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This is the peer reviewed (post-print) version of the following article:

Original
Economic impact of monetary policy: Focus on real estate sector in Italy / Ahmed, I., Socci, C., Medabesh, A., Severini, F., Zotti, J.. - In: INTERNATIONAL JOURNAL OF FINANCE & ECONOMICS. - ISSN 1076-9307. - STAMPA. - 26:1(2021), pp. 1256-1269. [10.1002/ijfe.1848]

Availability:
This version is available at: 11368/2968711 since: 2020-07-10T18:27:34Z
Publisher:

Published
DOI:10.1002/ijfe.1848
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10 November 2026

arTs Università degli Studi di Trieste
Archivio della ricerca – postprint

Accepted: 18 June 2020

Economic impact of monetary policy: Focus on real estate sector in Italy

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Abstract

This study investigates the nexus between financial market and real estate (RE) sector against the backdrop of ECB's unconventional monetary policy. A financial dynamic computable general equilibrium (DCGE) model is calibrated on the financial social accounting matrix (FSAM) of Italian economy. The findings confirm that the inclusion of financial intermediation into real economy affects the real estate sector's output, value added, and pricing.

KEYWORDS

CGE analysis, financial accounts, monetary policy, real estate sector, social accounting matrix

JEL CLASSIFICATION

E51; E52; G21

1 | INTRODUCTION

There are widespread interactions between financial institutions and economic sectors of countries (Dakila, Bayangos, & Ignacio, 2013). Real estate (RE) sector is one of the economic sectors which present a nexus with the financial market (Nobili & Zollino, 2017). These interactions are characterized by the income circular flow wherein final demand determines total output which leads to the generation and distribution of domestic income and finally the disposable income leaves the institutional sectors on a vein to consume or to invest in the financial market (Ciaschini, Pretaroli, Severini, & Socci, 2012). On the other hand, the easy access of money also changes the choices of the economic agents and effects their behaviour of investment and consumption (Ahmed, Socci, Severini, Yasser et al., 2018; Baker, Hollified, & Osambela, 2016; Cesarini, Lindqvist, Ostling, & Wallace, 2016; Mian, Rao, & Sufi, 2013). The trends in investment/consumption decisions in turn activate the productivity of both manufacturing and service sectors thereby affecting the level of employment, prices and output, etc.

The recent years evidenced a noteworthy growth in Italian RE sector with a rise of 5.6% in total RE investments by the year 2017 (CBRE, 2017). The residential properties surged up respectively by 4.3 and 6.7% in metropolitan cities and small municipalities while the business properties grew by 4.7 and 7.8% in metropolitan and small municipalities respectively.[1] This growth is vital to the aggregate Italian economy since the RE is a key sector for Italy and hence it can stimulate the production of other sectors (*backward linkage*), and can promptly respond to the demand of other sectors (*forward linkage*) (Ciaschini & Socci, 2007). Keeping in view the aforementioned RE growth and its strong connections with other sectors of economy, this study quantifies the impact of money flow on the performance of RE sector in the implementation of the monetary policy by European Central Bank (ECB). The analysis is carried out using a dynamic computable general equilibrium (DCGE) model based on the Financial Social Accounting Matrix (FSAM). This set of instruments is recognized by the current literature as a valid tool to quantify the impact of both fiscal and monetary policies because it allows tracking the policy transmission mechanisms through the phases of the income

TABLE 1 Basic framework of financial social accounting matrix (FSAM)

		Outlays	Commodities	Production activities	Factors of productions				Trade and transport margins	Institutional sectors current account				Institutional sectors capital account					Financial instruments	Total
					P1	P2	P3	P4 Taxes		Firms	Govt	HH	ROW	Firms	Govt	HH	ROW	Ch. In stocks		
Revenues		n.	1	2	3	4	5	6 7	8	9	10	11	12	13	14	15	16	17	18	19
Commodities		1		Intermediate consumption							Final demand by Govt	Final demand by HH	Exports	Gross fixed capital formation/ Investment demand by institutional sectors				Inventories		Total demand
Production activities		2	Domestic output																	Domestic demand for domestic output
Factors of productions	P1	3		Net value added									Factor income from ROW							Net value added
	P2	4																		
	P3	5																		
	P4	6																		
Taxes		7	Taxes on commodities																	Total taxes
Trade and transport margins		8	Transaction costs																	Total trade and transport margins
Institutional sectors current account	Firms	9			Firms' income					Distributive transactions among institutional sectors										Total revenue of institutional sectors
	Govt	10			Govt income			Taxes												
	HH	11			HH income															
	ROW	12	Imports		ROW income			Taxes												
Institutional sectors capital account	Firms	13								Firms savings				Capital transfers among institutional sectors					Financial liabilities by institutional sectors	Availability of capital by institutional sectors
	Govt	14									Govt savings									
	HH	15										HH savings								
	ROW	16											ROW savings							
Ch. In stocks		17												Inventories by institutional sectors						Total changes in inventories
Financial instruments		18												Financial assets by institutional sectors						Total financial assets
Total		19	Total supply to the domestic market	Domestic output	Net value added			Total taxes	Total trade and transport	Total outlays of institutional sectors				Total capital expenditures of institutional sectors				Total changes in inventories	Total financial liabilities	

Source: Ahmed, Socci, Severini, Yasser, et al. (2018).

Note: P1-compensation of employees; P2-mixed income; P3-gross operating surplus; P4-other taxes less subsidies; Govt-Government; HH-households; ROW-rest of the world.

circular flows (Ahmed, Socci, Severini, & Pretaroli, 2018; Ciaschini et al. 2015). In particular, when focusing on monetary policy, its effect originates from the financial markets and reverberates to the commodity markets. This connection can be studied using exogenous flows (as in Christiano, Eichenbaum, & Evans, 2005, Smets & Wouters, 2003, 2007) or alternatively, integrating the financial flows with the economic flows of the SAM to derive the FSAM (Ahmed, Socci, Severini, Yasser et al., 2018). Compared to the existing literature, the present study contributes to disclosure the connections between the financial market and the RE market that operate in two different but related levels, within the Italian economic system. The results of the policy simulation are indeed evaluated in terms of RE's total output, value added generation, demand of labour and price fluctuation.

The next section describes the construction of FSAM. Section three presents the dynamic general equilibrium model. Section four illustrates the policy simulation and presents the findings and section five presents the conclusion.

2 | THE FINANCIAL SOCIAL ACCOUNTING MATRIX

The SAM replicates the income circular flow within the economic system since it presents the economic transactions occurring among the production processes, the value added components and the institutional sectors for a particular year (Ciaschini & Socci, 2006). The inclusion of financial accounts to derive the FSAM implies the collection of the flows related to the capital accounts and the financial assets (or liabilities) accounts (Emini & Fofack, 2002). Indeed, the financial accounts depict the changes in the lending/borrowing of each agent in response to the changes in the holdings of financial assets and liabilities (Hubic, 2012). Notwithstanding, the SAM already contains a capital account that presents the information of gross fixed capital formation of the institutional sectors. However, this unitary account does not reflect the individual contribution of each institutional sector. In addition, the de facto capital account incorporates the information of physical capital of the institutional sectors. The integration of an individual capital account for each institutional sector keeps the detail of different resources of each agent as well as the detail of various assets (both physical and financial); the latter holds as counterparts of those resources (Ahmed, Socci, Severini, Yasser et al., 2018). The basic framework of the FSAM is reported in Table 1 and the aggregated FSAM is presented in Table 2.

The construction of the FSAM follows several steps: once the blocks of rows and columns referred to the specific economic functions are identified, it is possible to compile the quadrants of the flows following the income circular flow (Socci, Severini, Pretaroli, Ahmed, & Ciaschini, 2018). This dataset in itself represents an important tool for policy making which, thanks to its construction, can be utilized by researchers for a vast array of policy applications. For the Italian economy we can mention the study by Ciaschini et al. (2012) in which the authors develop a SAM for 2008 which integrates economic and environmental accounts. A more recent contribution in this field is given by Ahmed, Socci, Severini, & Pretaroli (2018) where the authors developed a SAM for Italian economy for 2009 with a disaggregation of Households by income classes to test the distributional effects of a fiscal policy. In Severini, Felici, Ferracuti, Pretaroli, and Socci (2019) there is a SAM for 2009 with a disaggregation of the value added components by gender to test the impact of policies aimed to reduce the gender employment gap.

In current study we deal with the monetary policies but we can also study the impact of fiscal policies, or policies for selected industries, and observe how they reverberate within the financial market. The FSAM distinguishes the several blocks as follows:

2.1 | Block of intermediate consumption: The USE table

The first quadrant of the SAM contains intermediate consumptions by commodities (Table 1, R1-C2). It is represented by a sub-matrix and posits the conversion of products into more complex products for further processing. We distinguish 64 commodities and 64 activities. The flows derive from the Use-Supply matrix for 2009 (ISTAT) and are expressed in purchasers' prices. Table A1 of appendix A lists the commodities and activities.

2.2 | Block of total output by activities: The Make table

The second quadrant of the SAM represents the make matrix (Table 1, R2-C1). It represents how the commodities are made by the production activities. The Make matrix flows are at basic prices. Therefore, we include a separate trade and transport margin account.

2.3 | Block of generation of income: The value added generation

The block of income generation, also referred to as value added generation, depicts the activities in which the primary income originates (Table 1, R(3–6)-C2). The value

TABLE 2 Aggregated FSAM for Italy (2009) (in millions of Euros)

					Factors of productions					Institutional sectors current account					Institutional sectors capital account						
Revenues		**Outlays**	**Commodities**	**Production activities**	**P1**	**P2**	**P3**	**P4**	**Taxes**	**Firms**	**Govt**	**H.H**	**ROW**	**Trade and transport margins**	**Firms**	**Govt**	**H.H**	**ROW**	**Ch. In stock**	**Financial Inst.**	**Total rows**
		n.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Commodities		1		1,551,044							324,684	929,482	333,714		149,070	38,404	107,206		−8,196		**3,425,408**
Production activities		2	2,919,618	-																	**2,919,618**
Factors of productions	P1	3		650,489									3,316								**653,805**
	P2	4		217,583																	**217,583**
	P3	5		464,905																	**464,905**
	P4	6		35,597									6,019								**41,616**
Taxes		7	151,121																		**151,121**
Trade and transport margins		8																			0
Institutional sectors current account	Firms	9					318,806			94,680	27,115	58,605	46,211								**545,417**
	Govt	10					28,735	41,616	148,044	51,397	694	407,553	4,607								**682,646**
	H.H	11			651,354	217,583	117,364			225,254	317,395	188,364	31,542								**1,748,856**
	ROW	12	354,669		2,451				3,077	39,323	43,705	12,360									**455,585**
Institutional sectors capital account	Firms	13								134,763						24,366	1	324		165,535	**324,989**
	Govt	14									−30,947				8,181		6,143	1,310		88,276	**72,963**
	H.H	15										152,492				2,953	895	1		20,805	**177,146**
	ROW	16											30,176		−62,248	−4,204	414			61,002	**25,140**
Ch. In stock		17													−8,230	−66	100				**−8,196**
Financial Inst.		18													238,216	11,510	62,387	23,505			**335,618**
Total column		19	**3,425,408**	**2,919,618**	**653,805**	**217,583**	**464,905**	**41,616**	**151,121**	**545,417**	**682,646**	**1,748,856**	**455,585**		**324,989**	**72,963**	**177,146**	**25,140**	**−8,196**	**335,618**	

Source: ISTAT, Eurostat, Bank of Italy and authors' calculation.

Note: P1-compensation of employees; P2-mixed income; P3-gross operating surplus; P4-other taxes less subsidies; Govt-Government; HH-households; ROW-rest of the world.

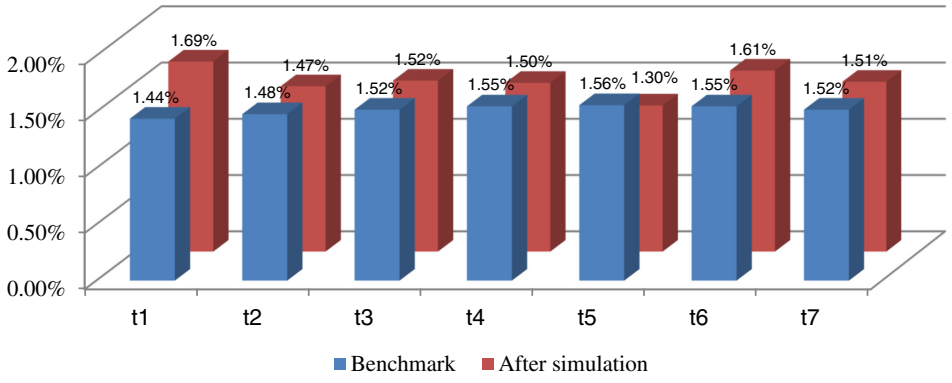


FIGURE 1 Change in output of RE sector - in percent [Colour figure can be viewed at wileyonlinelibrary.com]

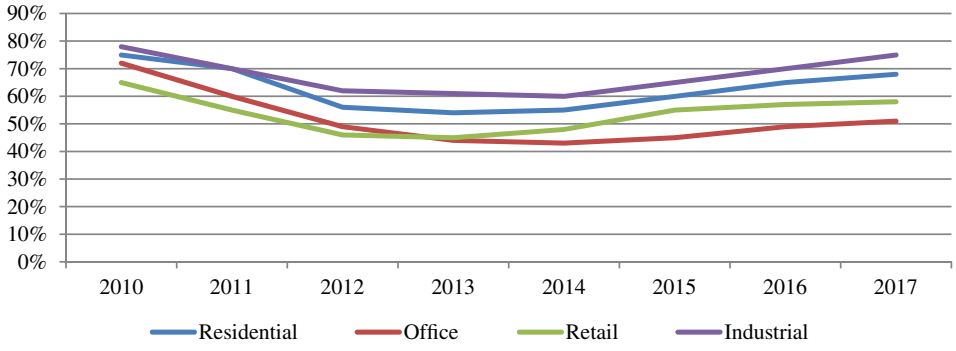


FIGURE 2 Transaction trend in real estate sector (2010–2017) [Colour figure can be viewed at wileyonlinelibrary.com]

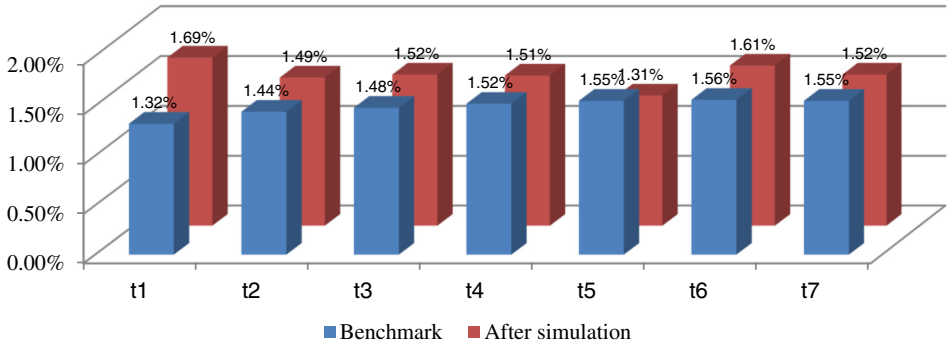


FIGURE 3 Change in employment - in percent [Colour figure can be viewed at wileyonlinelibrary.com]

added generated in production is considered as the incomes meant to the primary factors for their involvement in the production process. The current FSAM identifies four primary factors: employee's compensation, mixed income, gross operating surplus and other taxes less subsidies on domestic production.

2.4 | Block of primary income allocation

The block of primary income allocation focuses on resident institutional sectors in their capacity as recipients of primary incomes (Table 1, R(9–12)-C(3–6)). It describes where the items payable in generation of income account are receivable and includes the amounts of property incomes receivable and payable by institutional sectors (United Nations, 2008). This study identifies four institutional sectors namely "Firms," "Households," "Government," and "Rest of the World."

2.5 | Block of secondary income allocation

This block of secondary income distribution depicts the transformation of the primary income balance of an institutional sector into its disposable income in terms of current transfers (Table 1, R(9–12)-C(9–12)). It describes, in particular, the way the income is redistributed among institutional sectors via payments and receipts of current transfers.

FIGURE 4 Change in aggregated value added by real estate (RE) sector - in percent [Colour figure can be viewed at wileyonlinelibrary.com]

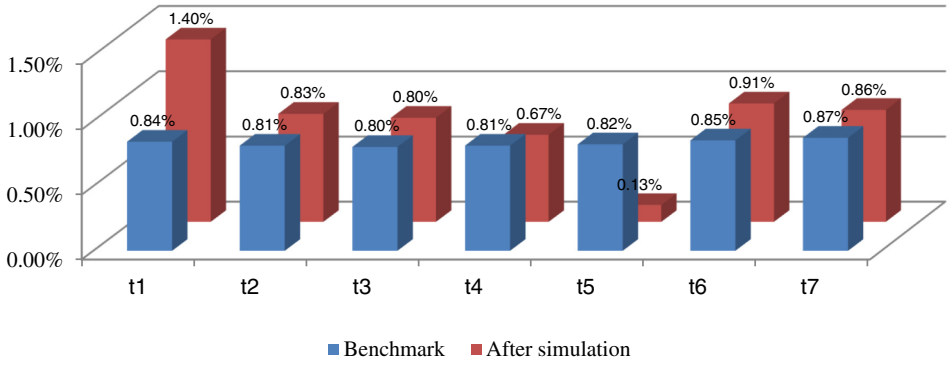


FIGURE 5 Change in RE prices - in percent [Colour figure can be viewed at wileyonlinelibrary.com]

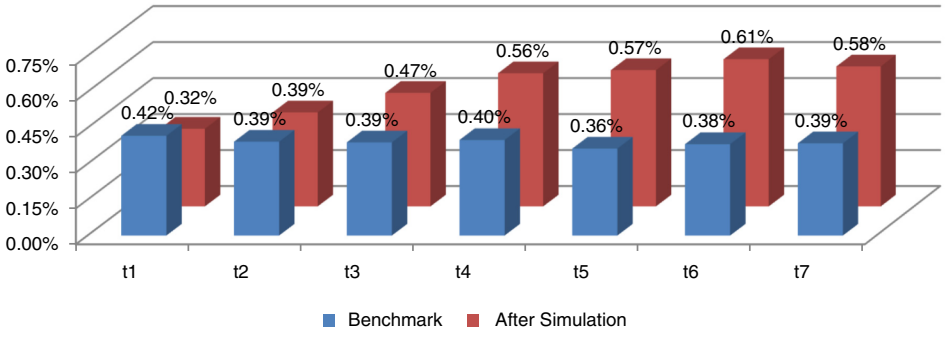
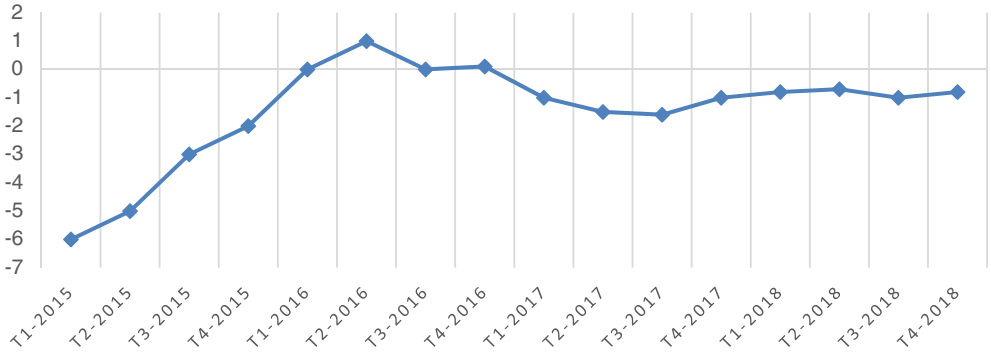


FIGURE 6 Price index of real estate - quarterly percentage change [Colour figure can be viewed at wileyonlinelibrary.com]



2.6 | Block of final demand and savings

The income circular flow closes with the determination of disposable income by the institutional sectors. This block describes how institutional sectors allocate their disposable income between final consumption (Table 1, R1-C(9–12) and saving (Table 1, R(13–16)-C(9–12). The disposable income is the balancing item carried forward from the secondary distribution of income account. The saving account is the first account that links the economic flows with the financial flows.

2.7 | Block of capital formation and inventory

The capital formation account presents the gross fixed capital formation and changes in inventories (Table 1, R1-C[13–17]). The current SAM has disaggregated this account among institutional sectors in order to provide the capital account of each institutional sector. Hence, the gross fixed capital is disaggregated according to the structure of the national accounting matrix (NAM) accordingly. This block also includes the capital account of the rest of the world.

2.8 | Block of capital transfers

The block of capital transfers describes net receivable capital transfers and net payable capital transfers among the Institutional Sectors including the rest of the world (Table 1, R(13–16)-C(13–16)). Note that this account exhibits the flows of physical capital. Together with the block of savings, capital formation, financial assets and financial liabilities, this block gives rise to the net worth of institutional sectors. These accounts represent the stepping-stones for including the financial accounts in SAM.

2.9 | Block of financial assets

This block represents the acquisition of financial assets by the institutional sectors (Table 1, R18-C(13–16)). It contains the flows of financial instruments among economic agents during the year. An asset represents a benefit or series of benefits accruing to the economic agent by holding the entity over a period of time (United Nations, 2008). It is a means of carrying forward value from one accounting period to another. Benefits are exchanged by means of payments. Financial assets are the financial claims, shares or other equity in corporations plus gold bullion retained by monetary authorities as a reserve asset.

Including this block in FSAM, the columns in capital account show the use of the available resources by economic agents in investment goods and on financial assets (Waheed & Ezaki, 2008). The financial assets comprise of 12 financial instruments which are further disaggregated for detailed description. Table A2 of appendix A lists the financial instruments.

2.10 | Block of financial liabilities

This block completes the financial mechanism in the FSAM showing the incurring of financial liabilities by the economic agents in terms of flow of the financial instruments (Table 1, R(13–16)-C18). A financial liability refers to the situation when one agent, the debtor, is obliged under specific conditions, to provide a payment or series of payments to another agent, the creditor. A legally binding contract establishes the liability and specifies the terms and conditions of the payments to be made while the payments according to the contract are unconditional. Hence the rows of capital account in FSAM show the resources available to the agents in terms of savings and financial liabilities. Like financial assets, the financial liabilities also present 12 main financial instruments which are further disintegrated into several sub categories.

3 | DYNAMIC COMPUTABLE GENERAL EQUILIBRIUM MODEL (DCGE)

The DCGE is used to assess the dynamic effects of monetary shocks and observe the behaviour of inflation and persistence in aggregate quantities (Christiano et al., 2005; Smets & Wouters, 2003, 2007). Its ability to integrate the financial frictions is receiving consent in the economic literature. For instance, Ahmed, Socci, Severini, Yasser et al., 2018 investigate the behaviour of investment and consumption of economic agents in response to the quantitative easing (QE) using financial SAM and DCGE model. Similarly, the DCGE is also used to investigate the nexus between capital inflow and growth rate of developing economies (Prasad, Rogoff, Wei, & Ayhan Kose, 2004).

Gerali, Neri, Sessa, and Signoretti (2010) have developed a model explaining the role of credit-supply factors in business cycle fluctuations. Using Bayesian techniques and data for the euro area over the period 1999–2008 into a DSGE model, the study shows that the largest part of the economic activities' slowdown during 2008 is mainly caused by shocks occurred within the banking sector. Similarly, Palić (2018) demonstrates the compliance of financial policy shocks by calibrating financial friction into DSGE model in the case of Croatia. The study posits the positive impact of monetary policy shocks on interest rate and negative initial impact on house prices and output gap.

While trying to reduce the negative impact of credit supply shock on economy, Kiyotaki and Moore (1997) construct a model of a dynamic economy in which debts cannot be paid unless they are secured. In this model the interaction of asset markets and credit markets has been highlighted as an important transmission mechanism by which the cumulative impact of a persistent shock on asst prices and on net worth is considered as an intertemporal multiplier process. Based on a real US data and a DSGE model with a heterogeneous banking sector, De Walque, Pierrard, and Rouabah (2010) have showed that the resilience of economy to shocks is well improved by Basel which unfortunately reduces the steady state and that liquidity injection is important to relieve financial instability but it has unclear impact on output fluctuation. For Brunnermeier, Eisenbach, and Sannikov (2012), these ambiguous effects can result in price instability and additional fragility. In fact, surveying the macroeconomic implications of financial frictions, authors suggest that the best policy in crisis times is the intervention of the central bank by substituting the lack of private credit by public funding.

The DCGE model calibrates not only the domestic financial flows but also the international financial flows in terms of exogenous foreign investments (Goodhart, Sunirand, & Tsomocos, 2004, 2005). The endogenous capital foreign capital flows are modelled by Maldonado, Tourinho, and Valli (2007) for Brazil. Several other studies are devoted to the inclusion of financial frictions in the calibration of DCGE model (e.g., Christensen & Dib, 2008; Christiano, Trabandt, & Walentin, 2011; De Graeve, 2008; Nolan & Thoenissen, 2009). On the other hand, the inclusion of agency problems due to financial

intermediation is augmented in DCGE by Christiano, Motto, and Rostagno (2014).

The current study incorporates the multi-sectoral aspect, which allows emphasizing the structural changes in intermediate consumption among the production activities of the economy and the changes in institutional sector's choice on investment and savings because of the fluctuations in financial instruments prices) according to the SAM structure.

3.1 | The dynamic financial CGE model

The dynamic FCGE model used in this study originates from Ahmed, Socci, Severini, Yasser, et al. (2018) and formalizes the main relationships among the agents over the time based on the data provided by the FSAM for the Italian economy. The model implies that the behaviour of agents depends on adaptive expectations and that the evolution path is a sequence of single period static equilibria and both are linked with each other by the capital accumulation condition (Lau, Pahlke, & Rutherford, 2002). The model allows computing the prices and quantities that solve the intertemporal optimization problem of the agents subject to income, technology and feasibility constraints.[2] In each period the economic flows related to the production processes, income generation and distribution among institutional sectors and final demand formation are linked to the financial flows describing the formation of the assets and liabilities through the capital accounts and savings. Therefore, the conjunction between the economic and the financial variables comes through the representation of the financial markets as complementary to the economic system. The changes in the demand of financial instruments, depending on disposable income by institutional sectors and financial instrument's price, affects the amount of savings and thus the total resources available for investments. Thus the change in investments reverberates in the production processes and income generation and distribution closing the loop.

The model is built to consider an open economy with a set of 64 commodities, 64 activities, 3 components of value added (compensation of employees, mixed income, gross operating surplus), taxes on production and imports less subsidies, 4 institutionalsectors (firms, households, government, and rest of the world), 12 financial instruments. Compared to the financial DCGE in Ahmed, Socci, Severini, Yasser, et al. (2018) in this study there is a specification of the behaviour of a selected commodity represented by Real Estate that is considered a key sector for the Italian Economy.

In broader terms, the total output (supply) by commodity constitutes of CES aggregation of domestic production and imports following Armington hypothesis.[3] The domestic production by commodity derives from the combination of primary factors and intermediate consumption by each activity according to a nested production function. More specifically, domestic output is the combination (assuming Leontief technology) of intermediate goods, which depends on total output and prices, and value added that is affected by total production and primary factors compensations. Then assuming a CES technology, value added is generated by combining capital and labour aggregates that are perfectly mobile across activities. Technically, all the parameters of the equations identifying the shares of each input on the respective aggregate (depending on the nest of the production function) are calculated from the flows identified by the FSAM in the model calibration process.

The final demand for each product comes from activities (intermediate consumption), households (final consumption), Government (public expenditure), rest of the world (exports) and investment. Again, the parameter (the shares) identifying the final demand allocation are computed from the FSAM as the value of each final demand component on the total final demand. Linear expenditure system (LES) determines the consumption of households and Government with a fraction of agent's disposable income allocated to each commodity. This quota is determined in the first period by the FSAM flows as the value of the consumption expenditure by commodity on the total disposable income by institutional sector. Then the share of disposable income allocated to final consumption and savings becomes endogenous in the following periods. Indeed, the institutional sectors' decisions on final consumption and savings depend on their intertemporal well-being function. More precisely, all the institutional sectors maximize the present value of their intertemporal utility function (Parada-Daza, 2004) depending on final consumption expenditure and gross saving subject to the lifetime budget constraint (Ciaschini, Pretaroli, Severini, & Socci, 2015). The lifetime budget constraint is the lifetime disposable income that derives from the sum of compensation of primary factors plus net transfers/taxes from the other agents occurring in the secondary income distribution phase in each period.

The financial market is included in this model considering the balance between the total demand (At) and the total supply of financial instruments (SLt). In other words, the financial instruments represent the goods that are exchanged in the financial market and thus for each of them we consider a production function and a function of demand. Therefore, the prices of financial

instruments are flexible and adjust in order to grant the perfect competitiveness of financial market where the flows originated by changes in demand for financial instruments generate a similar change in liabilities (supply) of those instruments. Hence, the change in the value, for each agent, lent to the financial fund and the changes in its liabilities with the financial fund are compatible with total savings (investment) in each period. Accordingly, the net asset equilibrium of each agent requires that net change in the balance of borrowings and loans of each agent, corresponds to the difference between savings and investment.

The model is completed by the market clearing conditions for all markets (commodities, primary factors and financial instruments), zero profit conditions, budget constraints of institutional sectors and macroeconomic closures.

The market clearing conditions impose that in each period total supply is equal to total demand thanks to the fluctuation of prices. Then, the zero profit conditions ensure that in each period, the equilibrium price from the market clearing condition equals the average cost to produce (supply) each commodity (or financial instrument).

The market clearing condition for each primary factor assumes the balance between the total demand by activity (endogenously determined) and the total supply (exogenously determined). The primary factors prices, as well as all prices are set equal to one in the benchmark, then they fluctuate to restore in each period the balance between the demand and the supply in all markets.

The Government balance follows the condition by which gross saving is endogenously determined as the difference between lifetime Government disposable incomes and total expenditure.[4] The condition for the balance of rest of world imposes that the real exchange rate can be flexible, while gross saving is fixed in nominal terms.[5] The condition for Savings-Investment balance imposes that investments are saving driven, so that in each period the gross fixed investment derives from the sum of institutional sector's savings. However, the model closes with the capital accumulation condition stating that the capital stock in period *t+1* is equal to the capital stock in period t, less depreciation, plus gross fixed capital formation in period t.

4 | POLICY SIMULATION FOR ITALIAN ECONOMY

In September 2012, the ECB decided to to support the debt ridden countries against the backdrop of spillover effects of global financial crisis (De Grauwe, 2013). Notwithstanding the criticism on the said policy from several member countries, the ECB took up the policy.[6]

4.1 | Policy setup

The current study supposes that the system has an inflow of funds in response to the increased demand of bonds in the Central Bank's assets. The resulting effects are estimated as the change in RE sector's output, value added and prices in seven periods onward. The study does not include the rents of owner-occupied lodgings. To assess these effects, we injected 10 Billion Euro. The study uses this amount for the purpose of simulation and it does not correspond to the actual amount of QE. Firstly, the bonds in the block of central bank's assets are increased and this increase is compensated by decreasing the counter cell in the block of government assets. Secondly, the currency in government assets is raised which is compensated by the decrease the same amount of currency in central bank's assets.

4.2 | Results and discussion

4.2.1 | Impact on RE sector's output

The money injection and its circulation from trading of bonds activates the whole income circular flow and the effects are recorded. The model is able to track the monetary policy transmission mechanism and, thanks to the disaggregation of production processes provided by the FSAM, the sectoral outcome can be plotted. Figure 1 depicts the percentage change in the RE output compared to the counterfactual scenario, that is the baseline trend without any shock. After policy simulation, the output of RE sector in t1 increases more than the benchmark, then in the succeeding periods the change is more or less similar to the benchmark. In other words, the injection of currency in the Italian economic system stimulates the RE output in the very short run, then the effect withdraws in the next periods. This finding is interestingly consistent with the actual statistics of Italian real estate sector for the years from 2014 to 2017. The transaction trend in real estate sector is depicted in Figure 2. The figure shows a decline in the transactions until the beginning of 2014 and it started to increase in the following years[7] after the introduction of QE. This resemblance proves the consistency of the model to forecast the response of the RE sector in Italy to a monetary policy shock.

4.2.2 | Impact on employment by RE sector

The impact on RE total output reverberates in the demand of primary factors, and in particular in the

labour employment. Figure 3 demonstrates the post simulation increase in employment by RE sector in the t1, t2, t3 and t6 periods. The change in employment is more persistent in the time compared to the effect on RE because of the indirect effects that the increase in RE sectors generates in the economy as a whole. Indeed, we already said that RE represents a key industry in Italian economy and thus, an expansion of its production directly and indirectly stimulates other production processes.

4.2.3 | Impact on aggregated value added by RE sector

Figure 4 presents the change in aggregated value added by RE sector. The changes in this variable are mainly due to the changes in its most important components that are capital and labour. The findings demonstrate a significant increase in the value added immediately after the policy and normalization in the subsequent periods till t5. Notwithstanding the employment also undergoes similar variation in the aforementioned periods however the variation is not as significant as it is observed in the aggregated value added. This is due to the price effect that is included in the value added performance.

4.2.4 | Impact on pricing of real estate services

Variation in prices of RE services from benchmark is depicted in Figure 5 which shows the decline after the policy simulation in period t1 and stabilizing prices in t2. The following periods observe a positive effect and there is a rise in the pricing of RE services.

The change in RE's prices can be compared with the actual RE price index as shown in Figure 6. The implementation of ECB's QE has a negative impact on the RE's prices in the first year. However, the prices are stabilized in the subsequent year and present a slight negative change in the next years. This actual trend is consistent with our findings in the first three periods and therefore can be partially interpreted as a result of ECB's monetary policy.

5 | CONCLUSION

Knowledge of inter-industry connections is vital in policy implication since it gives insightful information of the behaviour of different sectors in response to fiscal and monetary policies. After the great recession 2008, the nexus between financial market and real estate market has been the key subject of discussion since these two sectors were involved in the outbreak of financial crisis. Several studies have been devoted, hereafter, to study the interactions between financial sectors and real economic sectors.

This study contributes to the existing literature in a way that it investigates relationship between financial market and real estate sector for Italian economy. The study uses financial SAM and financial dynamic CGE model with a specification of the behaviour of real estate industry to investigate the impact of ECB's monetary policy in terms of this sector's output growth, labour employment, value added change and pricing trends.

The findings of our study confirm that the effects of the expansion in money supply stimulates the real estate sector but only in the short run and do not affect much prices. These results are consistent with the evidence showed in the performance of the RE sector in the latest years, confirming the forecasting potential of this model. A wide strand of literature has been devoted to the discussion of ECB's stance on Government bond buying policy and the financial SAM and Financial DCGE can be included in the range of tools able to detect the economic and financial impact of policy measures, whether they are monetary of fiscal or a combination of both.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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ENDNOTES

[1] See for detail at https://www.istat.it/en/archivio/216278.

[2] For the detailed description of the model see the appendix B of Ahmed, Socci, Severini, Yasser, et al. (2018).

[3] Following this assumption, domestic commodities and imports are imperfect substitutable since they have some elements of differentiation that can be observed by final consumers.

[4] The Government disposable income is calculated as the sum of total tax revenues (tax rates are assumed as fixed) primary factors remuneration and transfers from other institutional sectors. Total expenditure is the sum of transfers payed to other institutional sectors (exogenous in nominal terms) and Government consumption expenditure (exogenous in real terms).

[5] The balance in each period derives from the difference between Rest of world's revenues and expenditures. Revenues are imports

and transfers from domestic institutional sectors that are endogenously determined and depend on domestic income. Rest of world expenditures are exports and other transfers to domestic institutional sectors that are exogenous.

[6] See Ferry (2013), De Grauwe (2012, 2013), and Lane (2012).

[7] See the following reports for details:

1. https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/realestate/reflexions/lu_italian-real-estate-market.pdf
2. https://www.pwc.com/it/it/publications/assets/docs/pwc-real-estate-2018.pdf
3. http://www.italy24.ilsole24ore.com/art/real-estate/2017-03-22/a-positive-outlook-for-the-italian-real-estate-emerges-from-cannes-mipim-fair-135444.php?uuid=AEihCMr
4. http://www.propertywire.com/news/europe/italy-commercial-property-markets/.

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APPENDIX A

TABLE A1 Classification of commodities and activities in the SAM

Sr.	Commodities and activities
1	Agriculture and hunting etc.
2	Forestry and logging etc.
3	Fisheries
4	Mining and quarrying
5	Food beverages and tobacco
6	Textiles
7	Wood other than furniture
8	Paper
9	Printing and recording
10	Coke and refined petroleum
11	Chemicals
12	Pharmaceutical
13	Rubber and plastics
14	Other non-metallic minerals
15	Basic metals
16	Fabricated metals
17	Computer, electronic and optical
18	Electrical equipment
19	Machinery and equipment
20	Motor vehicles, trailers and semi-trailers
21	Other transport equipment
22	Furniture
23	Repair and installation
24	Electricity, gas, steam and air-conditioning
25	Natural water and water treatment
26	Sewerage and materials recovery
27	Constructions
28	Wholesale and retail trade and repair services of motor vehicles and motorcycles
29	Wholesale trade services, except of motor vehicles and motorcycles
30	Retail trade services, except of motor vehicles and motorcycles
31	Land transport services and transport services via pipelines
32	Water transport services
33	Air transport services
34	Warehousing and support services for transportation
35	Postal and courier services
36	Accommodation and food services
37	Publishing services
38	Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services
39	Telecommunications services
40	Computer programming, consultancy and related services; information services
41	Financial services, except insurance and pension funding

TABLE A1 (Continued)

Sr.	Commodities and activities
42	Insurance, reinsurance and pension funding services, except compulsory social security
43	Services auxiliary to financial services and insurance services
44	Real estate services (excluding imputed rent)
45	Imputed rents of owner-occupied dwellings
46	Legal and accounting services; services of head offices; management consulting services
47	Architectural and engineering services; technical testing and analysis services
48	Scientific research and development services
49	Advertising and market research services
50	Other professional, scientific and technical services; veterinary services
51	Rental and leasing services
52	Employment services
53	Travel agency, tour operator and other reservation services and related services
54	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services
55	Public administration and defence services; compulsory social security services
56	Education services
57	Human health services
58	Social work services
59	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services
60	Sporting services and amusement and recreation services
61	Services furnished by membership organizations
62	Repair services of computers and personal and household goods
63	Other personal services
64	Services of households as employers; undifferentiated goods and services produced by households for own use

TABLE A2 Flow accounts assigned to financial assets and liabilities (aggregated)

Sr.	Financial instruments
1	Monetary gold and SDRs
2	Currency and transferable deposits
3	Other deposits
4	Short-term securities
5	Bonds
6	Derivatives
7	Short-term loans
8	Medium and long-term loans
9	Shares and other equity
10	Mutual fund shares
11	Insurance technical reserves
12	Other accounts receivable/payable

Note: Many of these instruments are further disaggregated with households, firms, Government and rest of the world thereby make total 33 instruments for analysis.