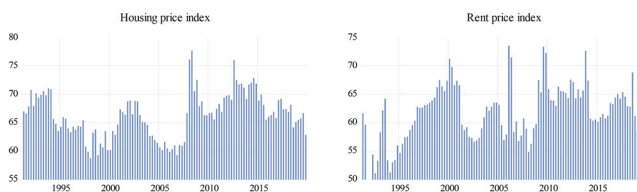


Figure 3. Total connectedness.

Source: The results of the author's empirical test.

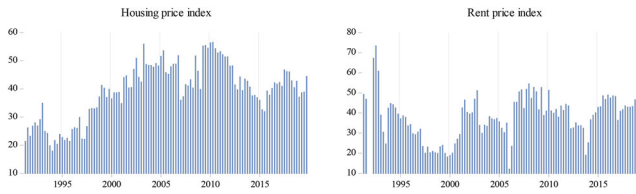


Figure 4. Indicators of segmentation (Germany).

Source: The results of the author's empirical test.

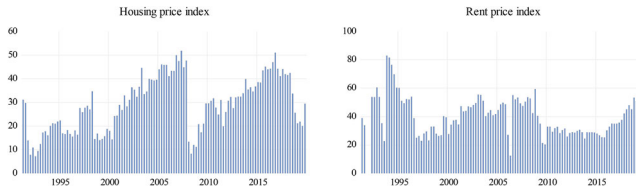


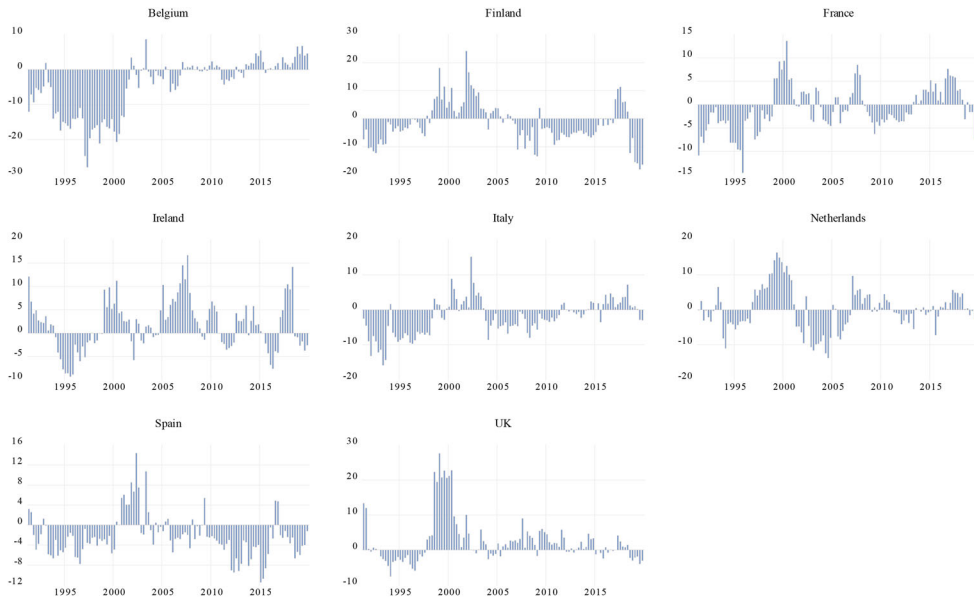
Figure 5. Indicators of segmentation (UK).

Source: The results of the author's empirical test.

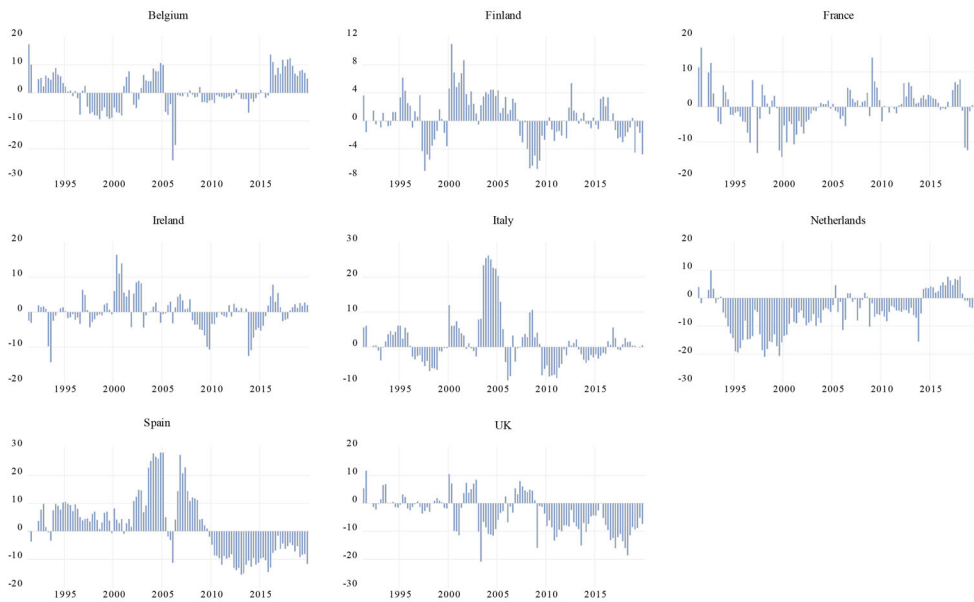
the segmentation had an increasing trend before 2007 and a decreasing trend thereafter. Similarly, the segmentation of the rental market of Germany showed a clear decreasing trend from 1992 to around 2000. Thus, there was an apparent increasing effect in connectedness in the rental markets in the European Union in this period. According to [Figure 5](#), such an increasing effect in connectedness did not appear in the United Kingdom. This may be because the United Kingdom did not join the European Union. The most apparent decreasing period of the segmentation of the housing market of the United Kingdom from other markets was from 2007Q4 to 2008Q2. This may be due to the influence of the global financial crisis. After that, the segmentation gradually increased until reaching a maximum in 2016Q4, which was exactly after the first proposal of the Brexit policy. This indicates that the majority of the fluctuation in the housing market in the United Kingdom is influenced by its own factors and is not correlated with other markets.

4.3. The relationship between market segmentation and immigration policy risks and immigration fears

According to the method of Diebold and Yılmaz (2014), rolling windows were used in the current study to estimate the net connectedness, which is the net influence, of the United Kingdom and Germany on every other country. For clearer observation, [Figures 6](#) and [7](#) were illustrated to show the net influence of Germany and the United Kingdom on other markets. The positive and negative values of the net influence indicate the directions of information transmission. If policy risk and net influence are significantly correlated, then policy risk influences market connectedness. Positive and negative correlations show the transmission directions of the connectedness. Then, correlation coefficients with policy risk were estimated. [Table 5](#) shows the correlations between the influence of Germany and the United Kingdom on other markets and policy risk.



(a) The housing markets



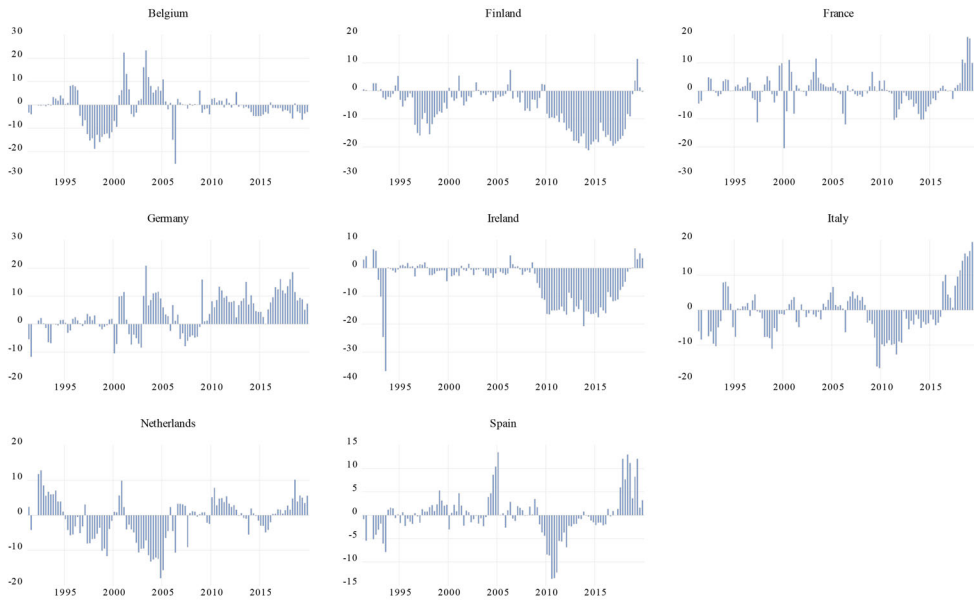
(b) The rental housing markets

Figure 6. Net connectedness (Germany). (a) The housing markets. (b) The rental housing markets. Source: The results of the author’s empirical test.

Table 5 shows that Belgium was most significantly influenced by the policy risk of Germany. The influence of German housing and rental markets on those of Belgium was significantly correlated with the migration policy risk of Germany (including



(a) The housing markets



(b) The rental housing markets

Figure 7. Net connectedness (UK). (a) The housing markets. (b) The rental housing markets. Source: The results of the author’s empirical test.

MPUI and MFI). The positive value of the correlation coefficient indicates that when migration policy risk is lower, Germany is more likely to have a negative net influence. Thus, the factors of foreign markets are more likely to influence the housing

Table 5. Net influence and migration policy risk.

	Housing market		Rental housing market	
	<i>GM</i>	<i>GF</i>	<i>GM</i>	<i>GF</i>
Belgium	0.2830 [3.1367]	0.3910 [4.5161]	0.4148 [4.8029]	0.3772 [4.2908]
Finland	-0.0409 [-0.4353]	-0.0054 [-0.0574]	0.0179 [0.1888]	-0.0341 [-0.3593]
France	0.2035 [2.2097]	0.2918 [3.2432]	0.0980 [1.0372]	0.0172 [0.1818]
Ireland	-0.0788 [-0.8403]	-0.1431 [-1.5367]	0.1448 [1.5414]	0.0878 [0.9284]
Italy	0.1170 [1.2518]	0.3451 [3.9090]	-0.0008 [-0.0083]	-0.1084 [-1.1487]
Netherlands	-0.0368 [-0.3919]	0.0331 [0.3518]	0.5300 [6.5856]	0.5109 [6.2609]
Spain	0.0067 [0.0708]	-0.0971 [-1.0367]	-0.2329 [-2.5236]	-0.4444 [-5.2259]
	<i>UKM</i>	<i>UKF</i>	<i>UKM</i>	<i>UKF</i>
Belgium	0.0413 [0.4394]	0.0822 [0.8766]	-0.0504 [-0.5322]	-0.0445 [0.4697]
Finland	0.4336 [5.1145]	0.4734 [5.7137]	-0.4123 [-4.7675]	-0.4972 [5.7521]
France	0.5660 [7.2988]	0.6680 [9.5431]	0.1625 [1.7354]	0.0969 [1.0256]
Ireland	0.5546 [7.0857]	0.5196 [6.4654]	-0.2266 [-2.4515]	-0.3575 [-4.0324]
Italy	0.4361 [5.1518]	0.5035 [6.1955]	0.4231 [4.9198]	0.3579 [4.0378]
Netherlands	0.2668 [2.9423]	0.1998 [2.1680]	0.2119 [2.2847]	0.2478 [2.6947]
Spain	0.1596 [1.7190]	0.0978 [1.0447]	0.1822 [1.9517]	0.1335 [1.4189]

Notes: *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. Number in bold denotes significance at 5% level.

Source: The results of the author's empirical test.

and rental markets of Germany. Overall, the influence of Germany on the rental market was more related to migration policy risk. By contrast, the influence of the United Kingdom on the housing market was more related to migration policy risk. Both the United Kingdom's policy uncertainty and migration fear significantly contributed to the influence of the United Kingdom's housing market on other markets except for Belgium and Spain. In the rental market, the correlations of Belgium, France, and Spain with the United Kingdom were not influenced by policy. For Finland and Ireland, when the migration policy risk of the United Kingdom was low, the net influence of the United Kingdom on the markets of these two countries increased.

Next, this paper uses the dynamic segmentation indexes (a_{ii}) estimated in Figures 4 and 5 to investigate its relationship to immigration policy risk and fear. Besides, as shown in Figures 3–5, the 2007 subprime mortgage crisis and the 2008 Lehman financial crisis caused the downward adjustment of house prices, which resulted in the phenomenon of market comovement. This phenomenon conforms to the contagion effect in the asset market. It caused abrupt changes in the market correlation in the data period. For controlling the effect of the financial crisis, one dummy variable was added, which is 1 from 2007Q2 to 2008Q4 and 0 in other periods. Table 6 shows the correlations between the housing market segmentation index and policy risk.

Table 6. Segmentation of the housing markets and migration policy risk.

	<i>GHSELF</i>		<i>UKHSELF</i>
GM_{t-1}	0.0754** (0.0209)	UKM_{t-1}	0.0192** (0.0392)
GM_{t-2}	0.0683** (0.0367)	UKM_{t-2}	0.0126 (0.1783)
<i>Dummy</i>	32.6756*** (0.0034)	<i>Dummy</i>	20.6496** (0.0280)
	<i>GHSELF</i>		<i>UKHSELF</i>
GF_{t-1}	0.0509 (0.1039)	UKF_{t-1}	0.0908** (0.0413)
GF_{t-2}	0.0396 (0.2076)	UKF_{t-2}	0.0400 (0.3687)
<i>Dummy</i>	32.7748*** (0.0041)	<i>Dummy</i>	8.0080 (0.2130)

Notes: The dependent variables are segmentation indicators of housing price indices in Germany and the UK, which are represented by *GHSELF* and *UKHSELF*, respectively. *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. *Dummy* denotes the dummy variable, which equals one when the testing period is during the financial crisis; otherwise, it is zero. The entry in parenthesis stands for the *p*-value. The symbols *** and ** respectively denote significance at the 1% and 5% levels.

Source: The results of the author's empirical test.

Table 6 shows that the housing market segmentation index in Germany was clearly influenced by the factor of financial crisis. In addition, the segmentation of the housing market in Germany was significantly influenced by MPUI but was less correlated with MFI. This means that when Germany has high migration policy uncertainty, the segmentation of the German housing market from other housing markets in the European Union increases. However, migration fear does not increase segmentation. Table 6 indicates that when the United Kingdom has high migration policy uncertainty or increasing migration fear, the segmentation of the housing market of the United Kingdom from other housing markets in the euro area increases.

Table 7 shows the correlations between the segmentation index of the rental market and policy risk; specifically, the segmentation indexes of the rental markets in Germany and the United Kingdom were clearly influenced by the factor of financial crisis. The segmentation of the German housing market was significantly influenced by MPUI and was less related to MFI. The estimation results for the United Kingdom showed that when policy risk was measured using either MPUI or MFI, the risk did not influence the segmentation of the rental market of the United Kingdom from other rental markets in the euro-area countries. The results of Tables 6 and 7 imply that the influence of policy risk on the market segmentation is more significant in the housing market than in the rental market.

Many recent studies have found that variables related to the housing market have heterogeneity problems, so it is more suitable to use regression methods that can relax the assumption of coefficient homogeneity: quantile regression.

Many studies analysing the housing market variables, either micro or macro research, has been verified that this regression method can provide better fitness and more complete estimation results (e.g., McCord et al., 2020; Özsoy & Şahin, 2022; Waltl, 2019; Zhang & Wang, 2016). Therefore, to more rigorously test the relationship between market segmentation and migration policy risks and fears and conduct further robustness tests, this paper continues to use quantile regression to estimate

Table 7. Segmentation of the rental housing markets and migration policy risk.

	<i>GRSELF</i>		<i>UKRSELF</i>
GM_{t-1}	0.0864*** (0.0027)	UKM_{t-1}	0.0174 (0.1990)
GM_{t-2}	0.0629** (0.0271)	UKM_{t-2}	0.0161 (0.2372)
<i>Dummy</i>	39.4695*** (0.0001)	<i>Dummy</i>	44.0706*** (0.0015)
	<i>GRSELF</i>		<i>UKRSELF</i>
GF_{t-1}	0.0520 (0.0661)	UKF_{t-1}	0.0598 (0.4162)
GF_{t-2}	0.0384 (0.1761)	UKF_{t-2}	0.0914 (0.2189)
<i>Dummy</i>	39.8817*** (0.0001)	<i>Dummy</i>	28.5658*** (0.0082)

Notes: The dependent variables are segmentation indicators of rent price indices in Germany and the UK, which are represented by *GRSELF* and *UKRSELF*, respectively. *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. *Dummy* denotes the dummy variable, which equals one when the testing period is during the financial crisis; otherwise, it is zero. The entry in parenthesis stands for the *p*-value. The symbols *** and ** respectively denote significance at the 1% and 5% levels.

Source: The results of the author's empirical test.

the models in Tables 6 and 7. The estimated results are listed in Tables 8 and 9. In addition, to illustrate the estimation results of quantile regression more clearly, this paper plots the coefficients estimated in Tables 8 and 9 as graphical representations in Figures 8 and 9, respectively.

Table 8 estimates the impact of migration policy risks, fears, and the financial crisis factor on the housing market segmentation index at different levels of housing market segmentation. Table 8 shows that the housing market segmentation in Germany was also significantly influenced by MPUI but was less correlated with MFI, which is consistent with the results of Table 6. In addition, Table 8 provides more detailed results of the impact of MPUI: The higher the market segmentation is, the more significant the effect of policy risks. This indicates that the phenomenon that the German housing market is more segregated from other markets is more likely caused by the high migration policy risks.

However, in the United Kingdom, the market segmentation with the medium and low quantiles is more affected by policy risks. The market segmentation with a high quantile (0.9) is mainly affected by migration fear, and the coefficient is very significant at 0.25, which is much higher than the coefficients under other quantiles. Figure 8 also shows that the coefficient asymmetry is most evident in the model that estimates the impact of policy risk on the German housing market segmentation. The higher the quantile of the dependent variable (market segmentation), the larger the coefficient.

Table 9 estimates the impact of migration policy risks, fears, and the financial crisis factor on the rental market segmentation index under different levels of rental market segmentation. Refers to the estimation results of Germany, the estimation results of the rental housing market are consistent with that of the housing market. It also shows that the higher the market segmentation is, the more likely it is to be positively affected by policy risks, i.e., the phenomenon of high market segmentation will exist, especially when the market is relatively segmented. Table 9 also shows that

Table 8. Segmentation of the housing markets and migration policy risk: Quantile regression.

Quantile	GHSELF			GHSELF			UKHSELF			UKHSELF		
	Variables	Coefficient	p-Value	Variables	Coefficient	p-Value	Variables	Coefficient	p-Value	Variables	Coefficient	p-Value
0.1	GM_{t-1}	0.0393	0.0727	GF_{t-1}	0.0164	0.1601	UKM_{t-1}	0.0113***	0.0053	UKF_{t-1}	0.1266**	0.0208
0.2		0.0240	0.4442		0.0443**	0.0142		0.0100**	0.0407		0.0478	0.3013
0.3		0.0584**	0.0148		0.0425	0.1086		0.0126**	0.0160		0.0964	0.1122
0.4		0.0526	0.1081		0.0314	0.3725		0.0086	0.1737		0.0966**	0.0395
0.5		0.0983**	0.0343		0.1030	0.6821		0.0318**	0.0332		0.0651	0.4054
0.6		0.1256**	0.0204		0.1261	0.6831		0.0228	0.2422		0.0535	0.5168
0.7		0.1520**	0.0092		0.1166	0.5689		0.0428	0.2345		0.0276	0.7390
0.8		0.2066**	0.0188		0.2141	0.3535		0.0418	0.3498		0.1213	0.1698
0.9		0.2472**	0.0160		0.2411	0.3950		0.0665	0.5088		0.2533**	0.0357
0.1	GM_{t-2}	0.0318	0.1626	GF_{t-2}	0.0235**	0.0297	UKM_{t-2}	0.0062	0.1971	UKF_{t-2}	-0.0534	0.3751
0.2		0.0522	0.0737		0.0162	0.3417		0.0085	0.1037		0.0454	0.3354
0.3		0.0340	0.1341		0.0208	0.4435		0.0096	0.0700		0.0076	0.8989
0.4		0.0736**	0.0415		0.0493	0.2049		0.0176**	0.0311		0.0345	0.4778
0.5		0.0601	0.1452		0.0041	0.9856		0.0018	0.8858		0.0830	0.3324
0.6		0.0924	0.0583		0.0609	0.8607		0.0221	0.5301		0.1157	0.1946
0.7		0.1373**	0.0479		0.1430	0.5037		0.0389	0.3130		0.1624	0.0659
0.8		0.2181**	0.0272		0.1435	0.5241		0.0631	0.2130		0.1197	0.1725
0.9		0.3437***	0.0063		0.1950	0.4967		0.1073	0.4344		0.0773	0.4725
0.1	Dummy	30.8148***	0.0000	Dummy	33.2709***	0.0000	Dummy	4.7369	0.1484	Dummy	-0.7836	0.8071
0.2		32.6964***	0.0000		31.7164***	0.0000		6.7269	0.0840		-1.8051	0.5998
0.3		33.1597***	0.0000		33.9862***	0.0000		6.5923	0.1380		-3.4617	0.4366
0.4		29.3204***	0.0000		31.7686***	0.0000		6.3391	0.1935		-7.2482	0.2092
0.5		28.6509***	0.0001		29.3811***	0.0000		5.4110	0.3106		-8.7896	0.1804
0.6		27.6145***	0.0010		22.8174	0.0608		36.4314***	0.0001		20.0520**	0.0142
0.7		22.1239**	0.0239		15.2983	0.0706		29.5031***	0.0019		17.6138**	0.0397
0.8		31.6356**	0.0479		4.0764	0.5741		30.0451***	0.0088		11.8138	0.2240
0.9		40.3115	0.0532		1.8091	0.8289		18.2140	0.3661		4.9607	0.6751

Notes: The dependent variables are segmentation indicators of housing price indices in Germany and the UK, which are represented by *GHSELF* and *UKHSELF*, respectively. *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. *Dummy* denotes the dummy variable, which equals one when the testing period is during the financial crisis; otherwise, it is zero. The symbols *** and ** respectively denote significance at the 1% and 5% levels.

Source: The results of the author's empirical test.

Table 9. Segmentation of the rental housing markets and migration policy risk: Quantile regression.

Quantile	GRSELF			GRSELF			UKRSELF			UKRSELF		
	Variables	Coefficient	p-Value	Variables	Coefficient	p-Value	Variables	Coefficient	p-Value	Variables	Coefficient	p-Value
0.1	GM_{t-1}	0.0164	0.6233	GF_{t-1}	0.0265**	0.0319	UKM_{t-1}	0.0074	0.1596	UKF_{t-1}	0.0234	0.7091
0.2		0.0678**	0.0361		0.0551***	0.0000		0.0104	0.1163		-0.0022	0.9680
0.3		0.0740	0.0516		0.0532***	0.0061		0.0069	0.4498		0.0083	0.9116
0.4		0.0866**	0.0329		0.0473	0.0639		0.0131	0.4142		-0.0024	0.9822
0.5		0.1040**	0.0354		0.0401	0.3718		0.0228	0.1440		0.0671	0.5825
0.6		0.1139**	0.0102		0.0535	0.7976		0.0242	0.1466		0.0674	0.5964
0.7		0.1640***	0.0001		0.0850	0.7465		0.0394	0.3029		0.0639	0.6899
0.8		0.2015***	0.0002		0.1372	0.6100		0.0434	0.4522		0.1876	0.1883
0.9		0.3175***	0.0038		0.1476	0.5455		0.1292	0.5486		0.2278	0.1378
0.1	GM_{t-2}	0.0502	0.0910	GF_{t-2}	0.0227**	0.0267	UKM_{t-2}	0.0072	0.1823	UKF_{t-2}	0.0482	0.4613
0.2		0.0218	0.4269		0.0061	0.5895		0.0053	0.4372		0.0926	0.1089
0.3		0.0490	0.2879		0.0161	0.4234		0.0123	0.2465		0.1003	0.1890
0.4		0.0712	0.0799		0.0333	0.2372		0.0255	0.0974		0.1357	0.2147
0.5		0.0673	0.1403		0.0716	0.2799		0.0220	0.1810		0.0797	0.5059
0.6		0.1050**	0.0104		0.1091	0.6278		0.0262	0.1450		0.0910	0.4672
0.7		0.1329***	0.0058		0.1626	0.5510		0.0262	0.4190		0.2203	0.1805
0.8		0.1469***	0.0020		0.1705	0.5323		0.0409	0.4785		0.1891	0.2183
0.9		0.2170***	0.0077		0.2120	0.3939		0.1183	0.6081		0.2999	0.0764
0.1	Dummy	38.8152***	0.0000	Dummy	37.3074***	0.0000	Dummy	39.0225***	0.0000	Dummy	32.0501***	0.0000
0.2		41.8949***	0.0000		37.8756***	0.0000		44.5549***	0.0000		34.9156***	0.0000
0.3		40.5684***	0.0000		43.9377***	0.0000		45.6744***	0.0000		33.6093***	0.0000
0.4		37.0879***	0.0000		42.1124***	0.0000		41.7444***	0.0000		29.4618***	0.0000
0.5		37.0752***	0.0000		38.8213***	0.0000		43.1708***	0.0000		28.7141***	0.0001
0.6		33.5788***	0.0000		33.2991***	0.0000		42.6097***	0.0000		28.2684***	0.0001
0.7		29.4451***	0.0004		24.2711***	0.0016		40.9043***	0.0000		8.3334	0.4860
0.8		37.3843***	0.0002		20.4239***	0.0064		38.2497***	0.0000		-3.5448	0.8074
0.9		42.8778**	0.0119		15.1363**	0.0236		11.9104	0.7422		-12.1516	0.4629

Notes: The dependent variables are segmentation indicators of rent price indices in Germany and the UK, which are represented by *GRSELF* and *UKRSELF*, respectively. *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. *Dummy* denotes the dummy variable, which equals one when the testing period is during the financial crisis; otherwise, it is zero. The symbols *** and ** respectively denote significance at the 1% and 5% levels.

Source: The results of the author's empirical test.

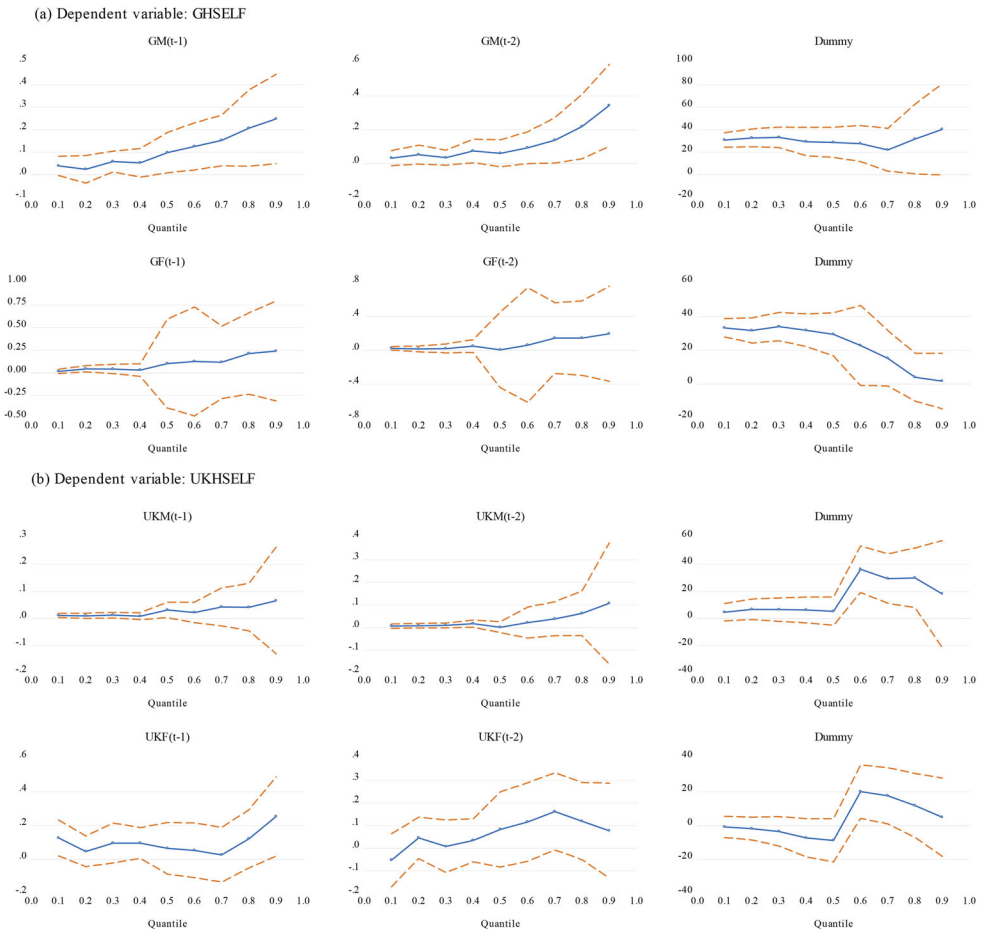


Figure 8. Coefficients of the quantile regression (Housing market).
 Notes: The dependent variables are segmentation indicators of housing price indices in Germany and the UK, which are represented by *GHSELF* and *UKHSELF*, respectively. *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. *Dummy* denotes the dummy variable, which equals one when the testing period is during the financial crisis; otherwise, it is zero.

Source: The results of the author’s empirical test.

when the segmentation of the German rental housing market is low, it is mainly affected by the fear of migration, but it is also positively affected. That is, the more the fear, the higher the segmentation.

On the other hand, the segmentation of the UK rental market is mainly caused by the factor of the financial crisis. Figure 9 also shows that the segmentation of the German rental housing market is affected by policy risks and will increase as the quantile increases. That is, the higher the quantile of the dependent variable (market segmentation), the larger the coefficient.

Therefore, the quantile regression’s estimation result further verifies this paper’s inference: the rise of the migration policy risk will increase the market segmentation, and this phenomenon is more evident in the German immigration policy.

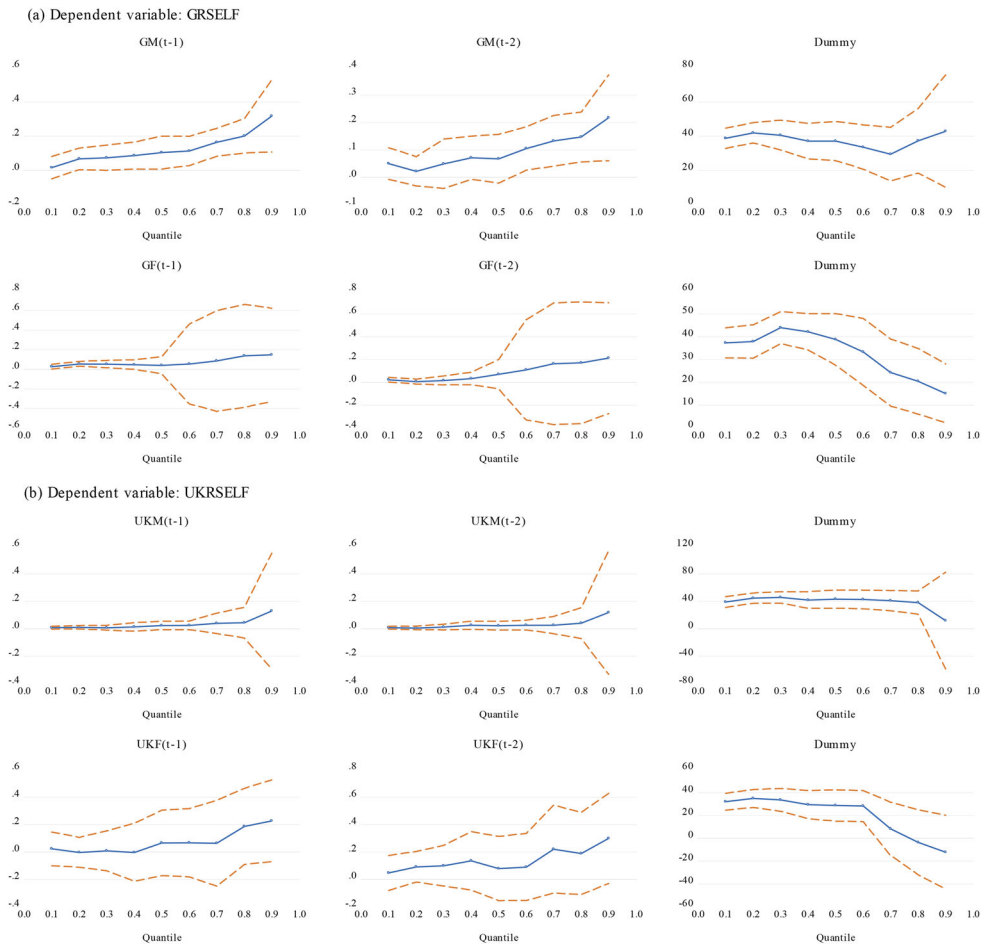


Figure 9. Coefficients of the quantile regression (Rental market).

Notes: The dependent variables are segmentation indicators of rent price indices in Germany and the UK, which are represented by *GRSELF* and *UKRSELF*, respectively. *GM* and *GF* denote migration EPU and migration fear index in Germany, respectively. *UKM* and *UKF* denote migration EPU and migration fear index in the UK, respectively. *Dummy* denotes the dummy variable, which equals one when the testing period is during the financial crisis; otherwise, it is zero.

Source: The results of the author’s empirical test.

4.4. Discussion of empirical results

Based on the above empirical results, this paper obtained the following three findings:

1. The influence of the United Kingdom’s migration policy risk on the euro-area countries is higher than that of Germany. There is also literature (Adler-Nissen, 2016; Bahmani-Oskooee & Karamelikli, 2021; Barrell & Weale, 2003) finding that although the United Kingdom is not one of the euro-area countries, its policy and macroeconomic variables have a significant impact on the euro-area countries. In this paper, consistent results were also obtained.
2. Rental market connectivity is less influenced by migration policy risk and fear than housing market connectedness. We also speculated that this is because high

policy risk is more likely to affect long-term house purchase decisions but not short-term rental housing decisions. Previous literature (Ji & Bhandari, 2022; Tortorice, 2019) found that although the rental and housing markets are related, their performances tend to be different, and the housing market is more prone to bubbles. The results in this part of the paper imply that this difference also exists in the relationship between market connectivity and policy risk.

3. This study provided evidence showing that the higher the uncertainty of the migration policies of the United Kingdom and Germany is, the higher the housing market segmentation is from the house markets of other countries. Empirical results validate the inferences of this paper. Although past literature has found that immigration affects housing prices (Degen & Fischer, 2017; Gonzalez & Ortega, 2013), there is no literature on the relationship between migration policy risks and fears and the market connection of housing markets. The results in this part of the paper complement the lack of literature.

5. Conclusion

In this study, to analyse the influence of migration policy risk on market segmentation, the influence of policy risk in Germany and the United Kingdom on the correlations between the housing and rental markets of the two countries and seven other euro-area countries (i.e., Belgium, Finland, France, Ireland, Italy, the Netherlands, and Spain) was estimated. The data period was from 1981Q1 to 2019Q4. For the migration policy risk index, two indexes (MPUI and MFI) established by Baker et al. (2015) were used.

Research has shown that migrants influence the house price and rent. Research has also shown that the migration population has a spillover effect (Mussa et al., 2017). This implies that population movement increases the integration between the housing markets and rental markets in neighbouring cities. Thus, this study inferred that if the political or economic policies are not favourable for migrants, the integration between housing and rental markets may be reduced. That is, the segmentation between regional markets is increased. In recent years, there have been more discussions on the migration policy in Europe. Consequently, in this study, whether the increasing migration policy risk in the United Kingdom and Germany influences the correlation and segmentation of the markets in these two countries and other countries in the European Union was examined.

The empirical results showed that the segmentation of both the housing and rental markets of Germany is higher than that of the United Kingdom. However, for the housing markets in the euro area, the United Kingdom has an extremely high influence on other markets. For rental markets, the influence of Germany on the rental markets of the euro-area countries is higher than that of the United Kingdom. The results showed that the influence of Germany on the rental market is more related to migration policy risk. In addition, under a lower migration policy risk, Germany is more likely to have a negative net influence. Thus, the factors of foreign markets are more likely to influence the housing and rental markets of Germany. By contrast, the influence of the United Kingdom on the housing market is more related to migration

policy risk. The policy uncertainty and migration fear of the United Kingdom significantly contribute to the influence of the housing market of the United Kingdom on other markets except for Belgium and Spain.

The segmentation in both the housing and rental markets of Germany is significantly influenced by MPUI. However, it is less correlated with MFI. This means that when Germany has high migration policy uncertainty, the segmentation of German house and rental markets from the housing markets and rental markets in the euro area increases. And, migration fear does not increase segmentation.

When the United Kingdom has high migration policy uncertainty or increasing migration fear, the segmentation of the UK housing market from the euro-area housing markets increases. The measurement of policy risk using either MPUI or MFI revealed that the risk does not influence the segmentation of the rental market of the United Kingdom from the rental markets of the euro-area countries. Overall, this study found that the influence of policy risk on the market segmentation is more significant in the housing market than in the rental market. This may be because the high migration policy risk is more likely to influence decisions related to long-term house purchase, but not decisions related to short-term residence problems (rental decisions). In addition, according to the estimation results of quantile regression, this paper finds that the market segmentation with a high level is more likely to be caused by migration policy.

Based on the empirical results, some suggestions are objectively proposed. The government of each country should pay attention to the problems caused by the increasing migration policy risk. This is because the concrete evidence obtained in this study shows that the higher the migration policy risk is, the higher the segmentation in the housing market of that country from the housing markets of other countries is. The higher the segmentation is between markets, the lower the efficiency is, and more issues caused by residence problems are likely to occur. This means that the migration policy not only influences the population and labour in a country but also influences its housing and rental markets. It is suggested that the government should pay attention to the related problems of the housing market resulting from increasing migration policy risk.

Notes

1. OECD (2020), Housing prices (indicator). doi: 10.1787/63008438-en (Accessed on 11 August 2020).
2. The data of the MPUI and MFI can be downloaded from the following URL: http://www.policyuncertainty.com/immigration_fear.html
3. For more information, please see the following website: <https://voxeu.org/article/immigration-fears-and-policy-uncertainty>
4. The period numbers of rolling windows used in this study were applied to estimate the shortest period of the complete total connectedness index. To estimate the VAR model of the two lagging periods of the nine variables, the estimation was started on a 40-quarter rolling window in this study. The total connectedness index obtained from the estimation started from 1991Q2.

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