The "Flats-for-Land" System in Greece. An Idiosyncratic Equity Financing Mechanism in the Post-War Period

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ABSTRACT

The "flats-for-land" system was an equity financing mechanism extensively used in Greece following World War II to alleviate the acute housing crisis caused by mass migration from the countryside to big cities. Drawing on historical evidence and using a parsimonious VAR model, we show that the mechanism significantly stimulated housing production and accelerated Greece's vertical urban expansion, despite the country's underdeveloped banking system and even in the absence of state financing.

1. Introduction

At the end of World War II, Europe had suffered enormous human casualties and massive damage to housing and other physical capital. In the early post-war period, the welfare state, in almost all European countries, supported social housing in order to remedy the problem of underinvestment immediately and to accommodate rapid population growth. In Greece, the lack of welfare-state policies and the limited role of the public sector left the housing sector predominantly reliant on private initiatives. By the early 1970s, north-western European countries had begun to embark on financial liberalization and the development of their banking sector. In Greece, however, housing loans remained very limited in scale until the end of 1990s. Nevertheless, the country's housing stock showed robust growth thanks in no small part to

the "flats-for-land" ("αντιπαροχή", antiparochi, in Greek) system, a *sui generis* equity financing tool widely used in Greece in the post-war years.[1] The mechanism involves an economic agreement between a real estate developer and a landowner. The agreement is a form of equity financing, since the developer does not need to finance the purchase of the land. The landowner contributes his land and in exchange receives a portion of the real estate unit(s) once the project is completed.

This paper examines the impact of the flats-for-land mechanism on Greece's housing production in the post-war period. We use historical evidence to trace the drivers of the emergence of this idiosyncratic equity financing mechanism, and we employ an econometric model to quantify its contribution to the country's housing supply.

A house is considered both a consumption and an investment good. Furthermore, access to housing is recognized as a basic social, cultural and economic right. The literature has shown that the fundamental determinants of housing are affected by demand-side factors such as population growth (Mankiw and Weil, 1989), inflation (Tsatsaronis and Zhu, 2004), employment growth, interest rates and household income (Malpezzi, 1999; Meen, 2002; Case and Shiller, 2003; Muellbauer, 2008), as well as by supply-side factors such as construction costs (Abraham and Hendershott, 1996), land availability and the existing building stock (Wheaton, 1999). Credit availability is also a critical component of housing; indeed, credit is its most important source of funding. In financially constrained markets, housing is the first sector to suffer, since property investment involves relatively large amounts of capital.

To the best of our knowledge, we are the first to describe the flats-for-land agreement as an idiosyncratic substitute for state and bank financing. Housing finance relies on three major sources: the public sector (state), the banking sector and the private sector, i.e.

[1] The "flats-for-land" mechanism has also been widely applied in Cyprus since 1974. Note that Cyprus, whose culture is predominantly "Greek," also had a rather weak financial sector. We thank an anonymous reviewer for pointing this out to us.

developers and local lenders/building societies. In our investigation we provide historical evidence that supports the view that flats-for-land contributed significantly to Greece's housing output in a period of financial underdevelopment for both the state and the banking sector. Our analysis of historical evidence draws on theories from urban economics to interpret some developments in housing production in Greece. We also employ an econometric model to examine the determinants of housing production and the role of the flats-for-land mechanism. More specifically, we estimate a vector autoregressive model (VAR) and we provide empirical evidence on the dynamic influence of flats-for-land on housing supply after taking into account significant demand and supply determinants, such as population growth, the unemployment rate, GDP per capita, construction costs and house prices.

Our findings are entirely consistent with the extant literature suggesting that the source of housing finance is a critical component in defining the characteristics of housing and urban development (Blackwell and Kohl, 2018). State financing in urban infrastructure projects and good planning prior to urbanization are prerequisites in order to ensure uniform, formal urban growth (Diefendorf, 1989). The absence of state intervention and of bank financing in economies such as that of post-war Greece leads to weaker building and infrastructure systems which rely more extensively on individualized and undercapitalized housing production plans. In contrast with the pattern in other developed European countries (and the United States), post-war building in Greek cities was not based on large-scale projects for low-density, horizontal urban expansion, but on vertical urbanization through the development of stand-alone, fragmented multi-story units that densified the country's city centers.

The paper is organized as follows: Section 2 reviews the literature. In Section 3 we describe the historical background of the flats-for-land mechanism, and in Section 4 we discuss the theoretical framework of the mechanism. In Section 5 we set out empirical results from the econometric analysis. In Section 6 we summarize our conclusions, present the implications of the study and suggest directions for future research.

2. Literature Review

This section discusses previous studies of cross-country differences in housing financing, especially in the early post-war period. Donnison (1967) argues that such differences are related to the extent of governmental intervention in the social housing sector. Gerschenkron (1962) suggests, instead, that they are determined by the degree of financial backwardness before the inception of industrialization. Protagonists of the second industrial revolution like Germany, Austria and Denmark established a more centralized financial system for housing financing, mainly coordinated by large banks and controlled by the central government. These countries, unable to mobilize resources from the capital market, relied heavily on bank financing and on subsidized lending by the state, especially during periods of financial distress for the banking sector.

In the United Kingdom and the other more advanced Anglo–Saxon industrialized countries, the structure of housing financing was much simpler, aligned with the free market and substantially decentralized, relying chiefly on deposit-based institutions (Blackwell and Kohl, 2017). These member-owned mutual organizations (building societies) accepted deposits from savers and provided mortgage lending and other financial services (Whitehead, 2007).

While in the United Kingdom the state did little to promote access to mortgage credit, in the United States the federal government played a much more active role in improving the supply of mortgage credit. Government intervention in the housing finance market came much earlier there, in response to the massive waves of foreclosures brought on by the Great Depression, as the existing mortgage lending regime proved unable to overcome the mortgage crisis (Snowden et al, 2014).[2] These government measures resulted in a

[2] The federal government intervention focused on three fronts: the creation of the Home Owners' Loan Corporation, which raised funds to purchase and refinance defaulted mortgages; the institution of the Federal Housing Administration (FHA), which provided insurance to approved mortgage lenders on qualifying loans; and the establishment of the Federal National Mortgage Association (known as Fannie Mae), which

substantial expansion of the US property market (McFarland, 1966; Fetter, 2016; Chambers et al, 2013), increased the home ownership rate and transformed the United States from a nation of urban renters into one of suburban homeowners (Green and Wachter, 2008).

Although the US and the UK possess two of the world's most efficient housing finance systems (Diamond and Lea, 1992), both have experienced long periods of instability in the past. Lea (1994) suggests that the difficulties faced by their housing finance systems stem from a combination of macroeconomic policy instabilities and pre-existing financial and housing constraints. It has been argued that liberalization offers significant benefits to the financial system but can worsen the effects of pre-existing market distortions. On this point, studies like that of Mian and Sufi (2009) suggest that the sharp increase of mortgage supply to high latent demand positions, which experienced significant negative income and employment growth, was responsible for the 2007 US mortgage default crisis.

A variety of equity financing schemes for housing output have also been developed in other countries. In Germany, the "*Sozialwohnungsquote*", where municipalities provide land in exchange for the developers earmarking a certain share of the housing built on that land for social dwellings (see Krätke, 1989). In Netherlands, public land development (PBL), where the local government buys the land and then readjusts the parcels into suitable forms for the desired development and sells them to a developer who receives a prime location to build on (see Squires and Heurkens, 2015). In the United States, Community Land Trusts (CLTs), most recently also instituted in towns and cities of northwestern Europe, where a community owns the land via a trust and home buyers have ownership of the housing unit or units (dual ownership, see Engelsman et al., 2016). In the United Kingdom, house purchase through shared ownership

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acted as a secondary mortgage market facility that could purchase, hold and sell FHA-insured loans. Later (in the 1970s), the secondary mortgage market expanded with the creation of the Federal Home Loan Mortgage Corporation (Freddie Mac).

schemes, where the buyer purchases a share of the property and pays rent on the rest to a housing association (see Wallace, 2012). In the most recent years we also find co-housing mechanisms, in Germany the "*Baugruppen*" and in France the "*l'habitat participatif*", where self-organized private communities (building groups) finance and develop self-builds (Tummers, 2015).

Unlike the flats-for-land mechanism, the equity sharing models described above necessitate government participation and hence significant expenditure on the part of the state ("*Sozialwohnunsgsquote*", PBL), impose several restrictions on home buyers (Community Land Trusts),[3] or are inadequate to facilitate nationwide housing production at aggregate level (co-housing model).

Previous Greek studies of flats-for-land concentrate on its urban impact (Leontidou, 1996; Leontidou, 1990; Marmaras, 1989) or its socio-political effects (Maloutas, 2003; Maloutas and Karadimitriou, 2001; Antonopoulou, 1991). This paper, by contrast, is the first to assess the mechanism's effects through the lens of modern finance theory.

Katsikas (1991, 2000) examines the mechanism from a political economy perspective. He argues that, in the long run, the arrangement contributed to house price inflation (Katsikas, 1991), and that the emergence of this form of financing reflected the fact that Greek households considered property to be a superior store of value relative to money (Katsikas, 2000).

The majority of studies, which focus either on the positive or on the negative side of the housing finance system, suggest that the macroeconomic environment (Renaud, 1999) and the legal framework of financial contracts (Beck and Levine, 2005; Cerutti et al., 2017) can account for the variation in the housing finance systems across countries. This may be relatively easy to establish for demand-side indices, but the housing system interacts with supply-side components as well. Supply-side factors are highly

[3] In most cases, CLTs set a cap on the selling price if the home buyer later puts the property up for sale. Also, the home buyer does not have title to the land.

heterogeneous across countries, and they are strongly influenced by state action in the provision of infrastructure, regulation of the housing sector and organization of the whole construction industry (World Bank, 1993). A study must incorporate both the demand- and the supply-side components of the housing market in order to document the full extent of the complexity of a country's housing finance system (Warnock and Warnock, 2008).

3. The Emergence of an Idiosyncratic Housing Production Mechanism

Background

Flats-for-land is an economic agreement between a developer and a landowner. The landowner offers a tract of land for the purpose of development, and the developer finances and constructs a real estate unit, or several units, on the land. The mechanism was first adopted by developers who conceived it as an effective means by which to develop the housing product and at the same time to reduce the foundational capital required to initiate the project. Developers were quick to adopt the view that the scheme eliminated the sunk cost of land acquisition and provided the flexibility to initiate single and multiple developments on land belonging to others that would cost the developer a pre-arranged share of the completed project, to be awarded to the landowner.

The flats-for-land arrangement was facilitated and generalized by the adoption of two regulatory protocols in 1929: the *Law of Property Division*[4] and the country's first *Building Regulation*.[5] These mea-

[4] Law 3741/1929 "*Horizontal Property Division*", Official Government Gazette 4/A/09-01-1929 (Νόμος 3741/1929 – ΦΕΚ 4/ /09-01-1929, ''Πέρι της Ιδιοκτησίας κατ' ορόφους''), National Printing House, http://www.et.gr/idocs-nph/search/pdfViewerForm.html?args=5C7QrtC22wE8cLD08eZ_KndtvSoClrL8xJKSjjboeVQpCCmqt4mgGEHlbmahCJFQEmRQwePEviF8EeCoaT0MAKztT3Sb63xk3VkL3PiCQ3RLoVYQqjKiogfu8Gq1RKKQmyoZK8o4WQOIbT33a_m1dumCicF7jt72uK0Q9yQ_3rWxBOrHCE5OHw.

[5] Presidential Decree 03-04-1929 "General *Building Regulation*", Official Government

sures modified Greece's traditional property regime, consisting of single undivided units, by introducing the concept of ownership of floors and apartments. It also helped hasten the rise of rental agreements and provided flexibility to the market of property ownership.

The law on property division provided the legal framework allowing a group of individuals to share ownership of a unit of property. This reform was of the utmost importance, given that up to then the country's property regime had been dictated by Roman law, under which the landowner was the exclusive holder of anything that existed below or above the ground, rendering multiple ownership of a single plot of land impossible.

The building regulation prescribed numerous technical rules (permissible building heights, permissible building areas, etc.). It was designed to solve the housing shortage in the densified city centers through vertical expansion, and accordingly provided the technical rules for the development of a new form of residential space – the apartment.

Population growth, housing shortage and urbanization

Above all, the regulatory protocols came in the wake of the migratory waves that rapidly increased the country's population and they signaled that the country was obligated to meet the humanitarian need for housing in urban centers.

Greece emerged from the Balkan wars (1912-1913) significantly strengthened, having gained territory and a more homogenous population. With the Treaty of Bucharest of 10 August 1913, Greece almost doubled its population and territory. Following the Greco-Turkish War (1919-1922) and the catastrophe in Asia Minor, Greece experienced massive cross-border migration as a direct result

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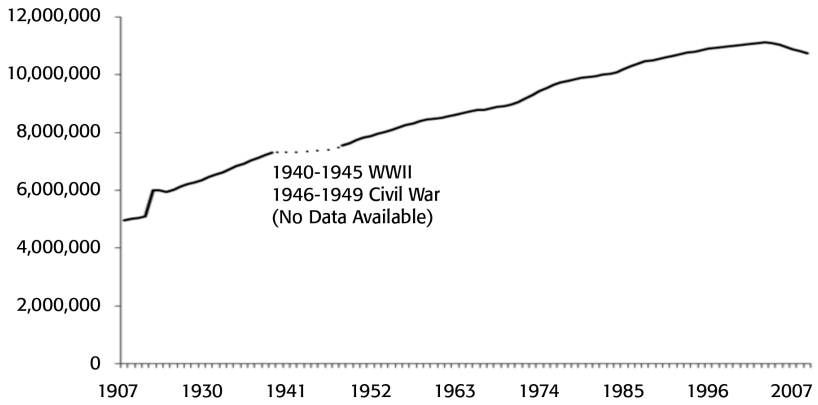
Gazette 155/A/22-04-1929, (Προεδρικό Διάταγμα 03-04-1929 – ΦΕΚ 155/A/22-04-1929, ''Γενικός Οικοδομικός Κανονισμός), National Printing House, http://www.et.gr/idocs-nph/search/pdfViewerForm.html?args=5C7QrtC22wE8cLD08eZ_Kndtv-SoClrL8vQU7OEDJhqR5MXD0LzQTLWPU9yLzB8V68knBzLCmTXKaO6fpVZ6Lx9hLslJUqeiQTdcv0m_jllLvBGpXnFO9PUlD3NekP30ZpafFIROAesI.

of the population exchange convention signed by the two countries. The convention caused an influx of about 1.1 million refugees to Greece. The country's capital, Athens, received 0.22 million immigrants, raising the city's population by a third in a few short months. Figure 1 plots the evolution of Greece's population over the period 1907-2016. Plainly, between 1907 and 1927 the country recorded remarkably rapid population growth.

Figure 1
Greece's population, 1907-2016



Source: Hellenic Statistical Authority.

By the end of 1926, the population had grown by 138 percent but the housing stock by only 30 percent. The housing stock was further depleted after World War II (1940-1945) and the Civil War (1946-1949), which brought immense casualties and environmental and material devastation. Greece lost more than 400,000 housing units, or 20 percent of its total housing stock. These were years of an acute housing shortage, and until 1950s rebuilding proceeded slowly, typically being limited to repair work. City centers were further burdened by rampant urbanization. Internal migration and population movements from rural to metropolitan areas were stimulated by the stagnation of agriculture during the post-war period.

The country's building regulations did not contemplate the planning needed to achieve the same standards of building as other European centers, and this meant that the country was not adequately prepared to accommodate the throngs of farmers who resettled in Greece's big cities. The properties built consisted of a mix of low-density villas belonging to the affluent and small, low-quality residential units that grew out of the self-organized, arbitrary settlements of immigrants. The latter phenomenon, informal and illegal, materialized more extensively in suburban areas.

In the post-war period, and until the end of 1970s, other European centers tended toward decentralization, inducing a population shift from urban centers to the suburbs (Hall and Hay, 1982). More specifically, the United Kingdom and Ireland, as well as other north-west European countries like Sweden, Norway, Denmark, the Netherlands and Belgium, invested in horizontal urban expansion schemes. Their idea was to accommodate the growing population by means of urban sprawl, with low-density building on the outskirts of cities. By contrast, horizontal urban expansion was not then the norm in Greece, where there was a tendency toward urban centralization.

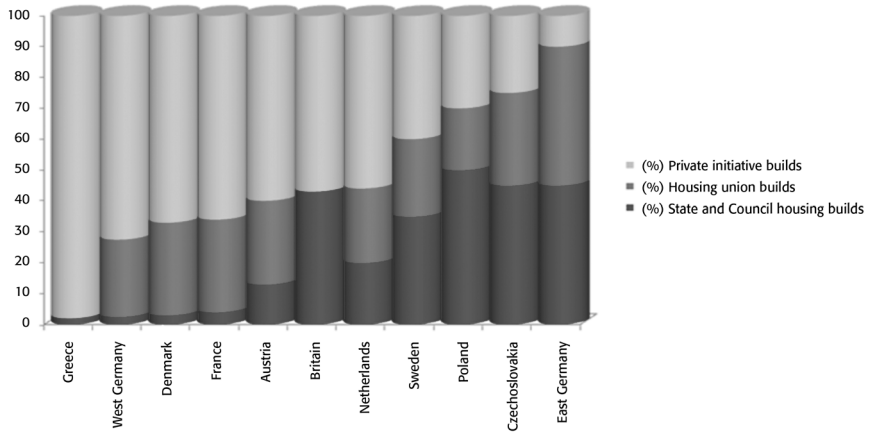
The country-to-country differences in urbanization schemes can be viewed as the outcome of different stages of urban development or of the urban life cycle, comprising urbanization, suburbanization, counter-urbanization and re-urbanization. It is generally agreed that suburbanization occurred first in the big cities of north-west Europe in the post-war period. Only considerably later, from the end of 1970s, did it begin to spread to southern Europe and then from the larger to the smaller countries of the region.

Absence of the state in housing and shortage of housing loans

The defining characteristic of the housing market in the post-war period, especially in Western European, was the rise of the social welfare state (Ronald, 2013). In Greece, an exception in Europe, the state took only minor direct measures to address the country's acute

housing shortage.[6] The foreign capital that Greece received in the form of aid programs was limited and granted mainly in order to support the major productive sectors, the provision of basic resources and infrastructure projects. Figure 2 gives descriptive statistics of new residential units during the 1960s. The data show that housing in Greece was entirely produced by the private sector, and that social housing remained at exceptional low levels compared with other European countries.

Figure 2
Social versus private housing in selected European countries in the 1960s



Note: Percentage shares of new residential units produced by the public and private sectors in selected European counties in the 1960s.

Source: D. Turin (1969).

Figure 3 shows that in the period from 1960 to 1989 mortgage financing accounted for an insignificant share of total housing pro-

[6] Eleftheria ("ΕΛΕΥΘΕΡΙΑ"), press articles (1962) mentioning Greece's acute housing shortage and the absence of state action for social housing. Source: National Library of Greece, http://efimeris.nlg.gr/ns/pdfwin_ftr.asp?c=64&pageid=-1&id=736715&s=0&STEMTYPE=0&STEM_WORD_PHONETIC_IDS=ARvARwARhARfARdARvARwARlARmARr&CropPDF=0; http://efimeris.nlg.gr/ns/pdfwin_ftr.asp?c=64&pageid=-1&id=736302&s=0&STEMTYPE=0&STEM_WORD_PHONETIC_IDS=ARvARwARhARfARdARvARwARlARmARr&CropPDF=0.

duction. The real estate sector was dominated by small-scale developers with limited internal funds and no assets in place, which made them unable to acquire a leveraged position. Credit rationing inhibited these developers from accessing external finance, and bank loans were only available to the country's large manufacturing firms. Access to mortgage credit materialized after the mid-1990s, when banks started to be released from state control and to grow through mergers and acquisitions in order to increase their competitiveness, adopting updated operational techniques and broadening their range of products and services.[7]

Figure 3
New housing units versus outstanding housing loans, 1960-2016

Note: Percentages (annual share) are calculated dividing the annual number of new residential units by the total number of new residential units (gray bar) and the annual outstanding housing loans over the total outstanding housing loans (black bar), respectively, for the period 1960-2016.

Source: Hellenic Statistical Authority.

[7] Access to bank lending by real estate investors burgeoned in the second half of the mid-1990s and reached its peak levels in 2004-2007.

In an effort to stimulate developers, the state enacted two regulatory protocols permitting an increase in building heights and building areas on a plot of land. These regulations effectively generated economies of scale for construction activity and produced higher profits, as unit construction costs tend to decrease as building size increases. Apart from the cost advantages of the larger scale of operations, the increase in the permissible building area increased developers' profit expectations, thus providing the necessary incentive to build.

Monetary instability, fragmented land ownership, low labor costs, micro-capitalists and vertical expansion

One reason why the flats-for-land mechanism grew significantly, especially during the early post-war years, was that households considered property a superior store of value compared with money. The preference for real estate assets can be ascribed to the monetary instability and hyperinflation that occurred during the German-Italian occupation, which left an indelible mark on households' collective memory for many years to come.[8]

Greece is far removed from the corporate dominance characteristic of other Western countries. Family capitalism and mainly small-scale units have historically prevailed.[9] Traditionally, the agricultural sector consisted chiefly of small family farms, each family working its own land. The exceptional growth of urban areas transformed agricultural land into urban land, but the pattern of land ownership did not change. Thus, the model of small-scale land ownership was extended from the provinces to urban centers, and this high degree of land fragmentation contributed to the division of building production into small units.

[8] After inflation was tamed, Greece joined the Bretton Woods system of fixed exchange rates in 1953 (Lazaretou, 2005). During the Bretton Woods period, the Bank of Greece imposed a strict regulatory framework on the allocation of bank credit.

[9] We would like to thank an anonymous reviewer for stressing the importance of this point.

At the same time, migration from the countryside to the cities increased the available supply of workers, previously employed in agriculture. Consequently, developers employed a substantial number of low-waged workers to turn out residential units, which were in high demand.

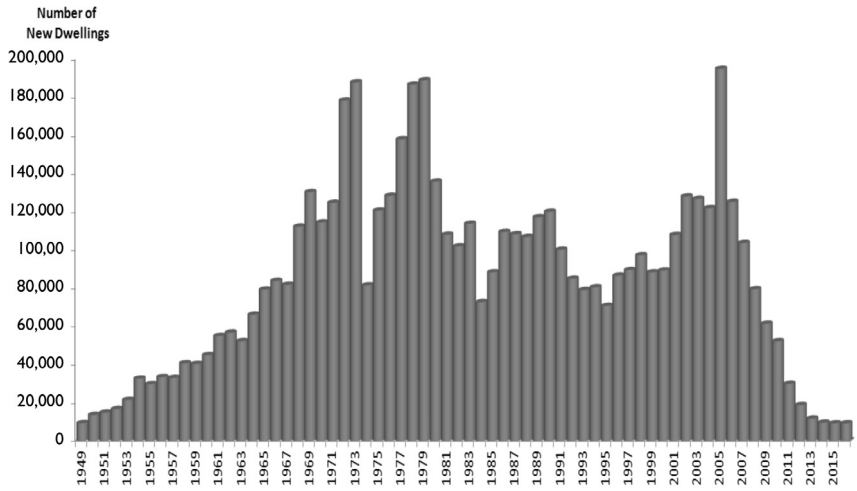
The statute of the flats-for-land mechanism emerged from the collaboration of private micro-developers with the landowners who appropriated small pieces of land. During this period, micro-developers were constrained by the banking system. To construct new buildings, they used a combination of internal funds, low-cost labor and easy access to urban land, which the flats-for-land arrangement provided through an informal joint venture with a landowner. Micro-developers constructed one building unit at a time on a fragmented piece of land. Note that an important share of the construction cost was borne by the homebuyers themselves, who in many cases purchased an apartment that still only existed in blueprint, paying the developer the purchase price in several scheduled installments.

The housing sector thus grew through relatively small investments, and then gained pace along with the infrastructure construction industry. Greece passed into a modernization phase in which city centers grew through vertical urbanization. Flats-for-land was the driving force of urban development. Between 1945 and 1980 the country's housing stock grew by more than 2.5 million units (Figure 4).

From Figure 5, which shows the percentage share of each building type in the total housing stock, one can readily observe that (until 1919) single, undivided and double-occupancy units accounted for more than 95 percent of the total housing stock, while multi-story units accounted for less than 4 percent. After that period, and especially between 1945 and 1980, when construction activity relied heavily on flats-for-land, there was a very significant decline in single- and double-occupancy units (to approximately 30 percent of the total housing stock) and a corresponding increase in multi-story residential units.

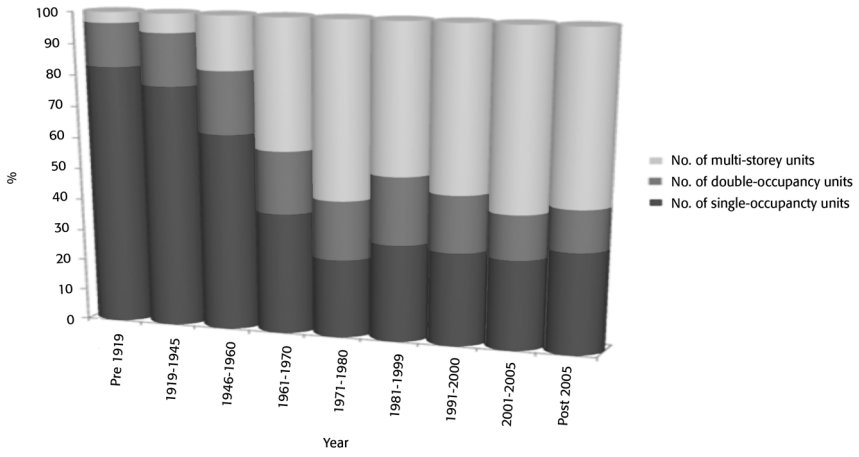
Housing demand in post-war Greece was concentrated in city

FIGURE 4
New residential units



Source: Hellenic Statistical Authority.

FIGURE 5
Percentage shares of each building type in total housing stock, 1919 to post-2005



Source: Hellenic Statistical Authority.

centers, where the majority of socio-economic activities developed. An additional factor was poor infrastructure, which restricted accessibility to central business district(s), restrained demographic development in the periphery and impeded the physical expansion of urban areas. Consequently, cities' populations grew and the land value of housing in core areas rose. In order to economize on the use of land and maximize their potential profits, developers had to build more dwellings per unit of land than had been the norm. This was made possible by two new protocols that brought about the emergence of a new form of residential space – the apartment (as discussed in the previous section) – implemented through the flats-for-land mechanism.

The country's vertical urbanization is further illustrated by the change in population density in the city centers. In 1928, the population density in Athens was 5,000-15,000 per sq. km. In the mid-1980s, despite the incipient expansion of the city into the suburbs, the population density reached approximately 30,000 per sq. km. This clearly indicates that the flats-for-land mechanism was predominantly employed to construct high-rise, high-density buildings.[10]

4. Theoretical Framework

This section provides an analytical description of the structure of the mechanism. The flats-for-land exchange involves the contribution of two separate entities: a capital-contribution member (landowner) and an operating member (developer)[11] with internal

[10] Kathimerini ("ΚΑΘΗΜΕΡΙΝΗ"), press article (2015) that reports that flats-for-land was the dominant mechanism of housing production in Athens from the 1950s, resulting in the development of about 35,000 multi-story apartment blocks by the early 1980s, compared with a stock of just 1,000 in the 1950s. Source: Kathimerini, http://www.kathimerini.gr/800942/article/epikairothta/ellada/h-antiparoxh-ka8orizei-thn-prwteyoysa.

[11] The developer is also considered a capital-distribution member, as he finances the construction of the whole project. In the present discussion, the developer is referred to as an operating member in order to emphasize his active role, compared with the landowner's far more passive role, in the construction process.

funds. According to the agreement, a landowner (L) makes over his land to a developer (D) free of charge, and the developer finances the construction of the unit. The agreement comes into effect once the two parties agree on the essential elements of the contract, most notably the project ownership rights that define the respective percentage ownership shares in the completed property units. The percentage share of independent properties that each party appropriates upon project completion is given by the following expression:

$$V = \underbrace{sV}_{developer} + \underbrace{(1-s)V}_{land\ owner} \tag{1}$$

where V is the project value, given by the value of all property units, and s is the percentage share over these units.

Before the agreement, the percentage share is subject to negotiation between the landowner and the developer, with differing possible outcomes in terms of capital and ownership structures. The form of capital structure most often seen, and especially common during the period under investigation, is the pure flats-for-land agreement, for which we have $0 < s < 1$ and no cash involved. In the more recent years, there are instances of a hybrid form of agreement in which the two parties use a combination of cash transfer and ownership share, but this case is not considered in our study. The two parties must also agree on the delivery time of the property units and the completion time for the whole project. The time of delivery is an essential element of the contract. The contract establishes the time in which the developer is required to initiate each component of the project.

After the commencement of the contract (agreement phase), which specifies the ownership structure, the terms and the responsibilities of each party, project management and execution are undertaken entirely by the operating member (developer). The capital-contribution member (landowner) holds control rights, in order to monitor the developer's compliance with the contract. A penalty clause is prescribed and even a term for the developer's de-

duction in the event of non-compliance. If the developer fails to complete and deliver the project or to meet the deadline for the completion of a stage (provided the delay is unjustified), the landowner even has the right to withdraw from the agreement without having to wait for delivery of the project. As a result of the developer's non-compliance, the project is ultimately undertaken by the landowner, but the developer will still face penalty fees for breach of agreement. The legal structure of the contract does not allow for managerial flexibility, and there is no exit mechanism. Under the flats-for-land agreement, the parties are fully committed to the terms of the contract. Consequently, it is not possible for them to respond to changes in the business environment (e.g. to alter or delay or abandon the project) even if they consider this necessary. Such actions would constitute non-compliance with the essential terms of agreement and incur heavy penalties as stipulated in the contract. In short, a flats-for-land agreement is considered an irreversible investment decision.

5. Empirical Strategy and Results

We now examine the contribution of the mechanism to the country's housing supply. To do so, we use a parsimonious vector autoregressive model, which includes, both (the major) demand- and supply-side components of housing. Since some of our data are not available as far back as the 1950s, our empirical analysis is implemented for a shorter span of time (1977-1996).[12, 13]

[12] It might be objected that the different timeframes could produce a sort of decoupling between the historical and the empirical framework. However, the shorter timeframe considered in the empirical analysis was the period in which mortgage financing accounted for an insignificant share (see Figure 3). Liberalization of the Greek banking system, with led to a significant development of domestic mortgage lending, began to make its presence felt after the mid-1990s. Consequently, we argue that for the period considered the flats-for-land system was the main source of financing for housing production and that "decoupling" the periods treated, respectively, in the historical and empirical sections is not intended to provide inconsistent outcomes.

[13] The dataset that we use in the empirical analysis (annual data on the percentage share

Our empirical strategy involves the implementation of causality tests and variance decomposition analysis. The variables considered in the empirical analysis are: the annual log change of private supply in new housing units (ΔS_t) in the urban areas, construction costs as measured by the annual log difference of the construction cost index of new dwellings (ΔC_t), house prices as measured by the annual log change of the house price index (ΔHPI_t), the annual log change of population (ΔL_t), the annual log change of the unemployment rate (ΔU_t) and the annual log change of GDP per capita (ΔI_t). Since there are no available data to directly measure the size of the flats-for-land system (ΔF_t), we use an indirect measure to incorporate the mechanism in the model. As vertical expansion was an outcome of the flats-for-land during the period investigated, we use the log fraction of the annual change of multistory units over the annual change of single- and double- occupancy units in the urban areas as a proxy of the flats-for-land agreement variable (ΔF_t).

First, we conduct bivariate Granger causality tests in order to investigate causality among the variables. Granger causality tests are performed using pairwise variables. Two variables and their lags are considered one at a time:

$$\Delta Y_t = \alpha + \sum_{i=1}^{m} \beta_i \left(\Delta Y_{t-1}\right) + \sum_{j=1}^{n} \tau_j \left(\Delta X_{t-j}\right) + \mu_t$$
$$\Delta X_t = \theta + \sum_{i=1}^{p} \varphi_i \left(\Delta X_{t-1}\right) + \sum_{j=1}^{k} \psi_j \left(\Delta Y_{t-j}\right) + \eta_t \quad (2)$$

Causality tests answer the question of which variable causes the other, in the sense that the lagged values of X should contain better information for Y than the information included in the lagged value

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of each building type) was culled from the Statistical Year Book of Greece. Data on an annual basis are available only for the period 1977-1996. We contacted the Greek Statistical Authority and were informed that the data on the percentage share of each building type before 1977 and after 1997 are collected with a national building census conducted every 5 or 10 year and are not available on an annual basis. Note that the literature includes a sufficient number of studies that empirically examine property market dynamics using a limited number of observations (e.g. E. Oikarinen, J. Engblom, 2015; L. Agnello, L. Schuknecht, 2011; B. Egert, D. Mihaljek, 2007; F. Ortalo-Magne, S. Rady, 2006; D.R. Capozza, P.H. Hendershott, C. Mack, 2004; R. Meese, N. Wallace, 2003).

of Y alone. The test requires all variables to be stationary. The ADF t- statistic indicates that all variables considered in our analysis are stationary (Table 1). We also consider the optimal lag length, which best fits each bivariate VAR, considered in the pairwise Granger causality tests, by using the Akaike information criterion.

From Table 2, which reports the outcomes of the bivariate Granger causality tests, we observe a unidirectional causality of

Table 1
ADF unit root tests

	Dln_ construction costs	Dln_unemployment	Dln_Population	Dln_Housing supply	Dln_House prices	Dln_GDP per capita	Dln_Flats for land
ADF - unit root tests	-2.60*	-3.47**	-2.99*	-5.06***	-3.20**	-3.98***	-3.79**

Note: Table 1 reports the ADF unit root tests of the seven variables included in the empirical analysis. The ADF critical values -3.9, -3.0 and -2.6 correspond to 1%, 5% and 10% significance levels, respectively.

Table 2
Results of Granger causality tests

Dependent variable	Housing supply	Flats for land	Construction costs	Population	Unemployment	GDP per capita	House prices
Housing supply	–	**0.10***	**0.04****	**0.10***	**0.09***	0.42	0.89
Flats for land	0.62	–	0.74	0.28	0.29	**0.10***	0.20
Construction costs	0.72	0.66	–	0.89	0.70	0.64	0.85
Population	0.43	0.61	0.70	–	0.35	0.22	0.86
Unemployment	0.56	0.64	0.16	**0.05****	–	0.46	0.25
GDP per capita	0.10	**0.04****	0.17	**0.07***	0.33	–	**0.08***
House prices	0.14	0.74	0.47	0.81	**0.07***	0.26	–

Note: Table 2 includes the results of the bivariate Granger causality tests, between causal variables and dependent variables. Causal variables are read from left to right and dependent variables from top to bottom. Symbols ** and * denote causality statistical significance at the 5% and 10% level, respectively.

flats-for-land, population and unemployment, to housing supply at the 10% significance level. The construction costs variable displays the highest causality over housing supply (5% significance level), whereas the results for GDP per capita and house prices indicate that the null of no causality to housing supply cannot be rejected even at the 10% significance level.

We also perform a decomposition to measure the percentage of variance in housing supply that is induced by each variable considered in the model. Variance decomposition identifies how much of the variable's forecast error variance can be explained by its own shocks and by shocks of the other endogenous variable(s). We now consider all the variables together in the following VAR system:

$$y_t = \sum_{j=1}^{n} B_j y_{t-1} + u_t \tag{3}$$

where u_t is the error term, n is the lag length, B_j is the coefficient matrix and y_t is the explanatory variable given by:

$$y_t = [\Delta L_t \, \Delta U_t \, \Delta I_t \, \Delta C_t \, \Delta F_t \, \Delta S_t \, \Delta HPI_t]^T \tag{4}$$

Before implementing the decomposition, we estimate the lag structure (1 lag) which best fits the VAR multivariate system.[14] We consider the lag order selected by five different information criteria: the likelihood ratio test (LR – at 5% level), the final prediction error (FPE), the Akaike information criterion (AIC), the Schwartz information criterion (SC) and the Hannan–Quinn information criterion (HQ). Then, we check the inverse roots of the characteristic AR polynomial to test the stability (stationarity) of the multivariate VAR model. We find that the VAR system is dynamically stable.

In the variance decomposition analysis, we follow the Cholesky decomposition method. Cholesky decomposition is sensitive to the ordering of the variables considered in the VAR system. We follow the Bekaert et al. (2013) set-up and place the variables in decreasing

[14] For the available number of observations, only short lags are plausible and are determined by the information criteria.

order of exogeneity. Population growth, unemployment rate, GDP per capita and construction costs are relatively more exogenous than the other variables considered in the model and are therefore placed first and in a fixed order, as described above. For the remaining variables, namely the flats-for-land mechanism, housing supply and house prices, the order of exogeneity, as an indication of which variable is more likely to influence the others, is opaque. Therefore, we use the information obtained from the Granger causality tests, and we set the ordering of these variables according to the direction of causality among them.

The total variance of the supply in new dwellings variable is decomposed in each period in a four-year forecast horizon and the results provide the percentage of variance explained by each variable and the percentage of variance explained by housing supply itself (Table 3).

Table 3
Cholesky (variance) decomposition

Period	S.E.	dln Population (%)	dln_ Unemployment (%)	dln_ GDP per capita (%)	dln Construction costs (%)	dln Flats for land (%)	dln_ Housing supply (%)	dln_ House prices (%)
1	0.14	2.10	6.77	1.67	21.75	24.88	42.79	0.00
2	0.20	22.04	4.06	6.29	24.68	15.96	26.71	0.23
3	0.21	20.82	4.30	12.09	23.15	14.70	24.68	0.22
4	**0.21**	**20.65**	**4.46**	**11.72**	**23.47**	**15.57**	**23.76**	**0.36**

Note: Table 3 summarizes the contribution of each variable to private housing supply variance (percentage shares).

The decomposition indicates that the higher explanatory power of the housing supply variable is attributed to its own shocks (23.76%). Construction costs and population growth follow in significance, contributing 23.47% and 20.65%, respectively, to housing supply variance. The flats-for-land mechanism contributes 15.57% to variations in the private housing supply and GDP per capita only

11.72%, whereas house prices and unemployment rate have zero effect. As a robustness test we change the ordering of the variables which are not considered strictly exogenous, namely housing supply, the flats-for-land mechanism and house prices, and we obtain an effect of the same order in the housing supply variance.

6. Conclusion

The flats-for-land mechanism emerged in Greece as an idiosyncratic financing tool for housing production in the post-war years. In a period of capital shortage, no public interference and financial underdevelopment in the banking sector, the mechanism ensured access to housing at a relatively low cost and resulted in high rates of owner-occupancy. At the same time, it boosted economic activity, with the building sector becoming for many decades one of the pillars of Greek economic growth. Using data from the Hellenic Statistical Authority, we are able to estimate the dynamic effect of the flats-for-land system on the growth in the country's housing stock. We find that there is a unidirectional causal effect of the flats-for-land mechanism on housing supply and that the mechanism contributes 15% to variations in private housing supply.

We also argue that in the case of Greece the source of housing finance was a major determinant of the housing type and urban development scheme. Flats-for-land, as an informal housing production mode, was adopted by small-scale, financial-constrained developers, and produced urban growth characterized by vertical expansion and the extensive development of fragmented, multistory property units. Future research could analyze, on the basis of a static or dynamic real options framework, the effect of the mechanism on the project's investment value. Other studies could conduct micro-level analysis to examine the effect of the bargaining power of the parties to flats-for-land agreements on the ownership share outcomes.

Greece is now exiting a severe, protracted crisis during which

the flats-for-land system came to a standstill as the construction sector collapsed. At the present, the construction sector is enjoying a significant revival and the flats-for-land system is part of it (40% of the flats/apartment buildings being built in Athens today come under this system). However, construction is also being infiltrated by large developers, many of them international, for the first time. The country may be at a turning point: a marginalization or even the final eclipse of the flats-for-land system could occur in the next few years.[15]

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