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The Role of the Real Estate Sector in the Economy: Cross-National Disparities and Their Determinants

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Abstract: A scientific understanding of the real estate sector's role in the national economy is essential for facilitating reasonable and effective regulation and promoting economic development. By analyzing panel data from a sample of 67 countries between 2010 and 2018, we examine the role of the real estate sector in different countries and its determinants. This empirical study yields three main findings. Firstly, there is a strong correlation between the real estate sector and the financial services sector, the construction industry, as well as wholesale and retail trade. Notably, China's real estate sector exhibits relatively high direct consumption of financial service activities compared to other major countries. Secondly, there is a transition trend in both the input and output of the real estate sector from primary and secondary industries towards service-oriented industries. Lastly, key determinants influencing the economic effects of the real estate sector in a country include economic growth, current national income level, expense structure of the economy, aging population, as well as urbanization speed.

Keywords: real estate sector; inter-sectoral linkage; economic effects; input–output analysis; panel data model

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1. Introduction

Real estate plays a pivotal role in the socio-economic development of all countries worldwide. Several empirical studies have demonstrated that the progress of the real estate market is closely linked to economic development and social stability [1–5]. A housing boom has the potential to stimulate household consumption and drive GDP growth [6,7]. In addition, as typical collateral, housing commodities largely determine the credit constraints of various industries and play an important role in economic development [8].

In the context of globalization and open markets, the real estate market is inevitably influenced by external factors, which in turn have ripple effects on other sectors of the economy [9]. Governments typically view real estate regulation as a crucial policy tool for driving economic growth due to the strong interdependence between the real estate sector and other sectors of the economy [10,11]. Therefore, it is imperative to accurately comprehend the linkages between the real estate sector and other sectors within national economies and to explore the core drivers of industrial linkage effects in the real estate sector.

Reaching a comprehensive understanding of the linkages is essential for gaining a competitive advantage in the real estate sector as the rapid growth of sectors with high linkages will stimulate real estate development. Furthermore, when these sectors enter foreign markets, it will be easier for the real estate sector to gain access to those markets [12]. Additionally, identifying the determinants of the economic effects of the real estate sector is crucial for systematically examining its role. Internationally comparative studies on the role of real estate within economies are of great importance for policymaking and economic

development, providing comprehensive information on the impacts of the real estate sector on the economy.

Input–output analysis, established by Leontief in 1936 [13], is a widely utilized method for examining the industrial structure, which holds significance in shaping industry policies and business strategies [14]. The input–output technique offers a quantitative approach to analyzing sectoral linkages and proposing policy implications [15–17]. While many researchers have investigated the macroeconomic impacts of the real estate sector using input–output analysis, most have focused solely on horizontally comparing the related effects of real estate across different regions or countries without specifically analyzing the key factors influencing its economic effects.

For instance, Pagliari et al. has conducted an analysis of the input–output relationship between commercial real estate in Australia, Canada, the United Kingdom, and the United States from 1985 to 1995, focusing on U.S. investors [18]. The empirical study by Song et al. revealed that the correlation effect of the real estate sector in Australia, France, and the United States consistently ranked in the top five during the study period, and as the sample countries' economies developed, the total correlation effect of the real estate industry gradually increased [19]. Bielsa and Duarte assessed inter-sectoral linkage effects of Spain's construction industry based on Spain's input–output table and compared results with OECD countries such as Belgium, Denmark, Finland, France, and Germany [20]. Ren et al. examined the significance of China's real estate construction sector through input–output analysis, which showed a strong final demand for this sector, with the regional economies highly dependent on it being particularly vulnerable to falling demand [21]. Chan et al. investigated real and financial linkages between China's real estate sector and other sectors using input–output analysis, which indicated strengthened linkages between them while also highlighting that credit risk in the real estate sector has a larger spillover effect on other sectors, suggesting that turmoil in this market may have a greater impact on China's economy than previously reported [22]. Using data from the World Input–Output Database, Liu and Zhu conducted a detailed analysis of changes in output structure within various countries' construction sectors from 1995 to 2011, demonstrating that real estate activities are one of the main outputs for most countries' construction sectors [23].

While researchers have examined the linkages between the real estate sector and other sectors in various countries, there has been a lack of focus on the input and output structures as well as the key factors that influence the economic effects of the real estate sector. Utilizing the Inter-Country Input–Output Tables (ICIO) from the OECD Input–Output Database, we conduct an analysis of the inter-sectoral linkage effects of real estate sectors in various countries and undertake a comprehensive investigation into the key factors influencing real estate economic effects.

The major contributions of this study lie in two aspects. Firstly, it presents new evidence on the push and pull effects of the real estate sector, as well as its changes in input and output structure. Secondly, this study empirically demonstrates the determinants of development using a panel dataset containing annual data from 63 countries (regions) between 2010 and 2018.

The rest of this paper is organized as follows. Section 2 analyzes the economic effects of the real estate sector in the economy using the input–output approach. Section 3 investigates the key factors that affect the real estate's economic effects by using the panel data model, to deeply understand the real estate sector's impact on the national economy. Section 4 presents the discussion, and Section 5 provides the conclusion. The technical roadmap for this paper is as follows (Figure 1):

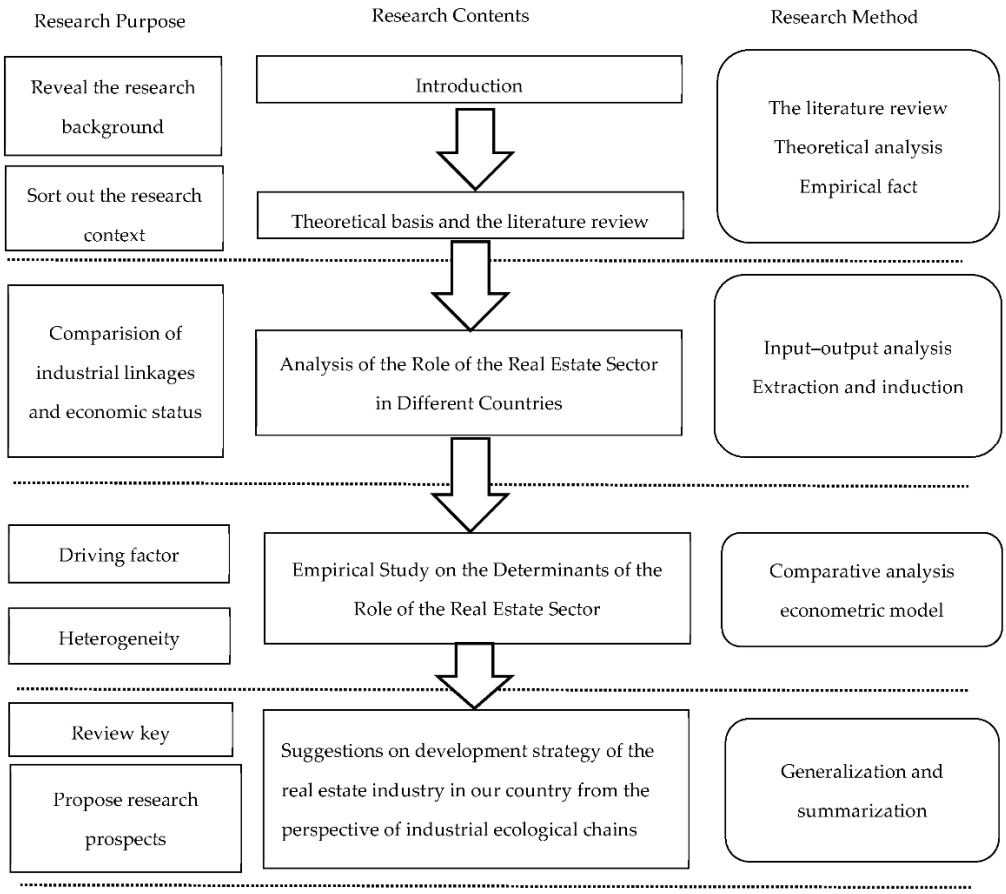

Figure 1. Research technical roadmap.

2. Analysis of the Role of the Real Estate Sector in Different Countries

2.1. Methods

A typical input–output table can be divided into three parts: the intermediate demand table, the final demand table, and the value-added table. The intermediate demand table describes the mutual input–output relationships between departments. Rows indicate the flow of output from one department to other departments, while lists indicate the input received by one department from other departments. The final demand table displays the demand for final goods and services that are not intended for further production, including household consumption, government consumption, investment, and exports. The value-added table records the value added by each department in the production process, including labor remuneration, capital income, and taxes.

It is widely accepted that input–output analysis within a country's economy can be categorized into two forms: a physical input–output analysis and monetary input–output analysis. The former primarily examines the flow of intermediate goods between sectors, excluding monetary factors, while the latter considers fluctuations arising from relative price changes across various economic sectors. Unlike traditional industries, real estate commodities are quintessential investment products, whose economic significance is more contingent on their monetary attributes than their physical characteristics. Fluctuations in real estate value directly influence a company's financing capacity and asset valuation. Therefore, relying solely on physical intermediate goods flow analysis can lead to significant biases. Indeed, the predominant research on the economic impact of the real estate sector often employs monetary input–output analysis [18,24]; this approach acknowledges that changes in the monetary value of real estate assets not only affect enterprise asset valuation but also inform production decisions, making it inseparable from the input–output analysis process.

The method to investigate inter-sectoral linkages and economic effects is based on two types of indicators derived from input–output analysis. The indicators to measure the linkages between the real estate sector and other sectors include the direct requirement coefficient and direct distribution coefficient; the former represents the direct backward linkage and the latter represents the direct forward linkage. The indicators to measure the economic effects of the real estate sector include the index of power of dispersion (IPD) and index of sensitivity of dispersion (ISD), which represent the pull effect and push effect on the economy, respectively.

In this paper, the direct requirement (technical coefficient) coefficient is used to measure the direct backward linkage between the real estate sector and other sectors, which presents the influence of the real estate sector on other sectors due to direct consumption in the process of production and operation. The formula for the direct consumption coefficient is as follows:

$$a_{ij} = x_{ij}/x_j \quad (1)$$

where x_{ij} represents the intermediate demand of products or services of sector i by sector j; and x_j denotes the gross input of sector j. The greater the value of a_{ij}, the greater the demand of sector j for sector i, which means a stronger direct backward linkage. The direct distribution coefficient is used to indicate the direct forward linkage of the real estate sectors with other sectors, which is denoted as follows:

$$h_{ij} = x_{ij}/x_i \quad (2)$$

where x_i denotes the gross output of sector i. The greater the value of h_{ij}, the stronger the direct forward linkage, which means more output of sector i flow to sector j.

Leontief's Inverse Matrix is used to measure the total demand effects between sectors within an economy, derived from the Intermediate Input Matrix. Assuming Z as the Intermediate Input Matrix, the relationship between total output X and intermediate inputs and final demand Y can be denoted as $X = Z\,X + \,Y$. Solving for X, we can finally obtain the relationship between total output and final demand: $X = (I - Z)^{-1}Y$, where I is the identity matrix and $(\,I\, -\, Z\,)^{-1}$ is Leontief's Inverse Matrix. In this paper, IPD and ISD are used to measure the pull and push effects of the real estate sector on the macro-economy, respectively. The IPD and ISD were introduced by Rasmussen [25], the former reflects the extent of the production demand generated by various sectors of the national economy when a sector adds one unit for final use in a national economy, measuring to what extent the development of other economic sectors has driven the growth of the real estate industry. The latter presents the amount of output that the sector needs to provide for the production of other sectors for an increase in one unit for final use in each sector of the national economy, measuring to what extent the development of the real estate sector contributes to the growth of other industries. According to its description, we provide graphical representation of the IPD and ISD (Figure 2):

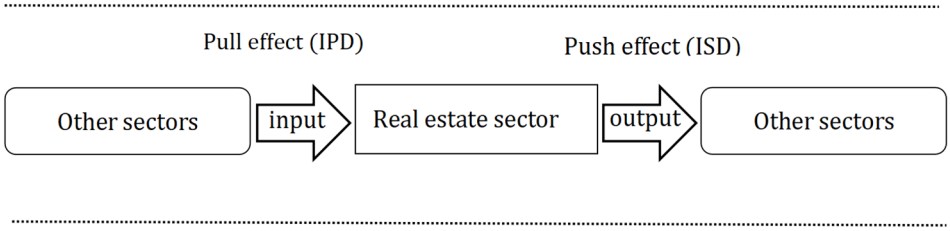

Figure 2. Graphical representation of IPD and ISD.

IPD and ISD actually measure the pull and push effects of the real estate sector in the economy. We can imagine that within an economy, the development of other sectors will require more factories and collateral, thereby creating demand for real estate products, "pulling" the development of real estate. With the further prosperity of the real

estate industry, more diverse housing products and diversified development models have provided support for the further development of other industries, thereby "pushing" the development of other sectors. The larger the value of IPD, the stronger the pull effect for economic development is, indicating the sector is a leading sector. The larger the value of ISD, the stronger the push effects for economic development are, implying the sector plays a key role in an economy [26]. We use the method improved by Liu (2002) to calculate IPD and ISD [27]. The IPD is calculated as follows:

$$\delta_j = \sum_{i=1}^{n} c_{ij} / \left[\sum_{j=1}^{n} \left(\sum_{i=1}^{n} c_{ij} \right) \times \partial_j \right], j = 1, 2, \cdots, n \quad (3)$$

where c_{ij} is Leontief's inverse coefficient; $\partial_j = X_j / \sum_k X_k$ is the final product composition coefficient; X_j is the final product quantity of sector j; $\sum_j X_j$ is the total output of the national economy. The ISD is calculated as follows:

$$\theta_i = \sum_{i=1}^{n} \omega_{ij} / \left[\sum_{i=1}^{n} \left(\sum_{j=1}^{n} \omega_{ij} \right) \times \beta_j \right], i = 1, 2, \cdots, n \quad (4)$$

where ω_{ij} is the fully supplied matrix element, namely $W = (I - H)^{-1}$; H is the matrix of direct distribution coefficient. Finally, $\beta_i = X_i / \sum_k X_k$ is the constituent coefficient of initial input, where X_i is the initial input of sector i; $\sum_i X_i$ is the total initial input of the national economy.

2.2. Data

The data employed to analyze the inter-sectoral linkages and economic effects were the Inter-Country Input–Output Tables (ICIO) published by the OECD Input–Output Database in 2020 [28]. The latest edition of the OECD Inter-Country Input–Output (ICIO) has 45 unique industries based on ISIC Revision 4. Tables are provided for 76 countries (and the Rest of the World) from 1995 to 2018. Considering the integrity of the data used for better understanding the real estate sector, other sectors, and change trends in various countries, a 45 × 45 input–output table of 67 countries and regions (excluding Cypress, Melta, Mexico, etc.) over the past 9 years was used. The sector we investigate is the real estate activities sector (D68), which encompasses the buying and selling of own real estate, renting, operating own or leased real estate, real estate agencies, and the management of real estate on a fee or contract basis. In this paper, we consider the real estate activities sector as the real estate sector to perform analysis.

Backward linkages are those that occur with other industrial sectors through demand linkages. For example, for the real estate industry, its relationship with the construction industry is a backward correlation. The direct consumption coefficient is an index to measure the backward direct correlation between industries. The backward perfect correlation degree reflects the complete driving effect of an industry on other industries through direct and indirect ways to consume the products or services provided by the industry in the production operation. In Section 3.2, the backward correlation degree is expressed by the direct consumption coefficient, namely a_{ij} in Equation (1).

The direct distribution coefficient is an index to measure the forward direct correlation between industries. The forward correlation degree reflects the promotional effect of an industry on other industries by directly or indirectly providing products or services to other industries during production and operation. In Section 3.2, the forward correlation degree is expressed by the direct allocation coefficient, namely h_{ij} in Equation (2).

2.3. Results

(1) Comparison of inter-sectoral linkages

Financial service activities, construction, and real estate activities are the main sectors which the real estate sector has direct backward linkages with in most countries (shown in Appendix A). The development of real estate requires large amounts of capital, and business development and consumers need assistance from financial systems. Therefore,

the real estate sector has strong direct backward linkages with the financial sector. The construction sector also plays an important input role for the real estate sector. A variety of real estate products including housing, offices, and industry are built by the construction sector. Therefore, the construction sector is strongly connected with the real estate sector. In line with Liu, the top rank of output from the construction sector is real estate activities, and the high rank indicates the close linkage between the real estate sector and construction sector [23]. What is more, the real estate sector has a direct relationship with itself.

Table 1 lists the top five sectors that the real estate sector has direct backward linkage with in China from 2010 to 2018. Financial services activities and administrative and support services are most closely linked with China's real estate sector. After the reform in 1998, China's private property management and brokerage business was promoted. The role of the real estate sector as a service sector has been strengthened. As can be seen from Table 1, most of the sectors promoted by the real estate sector are service-oriented sectors, such as real estate activities, administrative and support services, and accommodation and food service activities. The reason for this is probably the growing demand for services in China [29].

Table 1. Ranked sectors of the backward linkage of the real estate sector in China: 2010–2018.

Rank	2010		2014		2018	
	Sector	**Value**	**Sector**	**Value**	**Sector**	**Value**
1	Financial and insurance activities	0.0430	Financial and insurance activities	0.0937	Financial and insurance activities	0.0700
2	Administrative and support services	0.0328	Real estate activities	0.0390	Administrative and support services	0.0259
3	Professional, scientific, and technical activities	0.0282	Professional, scientific, and technical activities	0.0303	Professional, scientific, and technical activities	0.0222
4	Accommodation and food service activities	0.0158	Administrative and support services	0.0293	Real estate activities	0.0201
5	Construction	0.0144	Electricity, gas, steam, and air conditioning supply	0.0268	Construction	0.0062

Figure 3 shows the changes in the input indicator of four main sectors. From 2010 to 2012, the direct input indicator between financial service activities and the real estate sector exhibits an upward trend, indicating a gradual increase in the demand for financial services. In 2012, the value reached 0.1027. Subsequently, the demand began to decline, reaching 0.0700 by 2018. Notably, the financial sector maintained the top rank over the 9-year period, underscoring the close relationship between real estate development and the financial sector in China. The real estate activities sector demonstrated a gradual upward trend until 2015, after which the demand for this sector decreased to 0.0201 by 2018. The demand for administrative and support services and the professional, scientific, and technical activities sector both fluctuate around 0.0300, indicating a stable pull effect of the real estate sector on these two sectors. Analyzing the changing input indicators of the four sectors reveals a gradual decrease in their linkages with the real estate sector after 2015.

The input indicator of the financial sector in selected countries (regions) in 2010 and 2018 is displayed in Figure 4. The requirements of the financial sector of real estate in China were relatively high among those countries. In 2010, the value was 0.1407 in Australia, which was the highest among the ten selected countries during the same period. The value in the UK was 0.1250, which was larger than Korea (0.0986), Denmark (0.0933), Japan (0.0746), and Germany (0.0556). In 2018, the input indicator of the financial sector of real estate in Australia was 0.1418 and China had a value of 0.0700, which was larger than the UK (0.0632), USA (0.0628), and Germany (0.0466).

The input indicator of the administrative sector in selected countries in 2010 and 2018 is displayed in Figure 5. In 2000, the value for China was 0.0328, which was the highest

among the ten countries. In 2018, Korea (0.0399) and the USA (0.0347) had higher values than China (0.0259).

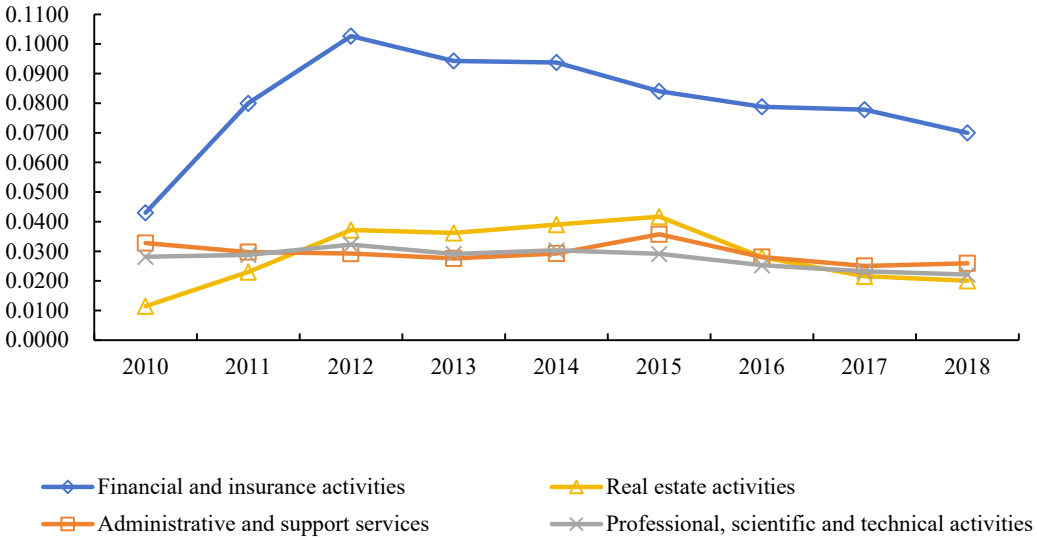

Figure 3. The changes in input indicator of real estate in China.

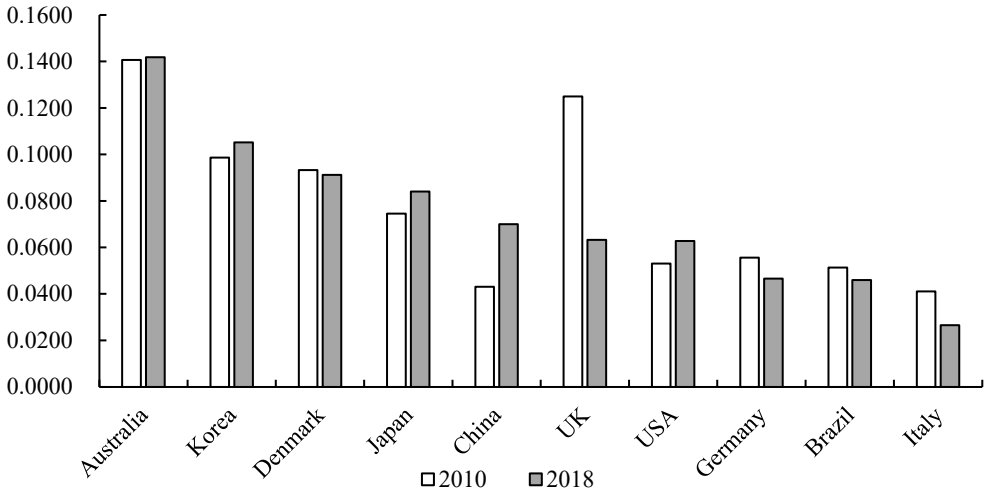

Figure 4. The input indicator of financial sector in 2010 and 2018.

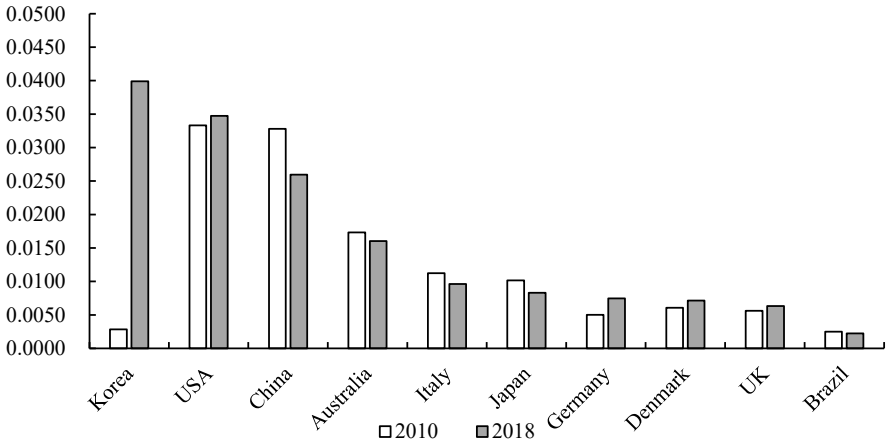

Figure 5. The input indicator of administrative sector in 2010 and 2018.

Wholesale trade and retail trade, IT and other information services, and telecommunications are the major three sectors that the real estate sector has direct forward linkage with (shown in Appendix B). Table 2 displays the top five sectors that real estate distributes to directly from 2010 to 2018. It shows that the real estate sector mainly directly flows to the wholesale and retail trade in China, which also implies the strong push effect of real estate to this sector.

Table 2. Ranked sectors of the forward linkage of the real estate sector in China: 2010–2018.

Rank	2010		2014		2018	
	Sector	Value	Sector	Value	Sector	Value
1	IT and other information services	0.0341	Wholesale and retail trade	0.0571	Other service activities	0.0624
2	Telecommunications	0.0340	Other service activities	0.0405	Wholesale and retail trade	0.0464
3	Other service activities	0.0236	Real estate activities	0.0390	IT and other information services	0.0335
4	Professional, scientific, and technical activities	0.0177	Financial and insurance activities	0.0305	Postal and courier activities	0.0320
5	Wholesale and retail trade	0.0150	Telecommunications	0.0241	Professional, scientific, and technical activities	0.0306

Figure 6 further illustrates the changing push effects of the real estate sector on wholesale trade and retail trade, IT and other information services, and the telecommunications sectors from 2010 to 2018 in China. The push effect on wholesale trade shows an increasing trend before 2015 (0.0624), but it decreased to 0.0410 in 2017. Similarly, the push effects on the other two sectors follow a comparable trend, fluctuating between 0.0200 and 0.0400, indicating an increase in the demand for real estate to a certain extent.

The output indicator of the wholesale trade sector in selected countries (regions) in 2010 and 2018 is displayed in Figure 7. Among the selected countries (regions), the demand of the wholesale trade sector for real estate is relatively large, which implies that a large proportion of Chinese real estate products and services are distributed to the wholesale trade sector. Compared to other countries such as Korea, Japan, and the UK, Chinese real estate's push effect on wholesale trade is much greater.

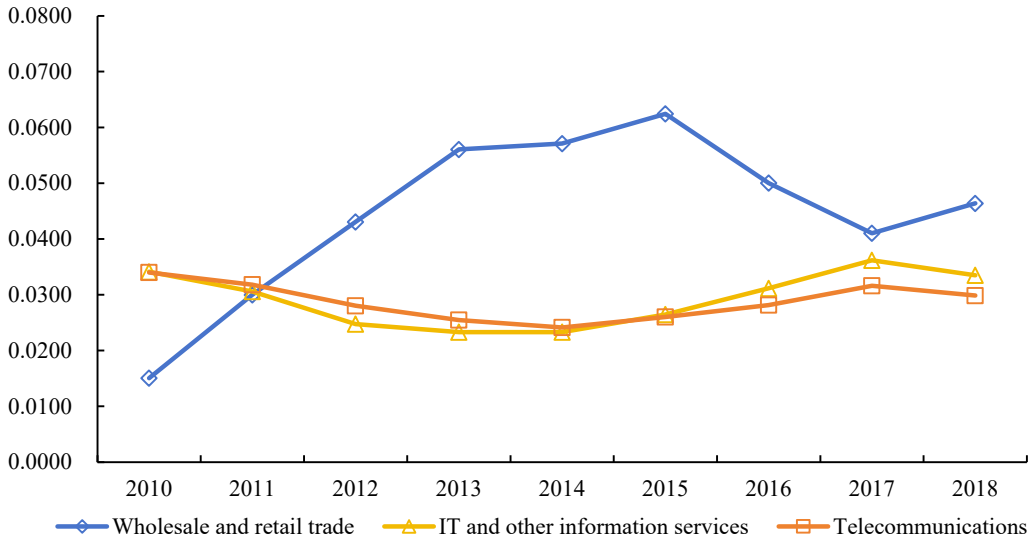

Figure 6. The changes in output indicator of real estate in China.

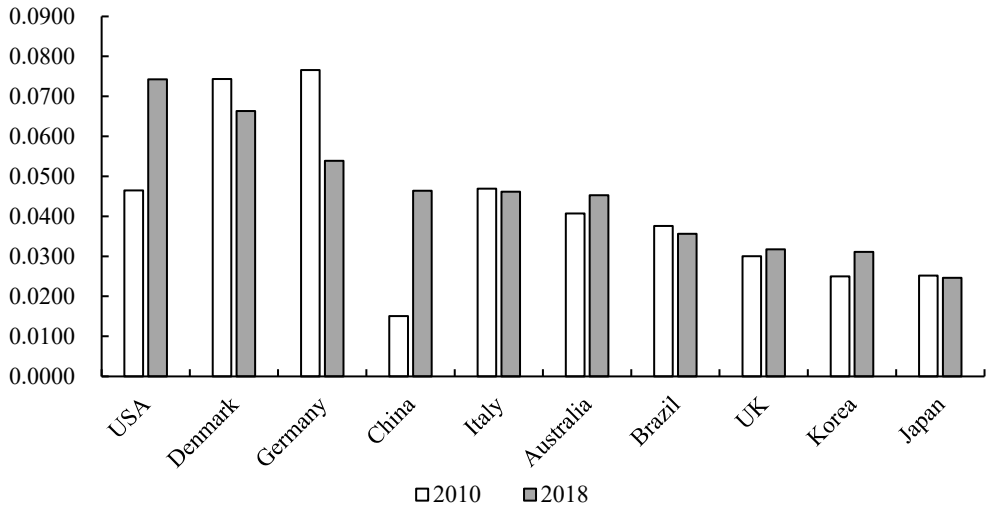

Figure 7. The output indicator of wholesale trade sector in 2010 and 2018.

The linkage of the real estate sector with other sectors shows a transition to service-oriented sectors. Appendix D shows the changes in the input structure and output structure of the real estate sector. We calculate the ranking of 45 sectors in the input and output structure of China's real estate industry in 2010 and 2018, respectively, and summarize the comparison results of the two years in Table 3 to demonstrate the changes in the input structure and output structure of China's real estate industry during the sample period.

Table 3. Statistics of input and output structure change.

Trend \ Classification		A	B	C	D	E	F	G
Input structure	uptrend	0	1	9	1	1	1	6
	downtrend	1	2	8	0	0	0	12
	unchanging	1	0	0	0	0	0	2
Output structure	uptrend	1	2	8	0	1	0	10
	downtrend	0	1	9	0	0	0	6
	unchanging	1	0	0	1	0	1	4

Columns A–G represent the seven classifications of the forty-five sectors according to the ISIC Revision 4 standard: A represents agriculture, forestry, animal husbandry, and fishery; B stands for mining; C denotes manufacturing; D refers to electricity, gas, steam, and air conditioning supply; E pertains to water supply, sewerage, waste management, and remediation activities; F indicates construction; G represents services.

Regarding the related sectors of mining (column B), in the input structure, two mining sectors experienced a decrease in their ranking for input to real estate, while one mining sector increased its ranking. In the output structure, two mining sectors increased their ranking for the consumption of real estate, while one mining sector decreased its ranking.

From the perspective of the service industry (column G), compared with 2010, in the input–output of the real estate industry in 2018, 12 sectors of the service industry ranked lower in the input structure and 10 sectors ranked higher in the output structure, indicating that the real estate industry's demand for the service industry has decreased but the products and services flowing from the real estate industry to the service industry have increased significantly.

At the same time, in the input and output structure of the real estate industry to the manufacturing industry (column C), the rise and fall in all sectors of the manufacturing industry are almost equal, indicating a stable linkage between the manufacturing industry and the real estate industry.

(2) Comparison of pull and push effects on the economy

In most countries, the push effects of real estate are less than the average social impact. As shown in Appendix C, real estate in Austria, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, The Netherlands, Norway, Russia, the Slovak Republic, Sweden, and the USA has a pull effect stronger than the average social impact, which implies real estate in these countries plays a leading role in their economic development. Only the push effects of The Netherlands's real estate remain greater than 1.0000, which implies that real estate in The Netherlands is a key industry. The push effects of the real estate sector in the USA, Japan, and China are relatively weak, with China showing a lower value compared to the USA and Japan.

Figure 8 illustrates the trend of the push effect of China's real estate sector. Analyzing the changes in the push effects of China's real estate activities over the past 9 years, the value of the push effect demonstrates a decreasing trend over time, decreasing from 0.6466 in 2011 to 0.5294 in 2018. This indicates a gradual weakening of the significant role that the real estate sector plays in economic development.

Figure 9 displays the pull and push effects of selected countries (regions) in 2018. Real estate in Germany has the strongest pull effect, with a value of 1.3347. Real estate in Denmark has the strongest push effects, and the value is 0.9474.

Table 4 lists the rank of pull and push effects of selected countries (regions) in 2010 and 2018. Taking the example of China, the pull effect of real estate in 2010 (rank 27) fell to rank 29 in 2018 and is expressed using the symbol "↓" to represent the downward trend. On the other hand, the push effects of real estate in 2010 (rank 36) moved to 29 in 2018 and is expressed using "↑" for the upward trend. Where there was no difference between 2010 and 2018, "-" is used to express the same number. It reflects that in the USA, real estate plays an increasingly leading and supporting role in the economy. In contrast, real estate's push effects in most countries on the economy are sliding down, except in Denmark, Korea, and the USA.

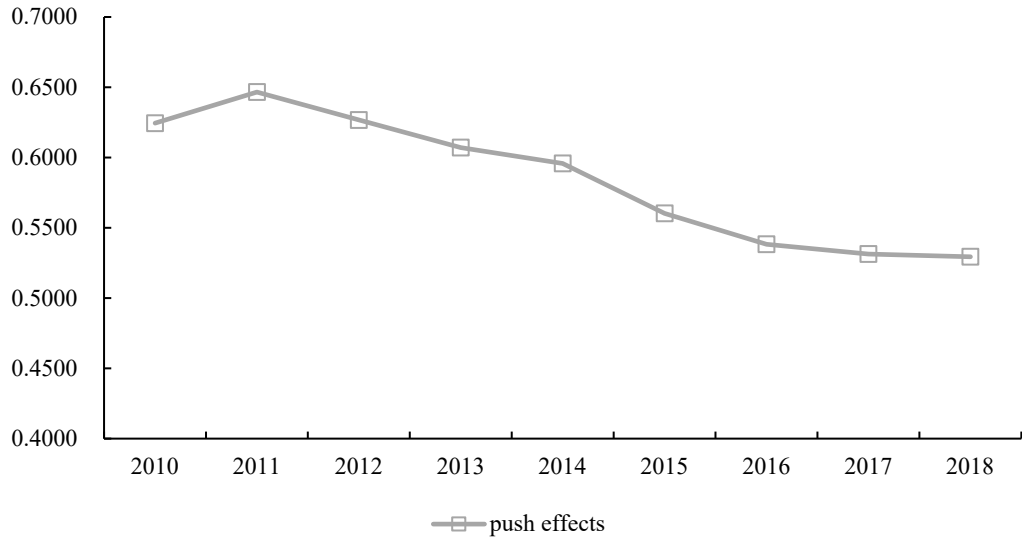

Figure 8. The push effects of China's real estate sector from 2010 to 2018 (the OECD's input–output table does not report final demand data for China so pull effects of China cannot be measured. The same below).

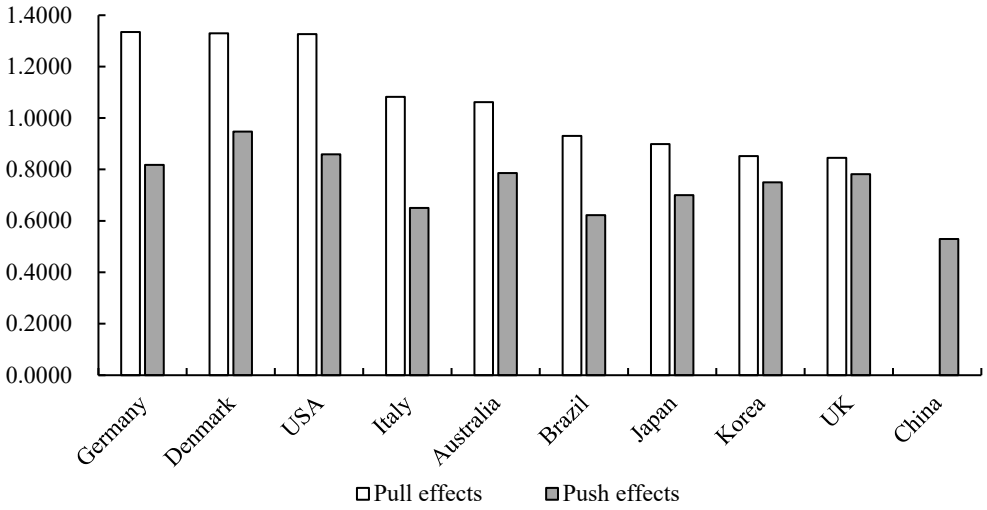

Figure 9. Pull and push effects of selected countries in 2018.

Table 4. Rank of real estate's pull and push effects in 2010 and 2018.

Country/Region	Pull Effects		Push Effects	
	2010	2018	2010	2018
UK	34	32 (↑)	13	24 (↓)
Denmark	4	5 (↓)	7	5 (↑)
Germany	3	3 (-)	19	19 (-)
Korea	27	29 (↓)	36	29 (↑)
China	-	-	39	40 (↓)
Japan	30	28 (↑)	32	37 (↓)
Italy	18	17 (↑)	37	38 (↓)
Australia	25	18 (↑)	20	23 (↓)
Brazil	28	27 (↑)	38	39 (↓)
USA	7	6 (↑)	18	14 (↑)

3. Empirical Study on the Determinants of the Role of the Real Estate Sector

In this section, we conduct an empirical analysis of determinants of the economic effects of the real estate sector using a panel regression model. Also, the approaches of lagging terms and removing control variables are employed to make the test robust.

3.1. Model

The development of a country's real estate sector is generally affected by the country's economic fundamentals, financial development, and demographics, as well as urbanization level [26,30–35].

Accordingly, the basic empirical models are constructed as the following equations.

$$PULL_{it} = c + \alpha_i + \beta_1 GDPY_{it} + \beta_2 LnPGDP_{it} + \beta_3 INDUSTRY_{it} + \beta_4 INVESTRATIO_{it} + \beta_5 PRIVATE_{it} + \beta_6 STOCK_{it} + \beta_7 URBANIZATION_{it} + \beta_8 OLDRATIO_{it} + \varepsilon_{it} \quad (5)$$

$$PUSH_{it} = c + \alpha_i + \beta_1 GDPY_{it} + \beta_2 LnPGDP_{it} + \beta_3 INDUSTRY_{it} + \beta_4 INVESTRATIO_{it} + \beta_5 PRIVATE_{it} + \beta_6 STOCK_{it} + \beta_7 URBANIZATION_{it} + \beta_8 OLDRATIO_{it} + \varepsilon_{it} \quad (6)$$

$PULL_{it}$ and $PUSH_{it}$ are the dependent variables that, respectively, represent the pull effects (IPD mentioned in Section 2) and push effects (ISD mentioned in Section 2) of the real estate sector on economy in country i at the period t. Eight factors are incorporated as the explanatory variables, including $GDPY_{it}$, $PGDP_{it}$, $INDUSTRY_{it}$, $INVESTRATIO_{it}$, $PRIVATE_{it}$, $STOCK_{it}$, $URBANIZATION_{it}$, and $OLDRATIO_{it}$.

The first four factors represent the economic fundamentals of a country. Among which, $GDPY_{it}$ and $PGDP_{it}$ are, respectively, the annual growth of GDP and per capita GDP of country i in the period t, measuring the level of the country's economic development. $INDUSTRY_{it}$ and $INVESTRATIO_{it}$ measure the structural features of the country's economic development. $INDUSTRY_{it}$ is the share of industry value added to GDP of country i in the period t, representing the country's industrial structure. $INVESTRATIO_{it}$ is the ratio of fixed capital formation and final consumption of country i in the period t, representing the expense structure of country i in the period t.

$PRIVATE_{it}$ and $STOCK_{it}$ are used to measure a country's financial development. $PRIVATE_{it}$ is the share of domestic credit to the private sector in the GDP of country i in the period t. $STOCK_{it}$ is the share of the total value of stocks traded in the GDP of country i in the period t.

$URBANIZATION_{it}$ is the share of urban population in the total population of country i in the period t, representing the country's urbanization level. The demographic factor considered is $OLDRATIO_{it}$, which refers to the elderly dependency ratio of country i in the period t.

Finally, c is the intercept; α_i denotes the individual fixed effect; ε_{it} indicates error terms. The definition of variables is listed in Table 5.

Table 5. Definition of variables.

Variables	Specification
Push	The push effects of the real estate sector in the economy (ISD)
Pull	The pull effects of the real estate sector in the economy (IPD)
Gdpy	The annual growth of GDP
Lnpgdp	The logarithm of real gross domestic product (GDP) per capita
Industry	The share of industry value added to GDP
Investratio	The ratio of fixed capital formation to final consumption, namely fixed capital formation divided by final consumption
Private	The share of domestic credit to the private sector in GDP
Stock	The share of the total value of stocks traded in GDP
Urbanization	The share of the urban population in the total population
Oldratio	The elderly dependency ratio, i.e., population ages 65 and above divided by population ages 15–64.

3.2. Descriptive Analysis

There are 63 countries used in Section 2 selected as the sample in the empirical analysis; some countries (regions) are excluded due to missing data of some key variables. All the data for the sample countries over the period from 2010 to 2018 were collected from the World Bank database. The descriptive statistics for variables used in this study are presented in Table 6. The means, medians, standard deviations, and maximum and minimum values are summarized for all variables. In Table 7, we present the correlations of the variables. As shown in the table, most of the selected explanatory variables are significantly associated with the dependent variables. All variables are then standardized for regression analysis.

Table 6. Descriptive statistics, N = 63 cross-country; T = 2010–2018.

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Unit of Measurement
Push	0.973	0.986	1.683	0.305	0.263	-
Pull	0.806	0.804	1.085	0.615	0.0890	-
Gdpy	3.090	2.779	24.48	−10.15	2.908	%
Pgdp	26.33	26.41	30.65	22.69	1.618	US$ Current Price
Industry	2633	2519	7367	647.9	935.5	% of GDP
Investratio	0.359	0.325	1.176	0.142	0.141	-
Private	89.13	69.75	524.5	4.767	68.33	% of GDP
Stock	44.81	14.66	668.6	0.0100	86.41	% of GDP
Urbanization	71.63	74.43	100	20.29	17.92	%
Oldratio	19.97	20.59	49.10	3.132	9.077	%

Table 7. Correlations.

Variables	Pull	Push	Gdpy	Lnpgdp	Industry	Investratio	Private	Stock	Urbanization	Oldratio
Pull	1									
Push	0.272 ***	1								
Gdpy	0.087 **	−0.296 ***	1							
Lnpgdp	−0.272 ***	0.144 ***	−0.140 ***	1						
Industry	−0.154 ***	−0.320 ***	0.213 ***	−0.0360	1					
Investratio	0.071 *	−0.245 ***	0.241 ***	−0.145 ***	0.486 ***	1				
Private	0.138 ***	0.0570	−0.260 ***	−0.0290	−0.356 ***	−0.127 ***	1			
Stock	0.0540	−0.175 ***	0.000	0.242 ***	−0.222 ***	0.126 ***	0.209 ***	1		
Urbanization	0.0170	0.413 ***	−0.320 ***	0.272 ***	−0.314 ***	0.0250	0.146 ***	0.254 ***	1	
Oldratio	0.178 ***	0.498 ***	−0.408 ***	0.200 ***	−0.478 ***	−0.321 ***	0.303 ***	0.0680	0.374 ***	1

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

3.3. Empirical Results

(1) Regression Analysis

According to the basic models (1) and (2), we implemented regression analysis, respectively, for the pull and push effects of the real estate sector based on the cross-country panel data from 2010 to 2018. Several models are estimated including the pooled ordinary least squares (OLS), the random effects regression model (RE), and fixed effects regression model (FE). In addition, Hausman tests are carried out, which suggest the fixed effect model should be adopted for both regressions for the pull and push effects.

The empirical results of the pull effect using the fixed effect model are presented in Table 8. As shown in the table, two models are estimated for the pull effects, among which model (1) and model (2) are, respectively, the estimation results of the single fixed effects model and double fixed effects model. The results indicate the significant positive effects of INVESTRATIO, GDPY, and OLDRATIO on PULL and the significant negative effects of INPGDP and INDUSTRY on PULL. The effects of PRIVATE, STOCK, and URBANIZATION are not significant.

Table 8. Regression results of *PULL* effect.

Variables	(1) Pull	(2) Pull
Gdpy	0.477 ***	0.504 ***
	(0.139)	(0.144)
Lnpgdp	−1.664 ***	−1.666 ***
	(0.245)	(0.247)
Industry	−0.000907 *	−0.000931 *
	(0.000527)	(0.000532)
Investratio	8.299 ***	8.420 ***
	(3.171)	(3.213)
Oldratio	0.283 ***	0.292 ***
	(0.0490)	(0.0501)
Private	0.00737	0.00705
	(0.00583)	(0.00588)
Stock	0.00660	0.00660
	(0.00532)	(0.00537)
Urbanization	−0.00179	−0.00152
	(0.0241)	(0.0242)
Constant	115.7 ***	115.5 ***
	(6.551)	(6.604)
Time	No	Yes
Observations	545	545
R-squared	0.180	0.182
Number of ID	63	63

Standard errors in parentheses, *** $p < 0.01$, * $p < 0.1$. The coefficient of PULL is increased by a hundredfold to enhance the visibility of the influence coefficient.

Based on the above analysis, we find that the pull effects of the real estate sector are significantly affected by a country's economic fundamentals and expense structure of the economy. The per capita GDP has a substantial negative impact on the pull effects, while the annual growth of GDP has a positive impact on the pull effects. It means that for a country with rapid economic growth, the real estate sector has more inter-sectoral linkages with other sectors, which then has stronger pull effects on the economy. However, when an economy becomes more developed, the pull effects of the real estate sector are weaker. These might be attributed to the role change of the real estate sector in a country. In a rapidly growing economy, the real estate sector often plays a pivotal role within the economy. As an asset that combines both consumption and investment attributes, real estate products typically have strong collateral properties, acting as a financial accelerator in economic development. This leads to a higher return rate for the real estate sector in fast-growing economies, further enhancing its driving effect. However, as the economy matures and housing price growth begins to slow, this driving effect gradually diminishes.

The relative amount of fixed capital formation exhibits a positive coefficient in our regression model. As production capacity increases, the expansion needs of enterprises grow, leading to higher demand for industrial real estate and office space, further driving the real estate market, resulting in a higher pull effect on the real estate sector.

The regression results of the push effect are reported in Table 9. As it shows, three models are also estimated for the push effects, among which model (1) and model (2) are, respectively, the estimation results of the single fixed effects model and double fixed effects model. The results indicate the significant positive effects of URBANIZATION and OLDRATIO on PUSH as well as the significant negative effects of STOCK, PRIVATE, and INDUSTRY on PUSH. Except for these five variables, the effects of other explanatory variables are not significant.

Table 9. Regression results of *PUSH* effect.

Variables	(1) Push	(2) Push
Industry	−0.00361 ***	−0.00379 ***
	(0.00132)	(0.00133)
Private	−0.0340 **	−0.0359 **
	(0.0146)	(0.0147)
Stock	−0.101 ***	−0.102 ***
	(0.0133)	(0.0134)
Urbanization	0.455 ***	0.452 ***
	(0.0603)	(0.0606)
Oldratio	0.964 ***	0.993 ***
	(0.123)	(0.125)
Gdpy	−0.386	−0.395
	(0.348)	(0.360)
Lnpgdp	0.894	0.936
	(0.615)	(0.619)
Investratio	−7.572	−6.001
	(7.947)	(8.038)
Constant	42.94 ***	41.72 **
	(16.42)	(16.52)
Time	No	Yes
Observations	545	545
R-squared	0.327	0.400
Number of ID	63	63

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$. The variable push is increased by a hundredfold to enhance the visibility of the influence coefficient.

Urbanization has a positive impact on the PUSH effect of the real estate sector. In the early stage of urbanization, the speed of urbanization is accelerating, and the real estate sector's role in the economy is mainly reflected in its direct contribution to investment

growth in the economy, while the inter-sectoral role in other sectors is relatively weak. When the country enters the latter stage of urbanization and the process of urbanization slows down, the real estate sector is amazingly embedded in the interaction of different sectors in the progress of economic development, strengthening its supportive role in development.

The coefficient of PRIVATE and STOCK is significantly negative. The former is because when the proportion of private sector credit to GDP is too high, the risk within the financial system also increases. To address potential financial risks, financial institutions may adopt tighter credit policies, reducing support for the real estate market. This would further suppress the development of the real estate sector and its push effect on other industries. The latter is probably due to the crowding-out effect of the stock market. With the prosperity of the stock market and the increasing proportion of investors investing in the stock market, the inflow of funds into the real estate sector—which is also an important investment product—has decreased, leading to a weakening of the push effect of real estate commodities on the economy.

Industrialization has significantly suppressed the importance of the real estate sector, resulting in the negative coefficient both in the push and pull effects. This is because as industrialization deepens, resources (including capital, human resources, and land) increasingly shift towards the industrial sector. The development of the industrial sector requires substantial capital investment, leading to a transfer of investment funds from the real estate sector to the industrial sector, thereby reducing the capital available for the real estate sector and suppressing its output growth.

The aging population also positively contributes to the increasing role in economic development, which can be partially attributed to the diversity of real estate demand. As the population ages, the proportion of elderly individuals rises, leading to higher demand for age-friendly housing and communities, including an accessible design, medical facilities, and retirement homes, which drives rapid development in specific segments of the real estate market (such as senior housing), thereby boosting the status of the real estate sector in the economy.

(2) Robustness tests

In order to check the robustness of the estimation, we substitute all the explanatory variables with their one-order lagging term to deal with the endogeneity. The robustness test results of the pull effect are reported in columns (1) and (2) in Table 10; the results of the push effect are presented in columns (1) and (2) in Table 11. The robustness tests show that most of the results are consistent with the former estimation.

Moreover, we carry out regression with the control variables removed, The results of the pull effect without the control variable are reported in columns (3) and (4) in Table 12. The results of the push effect without the control variable are presented in columns (3) and (4) in Table 13. Compared to columns (1) and (2), it can be found from the results that the key factors are significant whether we remove the control variables or not in the regression, which proves that the empirical results are robust.

Table 10. Robustness test results of *PULL* effect with variables in lagging terms.

Variables	(1) Pull	(2) Pull
L.gdpy	0.444 ***	0.465 ***
	(0.142)	(0.147)
L.lnpgdp	−1.712 ***	−1.714 ***
	(0.256)	(0.258)
L.industry	−0.00101 *	−0.00103 *
	(0.000546)	(0.000552)
L.investratio	8.689 **	8.765 **
	(3.379)	(3.420)

Table 10. *Cont.*

Variables	(1) Pull	(2) Pull
L.oldratio	0.295 ***	0.302 ***
	(0.0524)	(0.0533)
L.private	0.00512	0.00494
	(0.00602)	(0.00607)
L.stock	0.00832	0.00833
	(0.00566)	(0.00571)
L.urbanization	−0.00731	−0.00702
	(0.0249)	(0.0251)
Constant	117.6 ***	117.4 ***
	(6.817)	(6.871)
Observations	486	486
R-squared	0.188	0.189
Number of ID	63	63

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11. Robustness test results of *PUSH* effect with variables in lagging terms.

Variables	(1) Push	(2) Push
L.industry	−0.00356 **	−0.00374 ***
	(0.00139)	(0.00140)
L.private	−0.0377 **	−0.0394 **
	(0.0153)	(0.0154)
L.stock	−0.0981 ***	−0.0994 ***
	(0.0144)	(0.0145)
L.urbanization	0.446 ***	0.443 ***
	(0.0635)	(0.0638)
L.oldratio	0.992 ***	1.015 ***
	(0.134)	(0.136)
L.gdpy	−0.416	−0.440
	(0.361)	(0.373)
L.lnpgdp	0.879	0.916
	(0.653)	(0.657)
L.investratio	−5.731	−4.340
	(8.609)	(8.693)
Constant	43.26 **	42.32 **
	(17.37)	(17.47)
Time	No	Yes
Observations	486	486
R-squared	0.390	0.394
Number of ID	63	63

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$.

Table 12. Robustness test results of *PULL* effect removing control variable.

Variables	(1) Pull	(2) Pull	(3) Pull	(4) Pull
Gdpy	0.477 ***	0.504 ***	0.475 ***	0.502 ***
	(0.139)	(0.144)	(0.130)	(0.135)
Lnpgdp	−1.664 ***	−1.666 ***	−1.604 ***	−1.603 ***
	(0.245)	(0.247)	(0.219)	(0.220)
Industry	−0.000907 *	−0.000931 *	−0.00128 ***	−0.00129 ***
	(0.000527)	(0.000532)	(0.000459)	(0.000461)
Investratio	8.299 ***	8.420 ***	9.350 ***	9.491 ***
	(3.171)	(3.213)	(2.838)	(2.865)

Table 12. *Cont.*

Variables	(1) Pull	(2) Pull	(3) Pull	(4) Pull
Oldratio	0.283 ***	0.292 ***	0.279 ***	0.288 ***
	(0.0490)	(0.0501)	(0.0468)	(0.0477)
Private	0.00737	0.00705		
	(0.00583)	(0.00588)		
Stock	0.00660	0.00660		
	(0.00532)	(0.00537)		
Urbanization	−0.00179	−0.00152		
	(0.0241)	(0.0242)		
Constant	115.7 ***	115.5 ***	115.8 ***	115.5 ***
	(6.551)	(6.604)	(5.938)	(5.985)
Control variables	Yes	Yes	No	No
Time	No	Yes	No	Yes
Observations	545	545	545	545
R-squared	0.180	0.182	0.174	0.176
Number of ID	63	63	63	63

Standard errors in parentheses, *** $p < 0.01$, * $p < 0.1$.

Table 13. Robustness test results of *PUSH* effect removing control variable.

Variables	(1) Push	(2) Push	(3) Push	(4) Push
Industry	−0.00361 ***	−0.00379 ***	−0.00399 ***	−0.00405 ***
	(0.00132)	(0.00133)	(0.00113)	(0.00114)
Private	−0.0340 **	−0.0359 **	−0.0341 **	−0.0363 **
	(0.0146)	(0.0147)	(0.0143)	(0.0144)
Stock	−0.101 ***	−0.102 ***	−0.101 ***	−0.101 ***
	(0.0133)	(0.0134)	(0.0125)	(0.0125)
Urbanization	0.455 ***	0.452 ***	0.467 ***	0.466 ***
	(0.0603)	(0.0606)	(0.0563)	(0.0566)
Oldratio	0.964 ***	0.993 ***	1.050 ***	1.080 ***
	(0.123)	(0.125)	(0.117)	(0.119)
Gdpy	−0.386	−0.395		
	(0.348)	(0.360)		
Lnpgdp	0.894	0.936		
	(0.615)	(0.619)		
Investratio	−7.572	−6.001		
	(7.947)	(8.038)		
Constant	42.94 ***	41.72 **	61.05 ***	60.85 ***
	(16.42)	(16.52)	(6.136)	(6.163)
Control variables	Yes	Yes	No	No
Time	No	Yes	No	Yes
Observations	545	545	545	545
R-squared	0.327	0.400	0.389	0.394
Number of ID	63	63	63	63

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$.

(3) Heterogeneity tests

Depending on the strength of government regulation, real estate industries and related industries may develop differently, and this factor is a very important aspect influencing the establishment of a balance in the development of industries and their sustainability. Therefore, considering that the national legislation of a particular country may affect the relationship between real estate market development and the financial sector, based on the government regulation data of each country, this paper divides the sample into three

groups—a low level of government regulation, medium level of government regulation, and high level of government regulation—using the time spent dealing with the requirements of government regulations provided by the World Bank as the proxy of government regulation, and conducts heterogeneity analysis by regression of the low government regulation group and high government regulation group.

In Table 14, the regression results of the samples with low government regulation are closest to the main test conclusions. Among the main influencing factors, gdpy and industry display great differences in their influence on the pull effects due to different levels of government regulation. In the samples with high government regulation, no matter how GDP increases, the government may adjust the development pace of the real estate industry through policy means to avoid excessive impact or dependence on other industries caused by its excessive expansion. At the same time, under the strict supervision of the government, the increase in the proportion of the output value of the real estate industry reflects the natural growth of the market scale rather than the unlimited expansion, so it is difficult for this growth to significantly weaken its role as an economic engine in driving other industries. To sum up, government regulation, as a regulator, balances the relationship between the real estate industry and other industries and ensures stable economic development.

In Table 15, the regression results of the samples with low government regulation are closest to the main test conclusions. However, in samples with high government regulation, most influencing factors fail to exert the original impact on the PUSH effect due to different levels of government regulation. In the environment of high government regulation, the government's strict supervision and regulation measures on the real estate industry may have weakened the role of the market mechanism in resource allocation. Therefore, even if the proportion of the output value of the real estate industry increases, the investment intensity increases, the private sector becomes more active, or the share circulation improves, it is difficult for these market factors to directly and significantly promote the development of other industries because the government's policy orientation and intervention become the key factors affecting the economic effect of the real estate industry.

Additionally, considering that the construction and financial sectors in different countries are at different stages of their development life cycle, the development of the real estate industry should be taken into account when it comes to comparisons of different states. Therefore, based on the proportion of the real estate industry output value in each country, this paper divides the sample into three groups—a low level of real estate development, medium level of real estate development, and high level of real estate development—and conducts heterogeneity analysis by regression of the low and high real estate development group in Tables 16 and 17.

In Table 16, the regression results of the samples with a moderate real estate development level are closest to the main test conclusions, while in Table 17, the regression results of the samples with a low real estate development level are closest to the main test conclusions. Most main influencing factors influence the pull and push effects differently due to various real estate development levels.

Therefore, countries with high real estate development have mature markets, and GDP growth no longer significantly stimulates the extraordinary expansion of the real estate industry, so it does not play an obvious role in driving other industries. For countries with a high degree of real estate development, an increase in the share of real estate output may attract and occupy more resources, squeezing other sectors and reducing the positive pull on other sectors. Even if the proportion of the real estate industry output value increases and the private economic activity rises, the marginal effect of promoting the development of other industries will not be significantly enhanced because other industries have already adapted to the existing industrial structure. In addition, when the development of the national real estate industry is successful, aging does not cause large-scale housing demand changes or policy adjustments, which is not enough to significantly change the role of real estate in promoting other economic sectors.

Table 14. Heterogene ity test results of *PULL* effect in different government regulation levels.

Variables	(1) Low Government Regulation Pull	(2) High Government Regulation Pull
Gdpy	0.540 **	0.259
	(0.242)	(0.236)
Lnpgdp	−0.733 **	−1.374 ***
	(0.363)	(0.424)
Industry	−0.00416 ***	0.00119
	(0.00122)	(0.000849)
Investratio	19.09 **	16.07 ***
	(8.330)	(4.772)
Oldratio	0.178 **	0.498 ***
	(0.0879)	(0.0881)
Private	0.0108	−0.00223
	(0.0150)	(0.00627)
Stock	−0.0135 *	−0.00869
	(0.00803)	(0.0289)
Urbanization	−0.0164	−0.137 **
	(0.0396)	(0.0567)
Constant	100.0 ***	105.9 ***
	(9.685)	(11.92)
Time	Yes	Yes
Observations	170	0.259
R-squared	0.244	(0.236)

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 15. Heterogeneity test results of *PUSH* effect in different government regulation levels.

Variables	(1) Low Government Regulation Push	(2) High Government Regulation Push
Industry	−0.0177 ***	−0.00280
	(0.00390)	(0.00199)
Private	−0.195 ***	0.000766
	(0.0482)	(0.0147)
Stock	−0.148 ***	0.0904
	(0.0258)	(0.0679)
Urbanization	0.398 ***	0.150
	(0.127)	(0.133)
Oldratio	1.124 ***	0.387 *
	(0.282)	(0.207)
Gdpy	−2.616 ***	1.170 **
	(0.776)	(0.554)
Lnpgdp	3.107 ***	−2.628 ***
	(1.164)	(0.994)
Investratio	46.19 *	8.801
	(26.72)	(11.19)
Constant	28.67	150.6 ***
	(31.07)	(27.96)
Time	Yes	Yes
Observations	170	186
R-squared	0.673	0.157

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 16. Heterogeneity test results of *PULL* effect in different real estate development levels.

Variables	(1) Low Real Estate Development Pull	(2) High Real Estate Development Pull
Gdpy	0.579 *	0.0480
	(0.313)	(0.238)
Lnpgdp	−2.199 ***	−1.374 ***
	(0.584)	(0.430)
Industry	−0.00131	0.00338 **
	(0.00148)	(0.00143)
Investratio	16.03	3.680
	(11.60)	(4.171)
Oldratio	0.246 **	0.300 ***
	(0.101)	(0.103)
Private	0.0959 ***	0.00512
	(0.0292)	(0.00999)
Stock	−0.0539 *	0.0108 *
	(0.0312)	(0.00641)
Urbanization	−0.0119	0.155 ***
	(0.0538)	(0.0544)
Constant	127.6 ***	90.57 ***
	(13.22)	(11.40)
Time	Yes	Yes
Observations	188	178
R-squared	0.223	0.212

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 17. Heterogeneity test results of *PUSH* effect in different real estate development levels.

Variables	(1) Low Real Estate Development Push	(3) High Real Estate Development Push
Industry	−0.0143 ***	−0.00115
	(0.00286)	(0.00345)
Private	0.204 ***	0.0175
	(0.0565)	(0.0241)
Stock	−0.248 ***	−0.101 ***
	(0.0603)	(0.0155)
Urbanization	1.009 ***	0.510 ***
	(0.104)	(0.131)
Oldratio	0.452 **	0.0350
	(0.196)	(0.249)
Gdpy	0.167	−0.641
	(0.604)	(0.574)
Lnpgdp	−5.542 ***	5.250 ***
	(1.130)	(1.039)
Investratio	94.00 ***	15.46
	(22.44)	(10.07)
Constant	173.5 ***	−81.59 ***
	(25.57)	(27.52)
Time	Yes	Yes
Observations	188	178
R-squared	0.674	0.377

Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$.

4. Discussion

In most countries, the pull effect on the economy of the real estate sector ranks behind, which shows that the real estate sector in these countries has limited driving force for the development of the national economy compared with other sectors. However, in some

countries, including Norway, Sweden, Austria, and The Netherlands, the pull effects on the economy of the real estate sector are higher than the average social level, indicating that the more the economy develops, the greater the demand pressure of the real estate sector on the products of other sectors. The real estate sector may become a "bottleneck" industry for the development of other sectors, and unhealthy development of the real estate sector will affect the development of other sectors [22]. Therefore, the coordinated development of the real estate sector plays a crucial role in the healthy development of a national economy.

In terms of the dynamic development of the input and output structure of the real estate sector, in response to the changing trends of the world economy, the real estate sector in all countries has shifted from incremental development to stock development, presenting a service trend to some extent. On the one hand, the importance of the real estate sector has become increasingly prominent as the proportion of the tertiary sector in the social economy has gradually increased, and the role of related sectors has gradually increased. On the other hand, with the trend of a service economy in the world, the relative sectors of the real estate sector have shifted from the traditional material sectors to service sectors. The industrial structure has gradually shown a trend of "servitization", in other words, for the development of the real estate sector, the consumption of material resources has been relatively reduced, and the consumption of information and knowledge has increased.

However, real estate sectors in some countries rely too much on service sectors. Judging from the input structure, the real estate sector in China, Australia, and Singapore is highly related to the financial sector, and its relevance to the construction industry is relatively low. This unreasonable industrial structure may lead to a vicious change in the overall economy, which is not conducive to the long-term development of the real estate sector and the overall economy. Conversely, in Canada and Denmark, the financial sector and the construction sector are closely related to the real estate sector. The linkage between the real estate sector and the construction sector is greater than that of the financial sector. Over-reliance on the financial sector may lead to unregulated development, high market prices, and strong speculation, thus becoming a trigger for a financial crisis. In China and the USA, administrative and support service activities account for a large proportion of the input structure of the real estate sector, indicating the real estate sector has a close relationship with the government. Thus, the development of the real estate sector is strongly intervened by the government and the high housing price is inevitable. However, it is worth noting that the real estate sectors of these two countries have a different degree of correlation with themselves, and the real estate sector in the United States is closely linked with social welfare, which could promote the long-term development of the real estate sector and the overall economy. In contrast, China's real estate sector has a low degree of linkage with itself, indicating a low degree of specialization, industrial efficiency, and social service quality. In addition, when the proportion of the real estate output value in a country is at a high level, the driving force of its promotional effect on other national economic sectors will play a more significant role. However, its promotional effect is also more likely to weaken with a decrease in urbanization speed and slow industrial development, which to some extent explains the economic status change in the real estate industry from prosperity to decline. Hence, China should expand the circulation and service areas of the real estate sector and increase its own linkage in order to avoid an unregulated and unhealthy development of the real estate sector.

Compared with current research, this paper contributes to the dynamic evolution of the role of the real estate sector in economic development as well as the driving force of the push and pull effects in terms of the real estate sector. We find that such driving forces exhibit a significant heterogeneous trend among different government regulation levels and the life cycle of the real estate sector. We hope that our research can provide a more systematic perspective on measuring the role of the real estate market in the economy, uncovering key factors that affect the intrinsic development of the real estate sector, thereby improving the sustainability of the real estate sector in the national economy.

However, there are some limitations in our study. A common concern about our research is that our research is mainly based on the input–output table, which cannot catch the relative change in prices between different economic sectors. Due to the dual attributes of investment and consumer goods in real estate products, the driving and stimulating role of the real estate sector may not only be due to its role in transforming its position in economic development but also to changes in its prices themselves. In addition, the push and pull effects proposed in this article focus more on the driving role of real estate commodities as intermediate goods between different sectors but there is relatively less involvement in the consumption of real estate commodities as final commodities. Therefore, in future research, we will shift our research approach and attempt to use a general equilibrium model based on the SAM table to strengthen the theoretical analysis of role transformation in the real estate market, in order to make up for the shortcomings of the current research.

In addition, we consider real estate activities as the real estate sector, this excludes the construction of housing, offices, etc.; this could lead to an underestimation of the real estate sector's effects to some extent. Future research could consider restructuring the national input and output tables, combining the real estate sector and the building part of the construction sector as a new sector and, based on this, could explore the role of the real estate sector.

5. Conclusions and Implications

Using data from a world input–output table database covering 67 countries from 2010 to 2018, we examine the role of the real estate sector in various countries and its determinants by using input–output analysis and a panel model. To be specific, we quantitatively explore the inter-sectoral linkages, economic effects, and key factors of real estate on a multinational level, shedding light on the changing trends in the economy by observing changes in economic effects. The research findings can provide useful information for both policymakers and enterprises in formulating policies that facilitate the development of the economy and relative production activities of real estate.

Results show that in most countries, the input of real estate is from financial services activities, construction, and real estate activities, and the services of the real estate sector mainly flow to wholesale trade and retail trade. Moreover, the requirement of financial activities in China's real estate sector is relatively high among major countries. In addition, the inputs and outputs of the real estate sector show a transition to serviced-oriented sectors. As in most countries, the push effects of the real estate sector are less than the average social impact, and the key industry role that China's real estate plays is decreasing.

The key determinants of the pull effects are a country's economic fundamentals and the expense structure of the economy. The per capita GDP has a substantial negative impact on the pull effects, while economic growth has a positive impact on the pull effects. The speed of urbanization has a positive impact on the role of the real estate sector. Additionally, the more a country's economic growth is driven by capital formation, the less of a role the real estate sector plays in the country's economy. Also, the push effects of the real estate sector are positively affected by a country's aging population and the degree of urbanization.

The results of this study lead to several policy implications. First, the findings imply that the development of real estate should decrease the dependence on financial activities and it is necessary to increase the flow of financial activities to the economy. Second, the government should pay more attention to the quality of urbanization as well as the speed of urbanization.

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Appendix A. Direct Input Indicator of the Real Estate Sector from 2010 to 2018

No.	Country/Region	2010		2014		2018	
		Sector	Value	Sector	Value	Sector	Value
1	Switzerland	D41T43	0.0702	D41T43	0.0651	D41T43	0.05567
		D64T66	0.0530	D64T66	0.0438	D69T75	0.04021
2	Türkiye	D41T43	0.0168	D41T43	0.0306	D41T43	0.04050
		D23	0.0108	D23	0.0256	D23	0.03283
3	Japan	D64T66	0.0746	D64T66	0.0712	D64T66	0.08404
		D41T43	0.0261	D41T43	0.0342	D68	0.03371
4	Cambodia	D35	0.0513	D64T66	0.0395	D64T66	0.03917
		D61	0.0283	D61	0.0289	D61	0.03028
5	Thailand	D64T66	0.0702	D64T66	0.0835	D64T66	0.06453
		D35	0.0602	D35	0.0579	D35	0.04262
6	Tunisia	D64T66	0.0411	D64T66	0.0536	D64T66	0.05853
		D35	0.0126	D35	0.0090	D35	0.01086
7	Greece	D41T43	0.0437	D64T66	0.0489	D64T66	0.02529
		D64T66	0.0321	D41T43	0.0265	D41T43	0.02260
8	Argentina	D41T43	0.0233	D41T43	0.0242	D41T43	0.02084
		D77T82	0.0133	D77T82	0.0138	D45T47	0.01355
9	Lithuania	D16	0.0411	D68	0.0849	D68	0.05101
		D45T47	0.0227	D77T82	0.0349	D77T82	0.02893
10	Slovakia	D41T43	0.0983	D64T66	0.0654	D68	0.07392
		D68	0.0580	D68	0.0571	D64T66	0.05415
11	Australia	D64T66	0.1407	D64T66	0.1420	D64T66	0.14179
		D41T43	0.0647	D41T43	0.0549	D41T43	0.05588
12	Denmark	D41T43	0.0954	D64T66	0.0991	D41T43	0.10031
		D64T66	0.0933	D41T43	0.0922	D64T66	0.09122
13	Spain	D64T66	0.0510	D64T66	0.0359	D64T66	0.03844
		D41T43	0.0350	D41T43	0.0246	D41T43	0.03707
14	Vietnam	D35	0.0343	D41T43	0.1045	D41T43	0.15955
		D41T43	0.0190	D23	0.0244	D69T75	0.02405
15	New Zealand	D64T66	0.0725	D68	0.0700	D68	0.06804
		D68	0.0626	D64T66	0.0659	D41T43	0.06309
16	Brunei Darussalam	D64T66	0.0580	D64T66	0.0558	D64T66	0.08456
		D41T43	0.0441	D41T43	0.0397	D41T43	0.01507
17	Malta	D41T43	0.0493	D41T43	0.0654	D41T43	0.06780
		D68	0.0459	D69T75	0.0294	D69T75	0.03204
18	Poland	D35	0.1337	D41T43	0.1055	D35	0.11195
		D41T43	0.0950	D35	0.0878	D41T43	0.09533
19	Malaysia	D64T66	0.1246	D64T66	0.0507	D19	0.05428
		D68	0.0670	D41T43	0.0362	D64T66	0.04909
20	The Netherlands	D64T66	0.2525	D64T66	0.2845	D64T66	0.16119
		D41T43	0.0956	D41T43	0.0947	D41T43	0.11371
21	Belgium	D41T43	0.0631	D64T66	0.0726	D64T66	0.06400
		D64T66	0.0573	D41T43	0.0529	D68	0.04031
22	The Philippines	D64T66	0.0468	D45T47	0.0510	D45T47	0.04621
		D45T47	0.0257	D01T02	0.0234	D01T02	0.02126
23	Latvia	D41T43	0.0882	D68	0.0922	D68	0.04967
		D35	0.0499	D35	0.0336	D35	0.02743

24	Colombia	D64T66	0.0452	D77T82	0.0264	D77T82	0.02519
		D77T82	0.0216	D41T43	0.0262	D41T43	0.02253
25	Saudi Arabia	D64T66	0.0307	D41T43	0.0496	D41T43	0.04495
		D41T43	0.0252	D64T66	0.0118	D64T66	0.00955
26	France	D64T66	0.0642	D64T66	0.0680	D64T66	0.04581
		D68	0.0291	D68	0.0241	D68	0.02424
27	Kazakhstan	D68	0.1183	D41T43	0.0287	D41T43	0.04484
		D01T02	0.0552	D77T82	0.0154	D49	0.02913
28	Finland	D41T43	0.0614	D41T43	0.0599	D41T43	0.05633
		D64T66	0.0396	D64T66	0.0394	D64T66	0.04742
29	Peru	D64T66	0.0389	D64T66	0.0412	D64T66	0.03190
		D69T75	0.0176	D69T75	0.0172	D69T75	0.01443
30	China Non-Processing	D64T66	0.0430	D64T66	0.0937	D64T66	0.06999
		D77T82	0.0328	D68	0.0390	D77T82	0.02594
31	Chinese Taipei	D64T66	0.0730	D64T66	0.0700	D41T43	0.05380
		D41T43	0.0480	D41T43	0.0590	D64T66	0.04865
32	India	D41T43	0.0628	D41T43	0.0675	D41T43	0.06684
		D64T66	0.0221	D64T66	0.0201	D64T66	0.01887
33	Myanmar	D64T66	0.1208	D64T66	0.1250	D64T66	0.12498
		D41T43	0.0506	D41T43	0.0356	D41T43	0.03231
34	Iceland	D41T43	0.0600	D41T43	0.0561	D41T43	0.07944
		D64T66	0.0379	D64T66	0.0383	D64T66	0.03170
35	Estonia	D41T43	0.0524	D41T43	0.0552	D41T43	0.08130
		D64T66	0.0506	D64T66	0.0372	D64T66	0.04036
36	Luxembourg	D64T66	0.0656	D64T66	0.0408	D64T66	0.06971
		D41T43	0.0229	D41T43	0.0280	D41T43	0.04826
37	The United States	D64T66	0.0530	D64T66	0.0632	D64T66	0.06276
		D68	0.0449	D41T43	0.0435	D41T43	0.04258
38	Morocco	D64T66	0.0917	D64T66	0.0938	D64T66	0.08073
		D68	0.0035	D69T75	0.0047	D69T75	0.00357
39	The Russian Federation	D68	0.0500	D68	0.0414	D68	0.05503
		D35	0.0293	D35	0.0276	D35	0.03533
40	Ireland	D64T66	0.1764	D64T66	0.0558	D69T75	0.04008
		D41T43	0.0283	D41T43	0.0174	D41T43	0.02818
41	Israel (2)	D64T66	0.0374	D69T75	0.0274	D69T75	0.03283
		D69T75	0.0355	D64T66	0.0264	D64T66	0.02481
42	Chile	D41T43	0.1577	D41T43	0.1185	D41T43	0.10594
		D69T75	0.0268	D64T66	0.0414	D64T66	0.03776
43	Germany	D41T43	0.0760	D41T43	0.0709	D41T43	0.07856
		D64T66	0.0556	D64T66	0.0582	D64T66	0.04656
44	Bulgaria	D41T43	0.0727	D64T66	0.0644	D64T66	0.06928
		D64T66	0.0714	D41T43	0.0558	D41T43	0.06456
45	Slovenia	D41T43	0.0331	D41T43	0.0280	D64T66	0.03400
		D64T66	0.0173	D69T75	0.0167	D41T43	0.02640
46	Costa Rica	D64T66	0.0633	D64T66	0.0527	D64T66	0.05889
		D41T43	0.0350	D41T43	0.0394	D69T75	0.02724
47	South Africa	D64T66	0.0441	D64T66	0.0608	D64T66	0.06020
		D45T47	0.0269	D45T47	0.0266	D45T47	0.02970
48	Hungary	D64T66	0.0847	D64T66	0.0655	D64T66	0.05699
		D69T75	0.0271	D41T43	0.0284	D41T43	0.03587
49	Norway	D64T66	0.0649	D64T66	0.0871	D64T66	0.06105
		D41T43	0.0460	D41T43	0.0481	D41T43	0.05338
50	The United Kingdom	D64T66	0.1250	D64T66	0.0858	D64T66	0.06322
		D41T43	0.0631	D41T43	0.0607	D41T43	0.05257
51	Cyprus (1)	D41T43	0.0993	D41T43	0.0745	D41T43	0.03609
		D64T66	0.0782	D64T66	0.0482	D68	0.01947
52	Singapore	D64T66	0.0911	D64T66	0.1046	D64T66	0.08129
		D69T75	0.0489	D69T75	0.0408	D69T75	0.04449
53	Korea	D64T66	0.0986	D64T66	0.1253	D64T66	0.10517
		D35	0.0211	D41T43	0.0296	D77T82	0.03990
54	Italy	D64T66	0.0410	D64T66	0.0339	D64T66	0.02653
		D69T75	0.0289	D69T75	0.0214	D69T75	0.01574

55	Rest of the World	D64T66 D41T43	0.0390 0.0249	D64T66 D41T43	0.0331 0.0255	D41T43 D64T66	0.03980 0.03669
56	Croatia	D45T47 D35	0.0270 0.0210	D45T47 D35	0.0239 0.0207	D41T43 D35	0.05734 0.03070
57	Canada	D64T66 D41T43	0.0682 0.0538	D64T66 D41T43	0.0687 0.0533	D64T66 D41T43	0.06609 0.05844
58	Hong Kong, China	D64T66 D68	0.1227 0.0534	D64T66 D68	0.1275 0.0572	D64T66 D68	0.15151 0.05334
59	Austria	D41T43 D36T39	0.0848 0.0525	D41T43 D68	0.0928 0.0451	D41T43 D68	0.09489 0.05331
60	Sweden	D41T43 D64T66	0.1240 0.0615	D41T43 D64T66	0.1311 0.0696	D41T43 D64T66	0.12666 0.05518
61	Mexico Non-global manufacturing	D68 D69T75	0.0320 0.0137	D68 D69T75	0.0399 0.0131	D68 D69T75	0.02896 0.01084
62	Portugal	D64T66 D41T43	0.0390 0.0214	D64T66 D41T43	0.0289 0.0197	D64T66 D41T43	0.03465 0.01705
63	Romania	D64T66 D41T43	0.0312 0.0238	D64T66 D68	0.0453 0.0188	D64T66 D68	0.04394 0.02303
64	Indonesia	D41T43 D64T66	0.0799 0.0249	D41T43 D64T66	0.0826 0.0187	D41T43 D64T66	0.07438 0.01422
65	Czechia	D41T43 D64T66	0.0715 0.0706	D64T66 D41T43	0.0778 0.0736	D41T43 D64T66	0.07066 0.06289
66	Lao (People's Democratic Republic)	D41T43 D68	0.1651 0.0241	D41T43 D68	0.2114 0.0221	D41T43 D68	0.24825 0.01296
67	Brazil	D64T66 D41T43	0.0513 0.0068	D64T66 D69T75	0.0546 0.0065	D64T66 D69T75	0.04594 0.00664

Appendix B. Direct Output Indicator of the Real Estate Sector from 2010 to 2018

No.	Country/Region	2010		2014		2018	
		Sector	Value	Sector	Value	Sector	Value
1	Switzerland	D52 D55T56	0.0324 0.0319	D61 D68	0.0215 0.0209	D61 D68	0.0214 0.0188
2	Türkiye	D53 D45T47	0.0557 0.0544	D53 D45T47	0.0588 0.0533	D53 D45T47	0.0638 0.0513
3	Japan	D50 D52	0.1083 0.0381	D50 D52	0.1095 0.0416	D52 D68	0.0413 0.0337
4	Cambodia	D07T08 D16	0.0278 0.0240	D68 D62T63	0.0218 0.0157	D68 D62T63	0.0255 0.0188
5	Thailand	D64T66 D62T63	0.0077 0.0053	D64T66 D58T60	0.0072 0.0058	D58T60 D64T66	0.0040 0.0036
6	Tunisia	D90T93 D94T96	0.0196 0.0157	D90T93 D94T96	0.0158 0.0108	D90T93 D94T96	0.0195 0.0110
7	Greece	D61 D69T75	0.2276 0.1440	D61 D45T47	0.2426 0.1408	D61 D45T47	0.2000 0.1139
8	Argentina	D52 D45T47	0.0335 0.0210	D52 D45T47	0.0258 0.0164	D52 D45T47	0.0229 0.0144
9	Lithuania	D29 D03	0.1159 0.1074	D68 D90T93	0.0849 0.0658	D62T63 D90T93	0.0676 0.0661
10	Slovakia	D49 D55T56	0.1338 0.0584	D55T56 D68	0.0850 0.0571	D68 D90T93	0.0739 0.0666
11	Australia	D77T82 D45T47	0.0427 0.0407	D77T82 D45T47	0.0492 0.0451	D77T82 D45T47	0.0541 0.0453
12	Denmark	D55T56 D45T47	0.0850 0.0743	D55T56 D45T47	0.0881 0.0735	D55T56 D45T47	0.0899 0.0663
13	Spain	D45T47 D50	0.0474 0.0401	D45T47 D50	0.0462 0.0462	D45T47 D50	0.0436 0.0390
14	Vietnam	D53 D68	0.0368 0.0179	D45T47 D68	0.0228 0.0214	D45T47 D68	0.0242 0.0231

15	New Zealand	D52	0.0781	D52	0.0777	D52	0.0789
		D68	0.0626	D68	0.0700	D68	0.0680
16	Brunei Darussalam	D90T93	0.0430	D90T93	0.0376	D90T93	0.0245
		D94T96	0.0171	D94T96	0.0176	D94T96	0.0105
17	Malta	D68	0.0459	D51	0.0188	D51	0.0296
		D45T47	0.0237	D45T47	0.0168	D68	0.0283
18	Poland	D90T93	0.0278	D90T93	0.0272	D90T93	0.0338
		D86T88	0.0210	D86T88	0.0217	D86T88	0.0326
19	Malaysia	D68	0.0670	D68	0.0267	D68	0.0404
		D84	0.0332	D84	0.0137	D77T82	0.0153
20	The Netherlands	D52	0.0585	D52	0.0549	D55T56	0.0448
		D55T56	0.0535	D55T56	0.0433	D52	0.0446
21	Belgium	D52	0.0391	D45T47	0.0338	D68	0.0403
		D45T47	0.0371	D52	0.0322	D55T56	0.0393
22	The Philippines	D51	0.0444	D21	0.0165	D21	0.0134
		D62T63	0.0338	D07T08	0.0115	D07T08	0.0095
23	Latvia	D45T47	0.0744	D55T56	0.1153	D55T56	0.1316
		D90T93	0.0671	D68	0.0922	D45T47	0.0826
24	Colombia	D45T47	0.0639	D52	0.0659	D52	0.0576
		D61	0.0549	D45T47	0.0567	D45T47	0.0531
25	Saudi Arabia	D45T47	0.0231	D45T47	0.0308	D45T47	0.0307
		D31T33	0.0172	D31T33	0.0280	D31T33	0.0237
26	France	D45T47	0.0458	D45T47	0.0430	D45T47	0.0418
		D77T82	0.0337	D77T82	0.0318	D77T82	0.0281
27	Kazakhstan	D68	0.1183	D94T96	0.2798	D94T96	0.1683
		D10T12	0.0348	D62T63	0.0511	D64T66	0.1003
28	Finland	D55T56	0.0719	D55T56	0.0714	D55T56	0.0654
		D51	0.0631	D45T47	0.0608	D45T47	0.0606
29	Peru	D94T96	0.1018	D94T96	0.0886	D94T96	0.0850
		D85	0.0601	D85	0.0494	D61	0.0492
30	China Non-Processing	D62T63	0.0341	D45T47	0.0571	D94T96	0.0624
		D61	0.0340	D94T96	0.0405	D45T47	0.0464
31	Chinese Taipei	D90T93	0.0357	D90T93	0.0399	D55T56	0.0469
		D45T47	0.0335	D45T47	0.0333	D90T93	0.0415
32	India	D41T43	0.0185	D41T43	0.0223	D49	0.0191
		D61	0.0128	D49	0.0122	D41T43	0.0185
33	Myanmar	D68	0.0364	D68	0.0302	D68	0.0273
		D62T63	0.0255	D62T63	0.0226	D62T63	0.0254
34	Iceland	D94T96	0.0274	D94T96	0.0261	D94T96	0.0258
		D68	0.0200	D68	0.0220	D68	0.0222
35	Estonia	D55T56	0.0844	D55T56	0.0936	D55T56	0.1230
		D45T47	0.0721	D45T47	0.0764	D45T47	0.0882
36	Luxembourg	D41T43	0.0594	D77T82	0.0453	D94T96	0.0354
		D77T82	0.0463	D94T96	0.0349	D77T82	0.0341
37	The United States	D94T96	0.0847	D94T96	0.0923	D94T96	0.0826
		D90T93	0.0799	D52	0.0776	D55T56	0.0817
38	Morocco	D52	0.0380	D52	0.0292	D52	0.0256
		D51	0.0291	D58T60	0.0239	D51	0.0237
39	The Russian Federation	D94T96	0.0637	D55T56	0.0589	D55T56	0.0755
		D55T56	0.0606	D49	0.0551	D45T47	0.0573
40	Ireland	D55T56	0.0675	D55T56	0.0659	D55T56	0.0729
		D45T47	0.0657	D45T47	0.0404	D90T93	0.0708
41	Israel (2)	D52	0.0868	D52	0.0804	D55T56	0.0728
		D55T56	0.0668	D55T56	0.0739	D52	0.0709
42	Chile	D55T56	0.0554	D90T93	0.0617	D61	0.0708
		D45T47	0.0548	D45T47	0.0562	D45T47	0.0648
43	Germany	D61	0.0779	D61	0.0703	D61	0.0712
		D45T47	0.0766	D55T56	0.0615	D41T43	0.0569
44	Bulgaria	D62T63	0.0733	D62T63	0.0676	D62T63	0.0650
		D61	0.0419	D52	0.0524	D52	0.0575
45	Slovenia	D45T47	0.0215	D36T39	0.0289	D45T47	0.0109
		D52	0.0157	D45T47	0.0208	D55T56	0.0075

46	Costa Rica	D35	0.0751	D35	0.0648	D35	0.0276
		D58T60	0.0521	D58T60	0.0511	D45T47	0.0155
47	South Africa	D55T56	0.0452	D45T47	0.0393	D45T47	0.0423
		D45T47	0.0407	D69T75	0.0327	D69T75	0.0337
48	Hungary	D90T93	0.0531	D90T93	0.0563	D94T96	0.0661
		D94T96	0.0492	D94T96	0.0553	D90T93	0.0525
49	Norway	D55T56	0.0754	D55T56	0.0759	D55T56	0.0369
		D45T47	0.0632	D45T47	0.0607	D45T47	0.0367
50	The United Kingdom	D45T47	0.0300	D45T47	0.0340	D45T47	0.0318
		D52	0.0183	D52	0.0252	D55T56	0.0229
51	Cyprus (1)	D45T47	0.0599	D45T47	0.0693	D45T47	0.0436
		D58T60	0.0275	D51	0.0359	D53	0.0299
52	Singapore	D94T96	0.0787	D55T56	0.0916	D55T56	0.0852
		D55T56	0.0541	D94T96	0.0735	D94T96	0.0661
53	Korea	D55T56	0.0479	D55T56	0.0473	D45T47	0.0311
		D69T75	0.0334	D69T75	0.0350	D55T56	0.0273
54	Italy	D45T47	0.0469	D45T47	0.0476	D55T56	0.0464
		D55T56	0.0425	D55T56	0.0474	D45T47	0.0462
55	Rest of the World	D94T96	0.0293	D94T96	0.0362	D94T96	0.0374
		D55T56	0.0257	D62T63	0.0243	D55T56	0.0285
56	Croatia	D45T47	0.0524	D45T47	0.0487	D53	0.0202
		D69T75	0.0264	D53	0.0292	D45T47	0.0198
57	Canada	D94T96	0.0575	D94T96	0.0525	D94T96	0.0513
		D45T47	0.0375	D45T47	0.0353	D45T47	0.0364
58	Hong Kong, China	D52	0.1338	D94T96	0.1292	D52	0.1329
		D94T96	0.1205	D52	0.1175	D94T96	0.1223
59	Austria	D84	0.0475	D50	0.0520	D68	0.0533
		D68	0.0444	D84	0.0458	D84	0.0454
60	Sweden	D55T56	0.0874	D90T93	0.0883	D84	0.0543
		D90T93	0.0846	D85	0.0805	D55T56	0.0521
61	Mexico Non-global manufacturing	D52	0.0915	D62T63	0.0871	D58T60	0.0733
		D58T60	0.0644	D58T60	0.0843	D62T63	0.0722
62	Portugal	D45T47	0.0295	D45T47	0.0242	D45T47	0.0161
		D53	0.0265	D58T60	0.0224	D90T93	0.0121
63	Romania	D45T47	0.0591	D45T47	0.0644	D45T47	0.0561
		D68	0.0173	D68	0.0188	D68	0.0230
64	Indonesia	D45T47	0.0223	D94T96	0.0410	D94T96	0.0366
		D62T63	0.0146	D45T47	0.0176	D45T47	0.0177
65	Czechia	D90T93	0.0694	D55T56	0.0754	D55T56	0.0650
		D68	0.0670	D68	0.0613	D68	0.0601
66	Lao (People's Democratic Republic)	D85	0.0274	D85	0.0390	D85	0.0413
		D68	0.0241	D45T47	0.0357	D45T47	0.0366
67	Brazil	D90T93	0.0948	D90T93	0.1149	D90T93	0.1267
		D45T47	0.0376	D45T47	0.0417	D45T47	0.0356

Appendix C. Pull and Push of the Real Estate Sector from 2000 to 2018

Country/Region	2010		2014		2018	
	Pull Effects	Push Effects	Pull Effects	Push Effects	Pull Effects	Push Effects
Argentina	0.7240	0.6623	0.6816	0.6631	0.6547	0.6635
Australia	0.9719	0.8184	1.0419	0.8054	1.0618	0.7859
Austria	1.1660	0.9042	1.1861	0.9056	1.2188	0.9178
Belgium	1.0132	0.8483	0.9695	0.8234	1.0276	0.8090
Bulgaria	0.9174	0.7672	0.9977	0.7876	1.0568	0.8353
Brazil	0.9240	0.6356	0.9206	0.6250	0.9301	0.6222
Brunei Darussalam	0.5022	0.7342	0.5220	0.7348	0.4592	0.7285
Canada	0.9805	0.8403	0.9525	0.8397	0.9557	0.8463
Switzerland	0.8162	0.8396	0.6737	0.8081	0.6882	0.7892
Chile	1.0710	0.8509	1.0720	0.7890	1.1512	0.7836

China	-	0.6244	-	0.5958	-	0.5294
Colombia	1.1883	0.6829	1.1704	0.6653	1.1335	0.6571
Costa Rica	1.1362	0.8303	1.1558	0.8190	0.8336	0.8188
Cyprus (1)	0.8884	0.8841	0.9352	0.8466	0.9109	0.7485
Czechia	1.2871	0.9612	1.3162	0.9824	1.2969	0.9703
Germany	1.4208	0.8224	1.3567	0.8082	1.3347	0.8174
Denmark	1.3937	0.9189	1.3542	0.9289	1.3293	0.9474
Spain	0.9620	0.7005	0.9709	0.6764	1.0015	0.7139
Estonia	1.2085	0.8741	1.2922	0.8780	1.4380	0.8668
Finland	1.1814	0.8112	1.1845	0.8047	1.1778	0.8104
France	1.0367	0.7396	1.0105	0.7442	0.9911	0.7335
The United Kingdom	0.7914	0.8596	0.8386	0.8061	0.8452	0.7817
Greece	1.5648	0.7383	1.6828	0.7316	1.4925	0.7302
Hong Kong, China	0.4505	0.8196	0.5332	0.8367	0.6030	0.8488
Croatia	0.9750	0.7904	0.9846	0.8036	0.8205	0.9023
Hungary	1.2386	0.9210	1.1698	0.8934	1.2175	0.9288
Indonesia	0.6116	0.7217	0.6950	0.7446	0.6991	0.7179
India	0.5393	0.6819	0.5473	0.6816	0.5903	0.7047
Ireland	1.1166	0.9513	1.0432	0.8187	1.1893	0.8353
Iceland	0.8158	0.8300	0.8072	0.8408	0.8159	0.8775
Israel (2)	1.1326	0.7659	1.1742	0.7536	1.1770	0.7564
Italy	1.0799	0.6643	1.0952	0.6575	1.0822	0.6502
Japan	0.8948	0.6959	0.9192	0.7068	0.8988	0.7002
Kazakhstan	0.8641	0.9678	1.0446	0.7674	1.2353	0.8185
Cambodia	0.7380	0.9282	0.7609	0.9284	0.7544	0.9202
Korea	0.9414	0.6759	0.9523	0.7141	0.8518	0.7500
Lao (People's Democratic Republic)	0.4533	0.8828	0.6445	0.8929	0.6454	0.8779
Lithuania	1.2074	0.8591	1.2568	0.9355	1.2912	0.9194
Luxembourg	1.1059	0.7891	0.9784	0.8082	1.1262	0.8615
Latvia	1.1303	0.8621	1.3012	0.7862	1.3313	0.7571
Morocco	0.9187	0.7590	0.9084	0.7834	0.9160	0.7853
Malta	0.9195	0.8613	0.8241	0.8655	0.8777	0.8828
Myanmar	0.3555	0.8344	0.3331	0.8319	0.3265	0.8345
Malaysia	0.6711	0.8398	0.6997	0.7757	0.6401	0.7854
Mexico	-	0.7027	-	0.7017	-	0.7185
The Netherlands	1.1446	1.0431	1.1010	1.0619	1.0343	1.0153
Norway	1.2357	0.8861	1.2243	0.8767	1.0253	0.8769
New Zealand	1.2664	0.8181	1.2788	0.8123	1.2875	0.8151
Peru	1.2119	0.7283	1.1519	0.7298	1.1563	0.7262
The Philippines	0.5193	0.7800	0.4080	0.7704	0.4187	0.7828
Poland	0.7483	0.9749	0.7945	0.9453	0.8514	0.9907
Portugal	0.8601	0.6919	0.8351	0.7042	0.7460	0.7131
Romania	0.6951	0.6807	0.7452	0.6975	0.7792	0.7538
The Russian Federation	1.0468	0.7470	1.0667	0.7453	1.1693	0.7629
Saudi Arabia	0.8141	0.7544	0.9364	0.7509	0.8299	0.7056
Singapore	1.0927	0.8953	1.0778	0.9012	1.0872	0.8989
Slovakia	1.3515	0.8647	1.2512	0.8913	1.1554	0.8685
Slovenia	0.8104	0.7506	0.8238	0.7644	0.6908	0.7736
Sweden	1.4561	0.9852	1.4617	0.9930	1.2941	0.9834
Thailand	0.5703	0.7515	0.5918	0.7529	0.5896	0.7186
Tunisia	0.8372	0.7640	0.8129	0.7739	0.8264	0.7791
Türkiye	0.9826	0.6149	0.9798	0.7426	1.0025	0.8446
Chinese Taipei	0.7439	0.7131	0.7925	0.7193	0.8504	0.7451
The United States	1.2636	0.8262	1.2679	0.8238	1.3262	0.8588
Vietnam	0.6766	0.7142	0.6655	0.7675	0.6155	0.8200
South Africa	1.1385	0.7319	1.0368	0.7878	1.0719	0.7947
Rest of the World	0.9078	0.7627	0.8858	0.7680	0.8917	0.7705

Appendix D

No.	Classification	Sector	Change in Input Structure				Change in Output Structure			
			↑	↓	-	Total	↑	↓	-	Total
1	A	D01T02	23	23	25	-	37	21	13	↑
2		D03	21	25	25	↓	17	11	43	-
3	B	D05T06	25	25	21	↑	25	22	24	↑
4		D07T08	25	34	12	↓	30	18	23	↑
5		D09	26	31	14	↓	10	34	27	↓
6		D10T12	29	30	12	↓	35	27	9	↑
7		D13T15	25	31	15	↓	27	26	18	↑
8		D16	31	27	13	↑	27	26	18	↑
9		D17T18	34	28	9	↑	22	39	10	↓
10		D19	24	25	22	↓	24	31	16	↓
11		D20	21	37	13	↓	24	36	11	↓
12		D21	28	25	18	↑	36	19	16	↑
13		D22	28	32	11	↓	31	28	12	↑
14	C	D23	29	26	16	↑	23	29	19	↓
15		D24	34	17	20	↑	27	31	13	↓
16		D25	36	26	9	↑	25	28	18	↓
17		D26	35	29	7	↑	30	34	7	↓
18		D27	29	29	13	↑	23	36	12	↓
19		D28	30	28	13	↑	25	25	21	↑
20		D29	27	30	14	↓	27	30	14	↓
21		D30	29	30	12	↓	29	20	22	↑
22		D31T33	29	33	9	↓	33	27	11	↑
23	D	D35	34	23	14	↑	24	18	29	-
24	E	D36T39	36	24	11	↑	30	24	17	↑
25	F	D41T43	30	25	16	↑	14	13	44	-
26		D45T47	18	23	30	-	14	17	40	-
27		D49	24	35	12	↓	27	29	15	↓
28		D50	23	34	14	↓	34	24	13	↑
29		D51	28	30	13	↓	37	22	12	↑
30		D52	21	34	16	↓	35	23	13	↑
31		D53	29	32	10	↓	28	29	14	↓
32		D55T56	31	21	19	↑	34	22	15	↑
33		D58T60	34	23	14	↑	22	37	12	↓
34		D61	32	26	13	↑	15	43	13	↓
35	G	D62T63	18	39	14	↓	45	14	12	↑
36		D64T66	33	25	13	↑	13	13	45	-
37		D68	24	31	16	↓	19	24	28	-
38		D69T75	26	27	18	↓	25	16	30	-
39		D77T82	19	31	21	↓	30	18	23	↑
40		D84	27	29	15	↓	28	25	18	↑
41		D85	25	30	16	↓	35	22	14	↑
42		D86T88	30	22	19	↑	31	25	15	↑
43		D90T93	23	30	18	↓	30	24	17	↑
44		D94T96	27	22	22	↑	24	30	17	↓
45		D97T98	0	0	71	-	0	0	71	-

The changes in the input and output structure of the real estate sector. Notes: The numbers in columns 4,5,6,8,9,10 represent the number of countries whose input and output structures change in a certain direction. For example, in the first row, number 23 in the fourth column represents there are 14 countries whose consumption of sector D01T02 for the real estate sector is increasing (↑), and 23 countries decreasing (↓), 25 countries have no change (-). Overall, it shows a downward trend.

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