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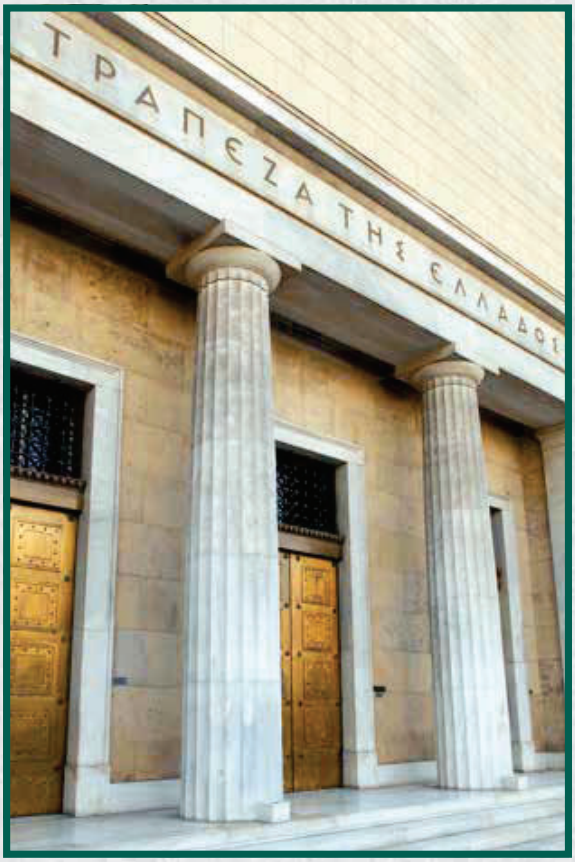

JULY
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BANK OF GREECE
EUROSYSTEM

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ΠΕΡΙΛΗΨΗ

Η παρούσα μελέτη, χρησιμοποιώντας διαστρωματικά δεδομένα από δύο κύματα της Έρευνας για τα Οικονομικά και την Κατανάλωση των Νοικοκυριών (Household Finance and Consumption Survey – HFCS) για το 2018 και 2021, κατασκευάζει έναν δείκτη προσιτότητας της στέγασης, ο οποίος ορίζεται ως ο λόγος του κόστους στέγασης προς το διαθέσιμο εισόδημα των νοικοκυριών σε εθνικό και περιφερειακό επίπεδο, αλλά και ανάλογα με το βαθμό αστικότητας. Η εξέλιξη του δείκτη υποδηλώνει ότι η προσιτότητα της στέγασης μειώνεται μεταξύ 2018 και 2021, αλλά αναδεικνύει και την ιδιαίτερη ετερογένεια που υφίσταται μεταξύ περιφερειών, καθώς το ζήτημα είναι εντονότερο στις αστικές περιοχές και ιδίως για τα νοικοκυριά που ενοικιάζουν. Στη συνέχεια, η μελέτη δείχνει ότι τα νεαρότερα και μικρότερα σε μέγεθος νοικοκυριά, οι άνεργοι αλλά και τα νοικοκυριά με χαμηλότερο εισόδημα είναι εκείνα για τα οποία είναι οξύτερο το ζήτημα της προσιτότητας της στέγασης. Μέσω αυτών των ευρημάτων, η μελέτη παραθέτει χρήσιμες πληροφορίες που μπορούν να βοηθήσουν στη χάραξη πολιτικών για την αντιμετώπιση του ζητήματος.

† Απεβίωσε πριν από τη δημοσίευση του παρόντος άρθρου.

ΜΗ ΤΕΧΝΙΚΗ ΣΥΝΟΨΗ

Ο πιο κοινός ορισμός της προσιτότητας της στέγασης εκφράζεται ως το ποσοστό των νοικοκυριών το οποίο δαπανά πάνω από 40% του διαθέσιμου εισοδήματός του για την κάλυψη του στεγαστικού του κόστους. Σύμφωνα με τα τελευταία διαθέσιμα δεδομένα της Eurostat, για το 2023, η Ελλάδα βρίσκεται στη δυσχερέστερη θέση ανάμεσα στα κράτη-μέλη της Ευρωπαϊκής Ένωσης αναφορικά με το πόσο προσιτή είναι η στέγαση. Ενδεικτικά, στην Ελλάδα σχεδόν το 1/3 των νοικοκυριών σε αστικές περιοχές καταγράφεται να δαπανά πάνω από 40% του διαθέσιμου εισοδήματός του για την κάλυψη του κόστους που σχετίζεται με τη στέγαση, όπου συμπεριλαμβάνονται λογαριασμοί υπηρεσιών κοινής ωφέλειας, ενοίκια, πληρωμές στεγαστικού δανείου και δημοσιονομικά τέλη. Σε συνθήκες ανόδου των τιμών των ακινήτων και του κόστους ενέργειας και υψηλού κόστους δανεισμού, το στεγαστικό κόστος αυξάνεται σταδιακά, καθιστώντας τη στέγαση ακόμη λιγότερο προσιτή για τα εγχώρια νοικοκυριά. Ταυτόχρονα, οι δημόσιες δαπάνες για στέγαση, ως ποσοστό του ΑΕΠ, είναι για το 2022 από τις χαμηλότερες μεταξύ των κρατών-μελών. Ο συνδυασμός των συγκυριών αυτών αναδεικνύει τη σημαντικότητα του ζητήματος της προσιτότητας της στέγασης, καθώς οι αυξημένες δαπάνες των νοικοκυριών για στέγαση έχουν άμεσες κοινωνικές και οικονομικές επιδράσεις. Αφενός, τα ελληνικά νοικοκυριά καλούνται να προσαρμόσουν τα καταναλωτικά τους πρότυπα, δεδομένου ότι η ζήτηση στέγασης είναι γενικά ανελαστική. Αφετέρου, δυσχεραίνεται η συσσώρευση πλούτου μέσω αποταμιεύσεων, γεγονός που έχει άμεσες επιδράσεις στις επενδύσεις στην πραγματική οικονομία, αλλά και στο χρηματοπιστωτικό σύστημα.

Με αφετηρία τη σημαντικότητα της στέγασης και τη δυσμενή κατάσταση που αντιμετωπίζουν τα νοικοκυριά στην Ελλάδα, η μελέτη, χρησιμοποιώντας ως βάση την Έρευνα για τα Οικονομικά και την Κατανάλωση των Νοικοκυριών (Household Finance and Consumption Survey – HFCS), διερευνά την προσιτότητα της στέγασης σε εθνικό επίπεδο, ανά βαθμό αστικότητας και σε περιφερειακό επίπεδο, αλλά και για διαφορετικές κατηγορίες νοικοκυριών, με σκοπό να αναδείξει τις σημαντικές ετερογένειες που υπάρχουν και που μπορούν να αποτελέσουν χρήσιμη βάση για τη χάραξη στοχευμένων πολιτικών προς αντιμετώπιση του ζητήματος. Συγκεκριμένα, κατασκευάζουμε το δείκτη προσιτότητας της στέγασης, ο οποίος ορίζεται ως ο λόγος του στεγαστικού κόστους προς το διαθέσιμο εισόδημα για κάθε νοικοκυριό. Στη συνέχεια, για τον υπολογισμό του ποσοστού υπερεπιβάρυνσης από το κόστος στέγασης (Housing Cost Overburden Rate), ανάγουμε στο ποσοστό των νοικοκυριών τα οποία δαπανούν το 40% ή άνω του διαθέσιμου εισοδήματός τους για να καλύψουν το κόστος στέγασης και ως εκ τούτου δεν διαθέτουν πρόσβαση σε προσιτή στέγαση. Τα αποτελέσματα του δείκτη αρχικά αναδεικνύουν ότι η προσιτότητα της στέγασης μειώθηκε μεταξύ 2018 και 2021. Επίσης, παρατηρούνται σημαντικές διαφοροποιήσεις ανά βαθμό αστικότητας, με το ποσοστό των νοικοκυριών που δαπανούν πάνω από 40% του διαθέσιμου εισοδήματός τους (ποσοστό υπερεπιβάρυνσης από το κόστος στέγασης) να είναι υψηλότερο στις αστικές περιοχές σε σχέση με τις ημιαστικές και αγροτικές περιοχές. Μια κύρια διαφορά είναι η διάρθρωση των νοικοκυριών ανά καθεστώς ενοίκησης (ιδιόκτητη ή μισθωμένη κατοικία), καθότι οι ενοικιαστές είναι περισσότεροι στις αστικές περιοχές από ό,τι στις ημιαστικές ή αγροτικές περιοχές. Σε επίπεδο περιφερειών, αλλά και για τα δύο μεγαλύτερα αστικά κέντρα, το ποσοστό υπερεπιβάρυνσης από το κόστος στέγασης παρουσιάζει μεγαλύτερες διακυμάνσεις από το διάμεσο ποσοστό δαπανών για στέγαση, υποδηλώνοντας ότι η δυσχερέστερη πρόσβαση σε προσιτή στέγαση μπορεί να επηρεάσει και την εισοδηματική ανισότητα. Συγκεκριμένα, σε περιοχές όπως το Νότιο Αιγαίο, η Ήπειρος, η Αττική, η Θεσσαλονίκη και η Κεντρική Μακεδονία παρατηρούνται τα υψηλότερα ποσοστά νοικοκυριών χωρίς πρόσβαση σε προσιτή στέγαση. Τα αποτελέσματα αυτά, σε συνάρτηση με την εξέλιξη του κόστους στέγασης αλλά και του διαθέσιμου εισοδήματος, υποδηλώνουν ότι η άνοδος του ενεργειακού κόστους και οι δομικές αλλαγές στην σύνθεση των νοικοκυριών ως προς το καθεστώς ενοίκη-

σης είναι από τους βασικούς παράγοντες που συνέβαλαν στη μείωση της προσιτότητας μεταξύ των δύο γύρων της έρευνας, αλλά και στη γεωγραφική ετερογένεια.

Πέρα από τις διαφορές που προκύπτουν στην προσιτότητα της στέγασης ανά γεωγραφική περιοχή, η μελέτη εστιάζει στην αναγνώριση των χαρακτηριστικών των νοικοκυριών που αντιμετωπίζουν τα μεγαλύτερα εμπόδια πρόσβασης σε προσιτή στέγαση. Τα περιγραφικά αποτελέσματα της ανάλυσης δείχνουν ότι το ζήτημα της προσιτότητας της στέγασης: (α) σχετίζεται με το ιδιοκτησιακό καθεστώς της κατοικίας, το οποίο παρουσιάζει μεγάλη διακύμανση ανά περιφέρεια, με βάση το εύρημα ότι και στους δύο γύρους της έρευνας περίπου το 60% των νοικοκυριών που ενοικιάζουν δαπανά πάνω από το 40% του διαθέσιμου εισοδήματός του για την κάλυψη των στεγαστικών του αναγκών, (β) πλήττει εντονότερα τα νεαρότερα νοικοκυριά, (γ) οξύνεται όταν ο επικεφαλής του νοικοκυριού είναι άνεργος και, τέλος, (δ) σχετίζεται με την οικογενειακή κατάσταση, όπως επίσης και με το μέγεθος του νοικοκυριού. Πέραν των περιγραφικών ευρημάτων, μέσω ενός εμπειρικού υποδείγματος λογιστικής παλινδρόμησης η μελέτη εξετάζει τις επιδράσεις των χαρακτηριστικών των νοικοκυριών, αλλά και τις επιδράσεις από διαστρωματικές διακυμάνσεις των τιμών των ακινήτων, οι οποίες προκύπτουν από την επεξεργασία στοιχείων εκτιμήσεων ακινήτων που συλλέγει η Τράπεζα της Ελλάδος. Τα αποτελέσματα του υποδείγματος επιβεβαιώνουν ότι το μέγεθος των νοικοκυριών, η κατάσταση απασχόλησης και η ηλικία έχουν ισχυρές επιδράσεις στην πιθανότητα να αντιμετωπίζουν μη προσιτή στέγαση. Την πιο βαρύνουσα όμως, λόγω στατιστικής σημαντικότητας, επίδραση στην πιθανότητα έλλειψης προσιτότητας φαίνεται να έχει το καθεστώς ενοίκησης, καθώς ενοικιαστές και ιδιοκτήτες με στεγαστικό δάνειο έχουν πολύ υψηλότερες πιθανότητες να μην έχουν προσιτή στέγαση σε σύγκριση με τα νοικοκυριά που ιδιοκατοικούν. Επίσης, σχετικά με την αγορά κατοικιών, βρίσκουμε ότι το επίπεδο των τιμών των ακινήτων συσχετίζεται αρνητικά με την προσιτότητα της στέγασης. Το γεγονός ότι αυτά τα ευρήματα παραμένουν στατιστικά σημαντικά ακόμη και αφού χρησιμοποιηθούν και άλλες μεταβλητές ελέγχου, αλλά και μακροοικονομικές μεταβλητές σε επίπεδο περιφέρειας, επιτρέπει να αναδειχθούν οι σημαντικότεροι παράγοντες που επηρεάζουν την προσιτότητα της στέγασης και συνεπώς η μελέτη μπορεί να υποβοηθήσει τη χάραξη στοχευμένων πολιτικών.

HOUSING AFFORDABILITY FOR GREEK HOUSEHOLDS*

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1 INTRODUCTION

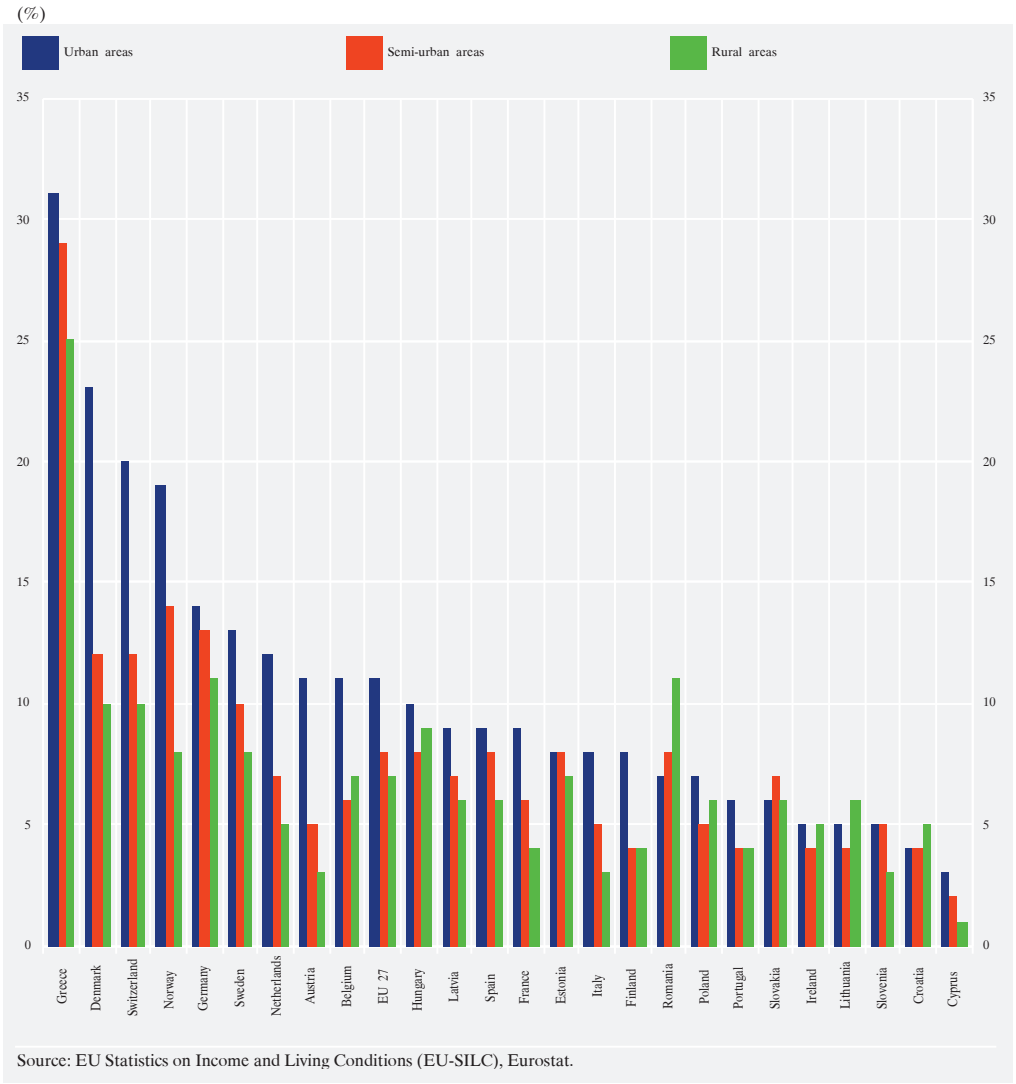
Housing is a fundamental pillar of both society and the economy, representing a network of essential human needs, economic stability and social well-being. Beyond its inherent value as a human right, housing has a profound impact on the economy. It is a key driver of consumer spending, as households allocate a significant portion of their income to housing expenses (Chambers et al. 2009; Iacoviello 2011). Furthermore, the housing sector encompasses a wide range of industries, thus contributing significantly to employment and economic growth (Muellbauer and Murphy 2008). Therefore, the availability of affordable housing allows households to adjust their consumption patterns (Anacker 2019) and be more resilient in meeting their financial obligations (McCord et al. 2011). Given the importance of housing affordability, this study is structured around three main themes: First, it presents a measure of housing affordability, harmonised across tenure status, as well as the housing cost overburden rate[1] at both the national level and across Greek prefectures, with a specific focus on the two largest urban centres, Athens and Thessaloniki. Second, it identifies the demographic and economic profile of Greek households facing the greatest difficulties in meeting their housing needs. Finally, it highlights the factors affecting housing affordability in Greece through an empirical analysis using household-level data.

In Greece, according to the latest available Eurostat data for 2023, households face significant budget constraints, largely due to the very high cost of housing relative to their income (Chart 1). Specifically, Greece ranks worst among EU Member States in terms of housing affordability, particularly in urban areas. According to EU Statistics on Income and Living Conditions (EU-SILC) data, in Greek urban areas, 31% of households spend more than 40% of their disposable income on housing costs, while, in rural areas, this percentage stands at 25%.[2] These findings are reinforced by the fact that government spending on housing in Greece is among the lowest in the European Union.

Housing affordability refers to the relationship between housing costs and household disposable income. Fluctuations in housing costs are directly affected by changes in property prices.

* The views expressed in this article are of the authors and do not necessarily reflect those of IOBE or the Bank of Greece. The authors are responsible for any errors or omissions. The authors wish to acknowledge the invaluable contribution of Dr. Sotirios Saperas, who passed away before the publication of this work.
† Deceased prior to the publication of this article.
1 The housing cost overburden rate is defined as the percentage of households that spend more than 40% of their disposable income in order to cover their housing costs. Housing costs include rent or mortgage payments, utility bills and fiscal taxes.
2 Housing costs include rent and lease payments, mortgage repayments and energy costs.

Chart 1 Housing cost overburden rate in Europe (2023)

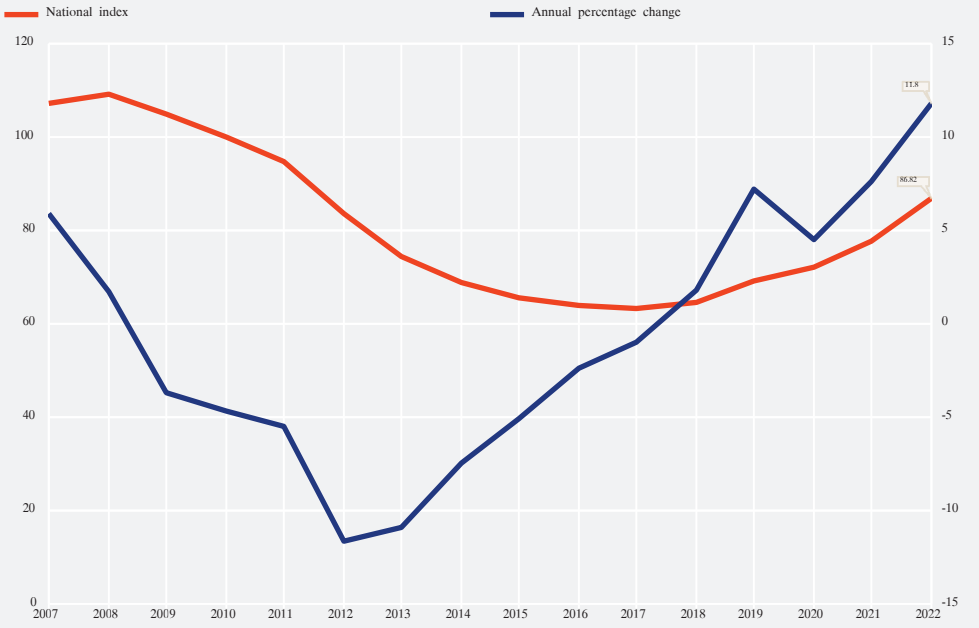


Source: EU Statistics on Income and Living Conditions (EU-SILC), Eurostat.

Apart from the underlying trends that drive house price developments, following significant declines during the Eurozone debt crisis (Vlamis 2013), prices in Greece have been on an upward trajectory since 2016. Furthermore, increased foreign direct investment in the real estate market and rising construction activity, particularly since 2018, indicate growing demand for housing, whether for residential or for commercial purposes (Chart 2), thereby exerting upward pressure on housing costs. Beyond rising property prices, housing affordability in Greece is further strained as the Price-to-Rent (PtR) ratio approaches pre-crisis levels (OECD 2023). Since the PtR ratio can signal potential market overheating, abrupt corrections could lead to an increase in non-performing loans, which would have direct negative consequences for the real economy. Furthermore, the Price-to-Income (PtI) ratio in Greece suggests that recent nominal income increases have not translated into equivalent purchasing power growth, due to high inflationary pressures, fuelling discussions for reg-

Chart 2 Evolution of house prices in Greece

(normalised index 2015=100; right hand scale: annual percentage change)



Sources: Bank of Greece and Eurostat.

ulatory interventions aiming to support households, while safeguarding the financial system through macroprudential measures targeting lenders (Bank of Greece 2023).

Additionally, international energy price hikes during the 2022-2023 period required households to allocate a larger share of their budgets to housing costs, ultimately making housing less affordable (Čermáková and Hromada 2022). Moreover, the monetary policy tightening during 2022-2023 aimed at curbing high inflationary pressures, increased borrowing costs (Gross and Souleles 2002; DeFusco and Paciorek 2017), thus discouraging Greek households from taking on more debt and imposing stricter budget constraints (Bank of Greece 2023). Also, potential credit protection measures, such as Loan-to-Value (LtV) or Loan-to-Income (LtI) ratio limits, intended to enhance the financial system's resilience, particularly in a prolonged period of rising house prices, could negatively impact household welfare by further restricting mortgage access (Balfoussia et al. 2018).

Moreover, on the supply side, the proliferation of short-term rentals is consuming an increasing proportion of the existing housing supply. Concurrently, a significant number of foreclosed properties —a legacy of past non-performing loans— remains vacant, exacerbating housing shortages and driving up prices. Finally, zoning regulations and the geographic distribution of housing supply are critical determinants of housing affordability (Glaeser and Gyourko 2002; Saiz 2010; Molloy 2020).

2 LITERATURE REVIEW

The first strand of the literature concerns the nature and characteristics of already existing housing affordability indices. A key challenge highlighted in the literature is whether a sin-

gle index can adequately capture the diversity of households (Jewkes and Delgadillo 2010; Cai 2017). As a result, various indices have been developed, such as the Self-Sufficiency Standard (Brooks and Pearce 2000), which measures the income required —without public or private subsidies— for a given family composition in a specific location to cover essential needs, including housing, healthcare and education. Similarly, the Shelter Poverty Index assesses whether a household's income is sufficient to meet non-housing needs after paying for housing costs. Another metric is the Amenity-Based Housing Affordability Index developed by Fisher et al. (2009), who argue that housing affordability should consider location factors, ensuring access to employment, education and other essential services. Beyond these, mostly qualitative, indices, the housing cost-to-income ratio is the primary metric for assessing affordability, due to its simplicity and accessibility. It is widely used by organisations such as Eurostat in Europe and the U.S. Department of Housing and Urban Development. The Housing Cost Overburden Rate, defined by Eurostat as the percentage of the population living in households that spend more than 40% of disposable income on housing, serves as a key benchmark for Eurostat across the EU. Similarly, the OECD Housing Cost Overburden Rate adopts the same 40% threshold to facilitate international comparisons. However, the use of threshold-based indices (e.g. 30% or 40% of income spent on housing) has limitations. Nelson et al. (2002) argue that these thresholds fail to distinguish between necessity and discretionary spending on housing. Fisher et al. (2009) highlight that spatial heterogeneity distorts affordability measurements, while Bogdon and Can (1997) criticise the neglect of qualitative housing changes over time. Despite these critiques, Schwartz and Wilson (2008) argue that the 30% threshold remains relevant for low-income households. While acknowledging these limitations, this study argues that, given the extensive sample size of the Household Finance and Consumption Survey (HFCS) and the simplicity of the index, the findings remain useful for cross-sectional analyses both within and across survey waves.

The second strand examines the socio-economic profile of households which experience the most significant housing affordability challenges, narrowing on low-income households (Lens 2018; Kropczynski 2012; Been et al. 2019; Gabriel and Painter 2020), renters (Mason et al. 2013; Luffman 2006; Anacker and Li 2016), single-parent households (Mulroy 1992; Cooper 2004) and young households (Zyed et al. 2016; Bujang et al. 2010).

The third strand investigates the determinants of housing affordability. Firstly, low interest rates and favourable credit conditions improve access to homeownership (Worthington and Higgs 2013; Dorokh and Torluccio 2011), whereas government policies, such as tax incentives, land use regulations and social housing programmes, also influence affordability (Lee et al. 2022). On top, macroeconomic factors that influence housing costs and affordability include energy prices, fiscal policies and wage trends (Coskun 2023; Biljanovska et al. 2023). Stronger economic growth and rising incomes improve affordability, while economic downturns and stagnant wages worsen it. Furthermore, inflationary pressures also increase both rental and homeownership costs, as well as construction and energy expenses. Lastly, because macroeconomic metrics do not vary significantly at regional levels, and our empirical analysis is based on pooled cross-sectional data over a short time frame, the inclusion of such metrics is expected to have limited explanatory power. However, controlling for variables such as gross domestic product and unemployment rates at the regional level allows for a more refined analysis of affordability trends.

3 DATA

As the study seeks to assess the socioeconomic status of households in terms of age, household

size, income, assets, employment and housing tenure, the primary data source is the Household Finance and Consumption Survey (HFCS), which, as far as Greek data are concerned, is compiled by the Bank of Greece as part of the Eurosystem's HFCS coordinated by the European Central Bank (ECB). The survey has been conducted four times – in 2009, 2014, 2018 and 2021.[3] Although not carried out annually, it provides valuable insights into housing affordability at both regional and broader geographical and administrative levels. Specifically, the HFCS contains extensive information on demographic and financial background, enabling an analysis of households experiencing the greatest financial constraints due to high housing costs, as well as an examination of the key determinants of housing affordability based on income and wealth characteristics.

For the construction of the housing affordability index, housing costs include mortgage payments for primary residences, rent payments, utility bills (water, electricity, heating) and property-related fiscal charges, such as the ENFIA property tax for homeowners. While most of these payments are already recorded in the HFCS dataset, additional primary data sources were integrated to estimate ENFIA. These include location-based factors, such as land zone prices, commercial coefficients, building frontage, floor level, surface area, building age and completion status. Based on these, the objective taxable value is calculated, allowing for an estimation of ENFIA costs for each household in the years corresponding to the HFCS survey waves.

Furthermore, to compute disposable income, as the HFCS only reports gross incomes, another primary dataset from the Bank of Greece was used, which records either net or gross household income on a monthly or annual basis. If only monthly income is reported, annual income is estimated based on the reported frequency of payments or by extrapolating to 12 months per year. Total household disposable income is then derived by aggregating different income sources, including wages, self-employment earnings, public and private pensions and unemployment benefits. For cases where only gross income is available, income tax rates, deductions and social security contribution rates are applied, based on income brackets, year, insurance contributions and number of dependents. Additional net income sources, such as financial transfers from relatives, rental income, dividends and capital gains are also incorporated. Summary statistics on the geographical distribution of household disposable income and housing costs are presented in the Appendix.

The second primary source of data consists of dwelling information, available from the Bank of Greece. This database includes properties whose values have been assessed by specialised appraisers from the four systemic banks in Greece. The use of these specific data is of particular importance for the study; as described in the empirical analysis section, property prices per prefecture are used as an independent variable, and the stratification differences arising from these will help us understand the impact of property prices on housing affordability per region. The hedonic methodology we employ is presented in the Appendix.

4 HOUSING AFFORDABILITY INDEX

The first step in constructing the housing affordability index is to determine the housing cost faced by each household in relation to its disposable income (Meen 2018; Suhaida et al. 2011). Subsequently, the corresponding housing cost overburden rate, as defined by Eurostat, is calculated as the percentage of households spending more than 40% of their income on housing costs. To formulate the housing affordability index, we follow the cost-to-income function of households and, more specifically, the methodology of Hick et al. (2024), where, in the

3 Due to differences in data collection for the first two waves and a lack of primary data regarding disposable income, contributions and taxes, our study focuses on the last two waves, i.e. 2018 (3rd wave) and 2021 (4th wave).

case of homeownership, the principal payments on household mortgages are included in the calculation of housing costs (in contrast to Eurostat's methodology for housing cost overburden).[4] By following this methodology, we ensure that the index is harmonised between renters and homeowners. A very important extension of this methodology is the geographical dimension of the index, as real estate market trends vary across cities, as well as between urban and rural areas. The housing affordability index is constructed as follows:

$$HAI_{i,w,r} = \frac{HC_{i,w,r}}{DInc_{i,w,r}},$$

where $HAI_{i,w,r}$ is the housing affordability index, representing the percentage of expenditure on housing for household i, in survey wave w and in geographical dimension r (degree of urbanisation or prefecture). *HC* and *DInc* are housing costs and disposable income, respectively. The only differentiation in the calculation of this ratio across tenure status lies in the numerator, with regard to the housing tenure status of the household. Specifically, for owner-occupied households, housing costs include mortgage costs, if any, electricity and water bills, and the cost of fiscal charges related to housing (e.g. ENFIA property tax for primary residences). Thus, another category of households is highlighted: those who are owners but with mortgage payments. For renters, this cost is determined by rent payments instead of mortgage payments.[5] Ultimately, for each region and degree of urbanisation, following the Eurostat methodology, we calculate the housing cost overburden rate, classifying households for which the *HAI* is above 40% as those with difficulties in access to affordable housing. Finally, we aggregate household data at the regional level and present the distribution of housing affordability by region.[6]

The results for the housing cost overburden rate reported in Table 1 are those that can be compared with the results for the housing cost overburden rate produced by Eurostat through EU-SILC data, by degree of urbanisation. While the metric is broadly comparable to that of Eurostat, the two indices have a fairly large divergence for the 3rd wave. Looking at the raw data of EU-SILC, this divergence does not stem from different dynamics between income and housing costs from 2018 to 2021 for the EU-SILC data. The overburden rate results initially indicate that the housing costs-to-income ratio is higher in urban areas than in semi-urban or rural areas. One of the reasons, as we will see

4 As constructed, higher affordability index (HAI) values indicate less access to affordable housing. The transformation of the index to the housing cost overburden rate is subsequently used to identify households with lack of affordable housing.
5 For homeowners, imputed rental payments are not included in their respective housing costs formula. The rationale is that we include only realised costs for the calculation of the housing affordability index.
6 The housing affordability index by each region represents the median household in order to reduce the effect of outliers in the calculation of the index.

Table 1 Housing affordability by degree of urbanisation

	Housing Affordability Index		Housing Cost Overburden Rate	
	3rd wave	4th wave	3rd wave	4th wave
Country total	24.0%	24.5%	28.7%	30.9%
Urban areas	25.0%	25.5%	30.2% (43.9%)	32.2% (32.4%)
Semi-urban areas	24.6%	23.3%	29.4% (41.3%)	28.8% (31.1%)
Rural areas	20.4%	21.2%	23.7% (31.7%)	27.7% (22.0%)

Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs. The percentages in parentheses refer to historical Eurostat findings, based on a different database but the same degree of urbanisation. For the percentage of income spent, Eurostat does not publish data by degree of urbanisation. For the 4th wave, since the HFCS sampling took place between 2020 (30%) and 2021 (70%), we report Eurostat's findings for 2021.

Table 2 Housing cost overburden rate by degree of urbanisation and housing status

	3rd wave		4th wave	
	Owners	Renters	Owners	Renters
Country total	10.4%	59.2%	15.3%	60.1%
Urban areas	10.3%	62.0%	15.6%	62.0%
Semi-urban areas	11.9%	48.7%	13.2%	55.7%
Rural areas	10.1%	44.8%	15.7%	50.9%

Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

below, is the structure of households by housing (tenure) status in these areas, as renters represent a higher share of households in urban areas (32.3% and 44.8% in 2018 and 2021, respectively) than in semi-urban or rural areas (11.3% and 22.4% for the respective years in rural areas). Also, from 2018 to 2021, the housing cost overburden rate recorded an increase across all degrees of urbanisation.

Table 2 above presents the housing cost overburden rate by degree of urbanisation and housing status, where particularly large variations can be observed between renters and owners. Specifically, beyond an increase in unaffordability between the two waves, a large percentage of renters spent more than 40% of their disposable income to cover housing costs, which increases with the

Table 3 Housing affordability by region

	Housing Affordability Index		Housing Cost Overburden Rate	
	3rd wave	4th wave	3rd wave	4th wave
Athens	22.0%	23.0%	27.7%	28.2%
Eastern Macedonia and Thrace	25.2%	21.7%	36.1%	31.1%
Attica	24.4%	25.4%	24.0%	35.4%
Northern Aegean	23.9%	22.6%	28.7%	23.0%
Western Greece	23.8%	21.7%	31.8%	28.0%
Western Macedonia	31.0%	23.8%	45.7%	24.0%
Epirus	25.9%	31.4%	34.8%	38.0%
Thessaly	22.5%	24.5%	23.5%	32.2%
Thessaloniki	28.0%	30.6%	35.4%	35.0%
Ionian Islands	23.8%	26.0%	24.2%	31.1%
Central Macedonia	25.5%	23.1%	30.5%	34.6%
Crete	21.4%	27.3%	22.2%	32.5%
Southern Aegean	30.0%	29.4%	28.0%	45.7%
Peloponnese	20.5%	26.4%	24.6%	29.5%
Central Greece	20.5%	18.9%	21.5%	23.4%

Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs. The percentage of income expenditure reported is at the median of the sample, so that the result is less prone to extreme values.

Table 4 Housing cost overburden rate by region and housing status

	3rd wave		4th wave	
	Owners	Renters	Owners	Renters
Athens	10.6%	60.1%	12.5%	61.0%
Eastern Macedonia and Thrace	21.3%	48.1%	16.0%	45.6%
Attica	9.9%	69.8%	20.0%	50.8%
Northern Aegean	1.4%	50.3%	10.5%	46.5%
Western Greece	15.1%	72.4%	13.1%	85.3%
Western Macedonia	30.6%	53.1%	6.8%	58.6%
Epirus	6.4%	55.9%	20.1%	59.6%
Thessaly	6.7%	74.0%	11.2%	55.9%
Thessaloniki	4.3%	64.2%	11.3%	68.1%
Ionian Islands	5.9%	37.0%	11.7%	69.6%
Central Macedonia	13.0%	58.1%	15.0%	40.5%
Crete	9.9%	61.7%	17.4%	85.3%
Southern Aegean	6.4%	60.6%	24.3%	58.9%
Peloponnese	4.9%	46.3%	13.4%	58.8%
Central Greece	7.0%	50.8%	9.8%	37.4%

Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

degree of urbanisation, from rural to urban areas.

At the regional level, and for the two largest urban centres, Table 3 presents the results for the median housing affordability index and the housing cost overburden rate. The results demonstrate uneven patterns in the evolution of housing cost expenditures across the Greek regions from 2018 to 2021. Specifically, regions such as Epirus, Attica, Crete, the Ionian Islands, the Peloponnese and Thessaloniki show an increase in median housing cost expenditures, while the remaining regions show either stagnation (Athens) or a decrease. The housing cost overburden rate rose in all regions except for Eastern Macedonia and Thrace, the Northern Aegean, Western Macedonia and Western Greece. The combination of these two findings —a marginal increase in the affordability index and an overall increase in the housing cost overburden rate— suggests that there were structural changes not only in housing costs and disposable income, but also in the household population structure and income inequality between the two waves of the survey, which may arise from an expansion of borrowing or a decrease in the rate of homeownership, among other factors.

Subsequently, Table 4 presents the results for the housing cost overburden rate by region and housing tenure. The results further highlight the affordability issues faced by renters, particularly in urban centres. However, these specific data should be interpreted with caution, due to the potentially small sample size per housing category and region. For example, in the 4th wave, the table's results for households renting in Western Macedonia are based on a sample of only 17 households.[7]

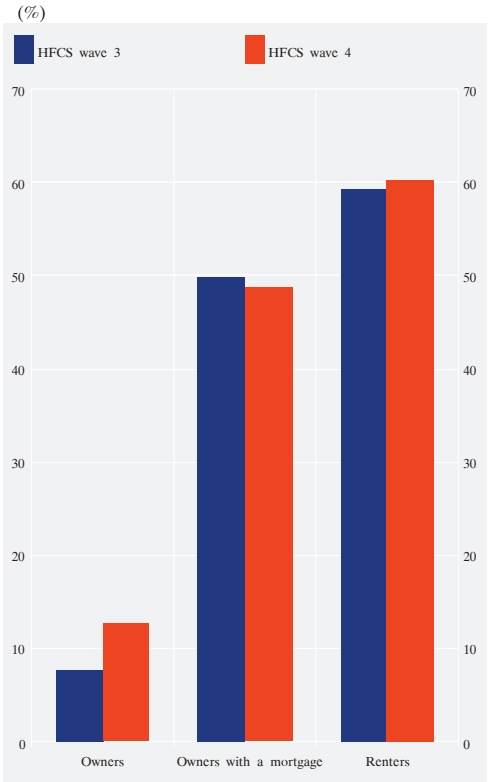
7 The data and analysis presented implement survey weights in order to calculate the aggregate statistics and regression outcomes.

5 DESCRIPTIVE EVIDENCE

In this section, we present descriptive evidence for households based on housing tenure, age group of the household representative, employment status, education level, marital status, household size and structure, and, finally, income level. For the 3rd and 4th waves, the results are shown in the charts below. Perhaps the most significant statistic exhibiting the greatest variation across household categories is housing tenure, given the differences in housing affordability between renters and owners with or without a mortgage for their primary residence (Chart 3). While the median expenditure of disposable income remained relatively stable between the 3rd and 4th waves, as did the measure of housing unaffordability, with only a slight increase in the latter for the 4th wave, the data indicate that renters are burdened much more heavily with housing costs, even compared to owners that make mortgage payments. It is particularly concerning that 60% of renting households, the majority of which reside in urban areas, spend over 40% of their disposable income to cover housing costs, making homeownership a hedge against the lack of affordable housing.

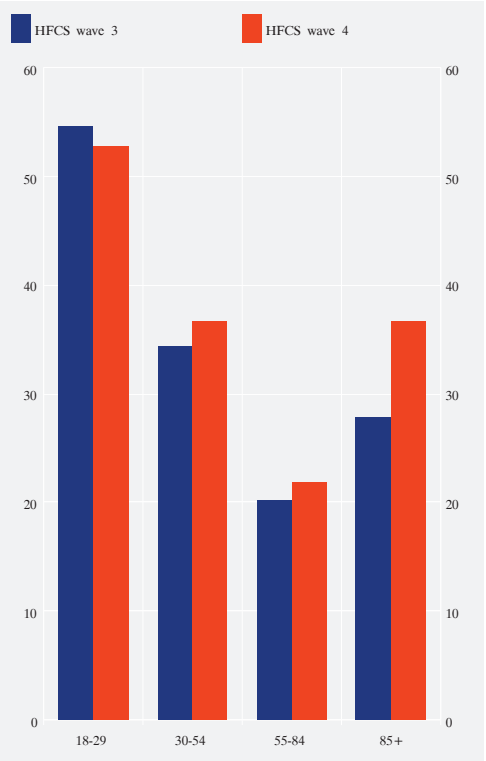
Next, we look at households across different age groups (Chart 4). Over half of households aged 30 or under have trouble accessing affordable housing. Housing affordability improves as households age but becomes more challenging for households aged 85 and over, likely due to lower incomes. However, as shown in

Chart 3 Housing affordability by tenure status



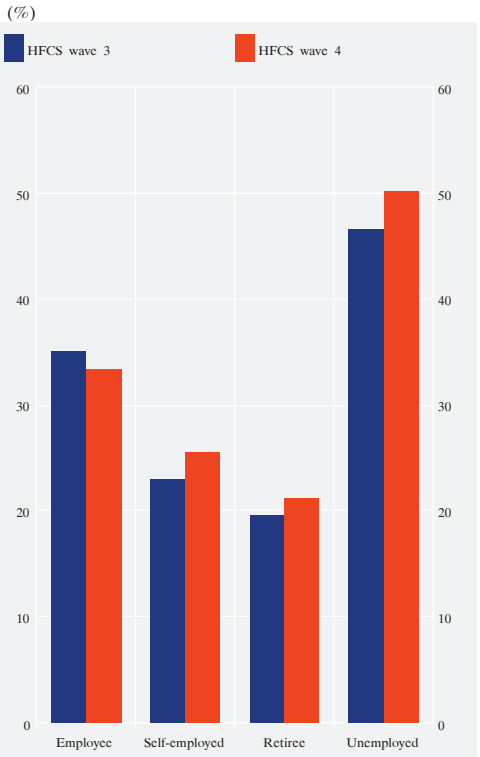
Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

Chart 4 Housing affordability by age group



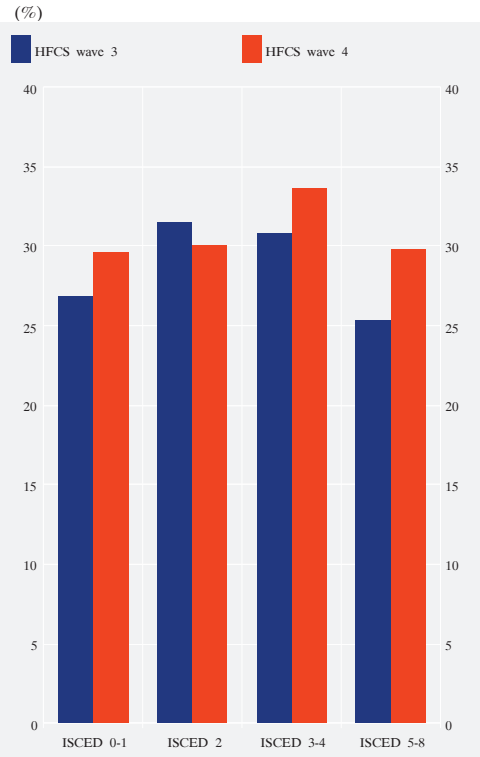
Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

Chart 5 Housing affordability by employment status



Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

Chart 6 Housing affordability by education level



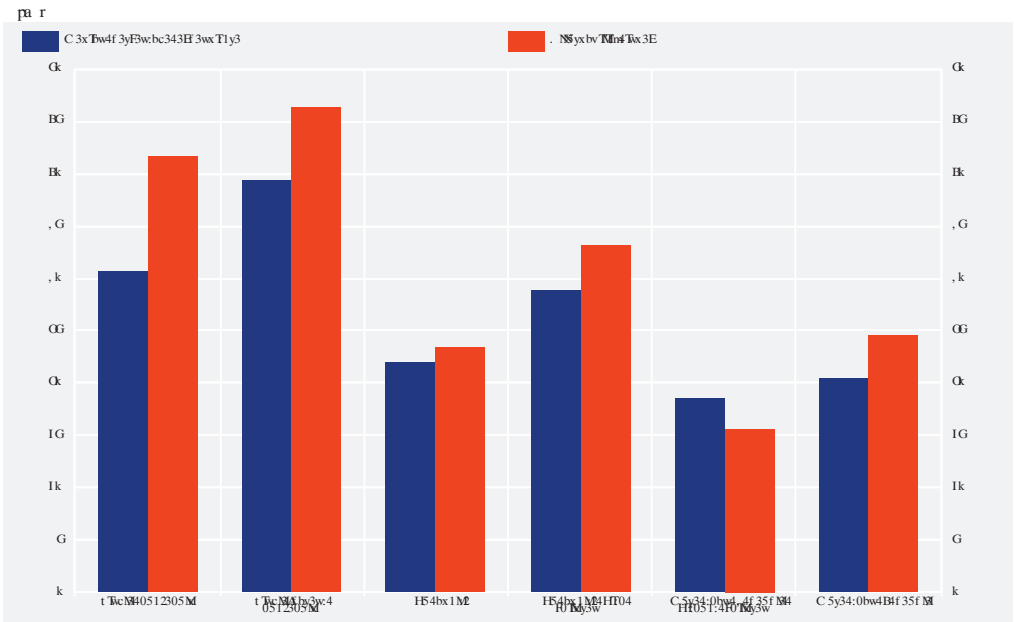
Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

Chart 5, retirees have the easiest access to affordable housing compared to employees, self-employed individuals and the unemployed. This result makes the empirical analysis, which combines demographic characteristics, particularly important for understanding vulnerable households and prioritising policies. Subsequently, it is observed that the unemployed face the greatest challenge in accessing affordable housing, while employees spend 10 percentage points more on housing needs compared to the self-employed, likely due to lower incomes.

With regard to education level, Chart 6 illustrates a relative homogeneity in the percentage of disposable income spent on housing costs. As the education level is correlated with disposable income, households whose representative has completed more years of education spend a smaller percentage of their disposable income on housing. However, these percentages may also vary in relation to housing consumption, based on the square footage of home. According to the HFCS, the level of housing consumption, measured in square metres of the primary residence, increased by approximately 6.4% and 8.8% per person in the household for 2018 and 2021, respectively.

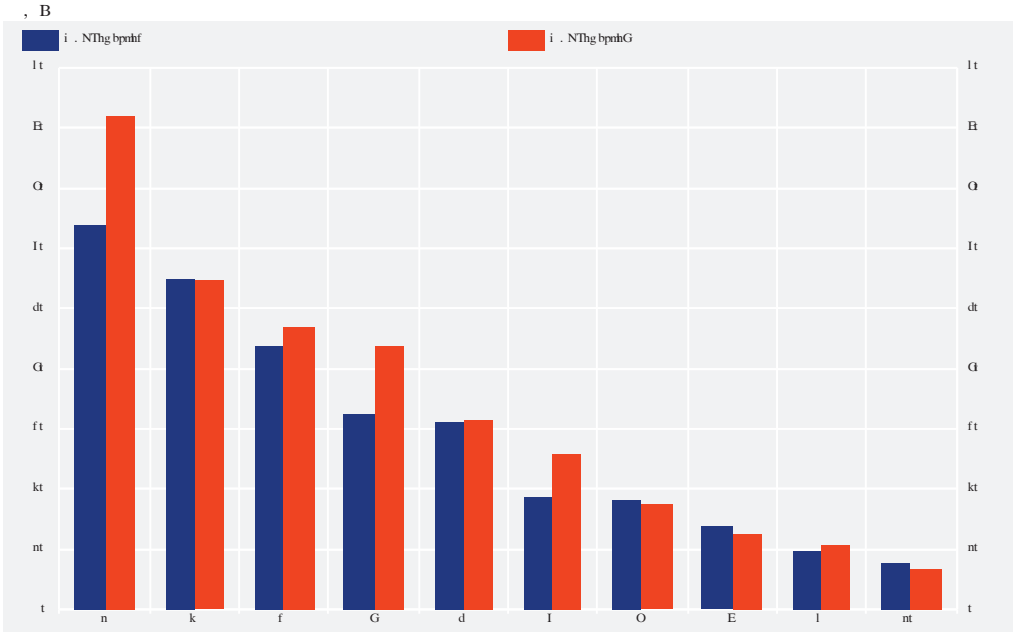
Furthermore, single-parent households face the greatest challenges in accessing affordable housing, followed by single-person households and then households with two adults with children, both in 2018 and particularly in 2021, when almost 70% of single-parent households spend over 40% of their disposable income to cover their housing costs (Chart 7). Generally,

Chart 7 Housing affordability by household size (HFCS wave 3)



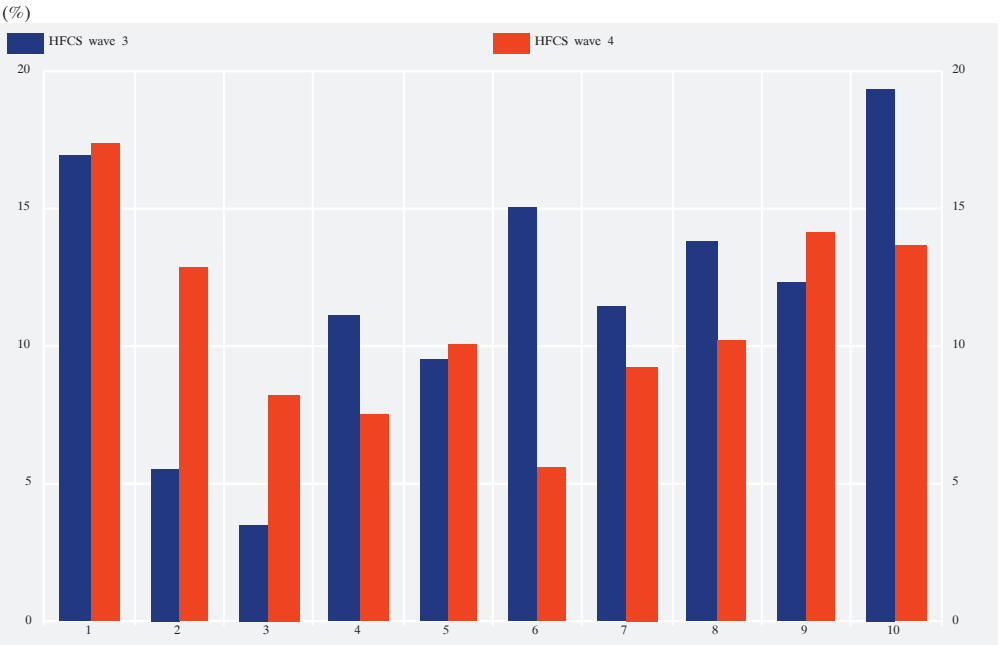
Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

Chart 8 Housing affordability by income decile



Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: The housing cost overburden rate is defined as the percentage of households that spend 40% or more of their disposable income on housing costs.

Chart 9 Percentage of homeowners with a first home mortgage by disposable income decile



Sources: HFCS, Bank of Greece, and IOBE calculations.

two trends are apparent: firstly, in relation to household size, the problem is particularly acute for single-person households, as well as for very large households of more than four adult members. Secondly, in relation to family status, the affordability issue is worse for families with children and especially for single-parent families.

Finally, Chart 8 presents the housing cost overburden rate per decile of the disposable income distribution. While the results are expected, i.e. as the income shrinks, the housing cost burden becomes higher, the findings in the middle of the distribution indicate that for households near the median, for 2021, the share of disposable income spent on housing declines disproportionately to income. This may suggest that these households either consume more housing (for every higher decile of disposable income housing consumption increases by approximately 4.5%, according to HFCS data for 2018 and 2021) or are homeowners with a mortgage among other things (Chart 9).

In conclusion, the descriptive evidence is in line with the findings presented in the literature. Households that rent, smaller and younger households, households with children and with precarious employment are those facing the most difficulties in access to affordable housing. In the empirical analysis that follows, the marginal effects of these variables on Greek households will be examined, further assisting in the development of policies to address the issue.

6 EMPIRICAL ANALYSIS

Having granular household-level data from the HFCS enables an empirical investigation of the impact of various factors on housing affordability at the microeconomic level. However, because the housing affordability index is constructed as the ratio of housing costs to disposable income, several socioeconomic characteristics of households are expected to be endogenous. For example, the employment

status of the household's representative directly impacts the evolution of their disposable income, which is a component of the housing affordability index. Therefore, we use a dummy variable to account for overburdened households, which takes a value of 1 when the household spends 40% or more of its disposable income to cover housing costs, and 0 otherwise. Such transformation is not expected to eliminate endogeneity; however, due to its lower variability, in the case of multicollinearity, this explanatory variable will not be included in the final estimation. Consequently, the methodology is a logistic regression model, which allows for the analysis of potential non-linear relationships.

Via the HFCS, a series of explanatory variables are employed regarding households' demographic and financial situation, as well as their estimates of the value of the property they reside in. Specifically, the key household-level characteristics, as reported by the household representative, are: age, divided into four distinct age groups (18-29, 30-53, 55-84 and 85+ years); marital status; employment status; household size; and highest level of education attained. Also, an important control variable is housing status, distinguishing between owners, owners with mortgage payments and renters. Furthermore, variables reflecting households' expectations regarding the evolution of their income and the price of their primary residence are used. Examining these specific variables allows for the assessment of potential biases held by households, which, however, can be a major driver of their consumption patterns. Regarding financial variables, we use variables such as household investments in financial products, e.g. stocks and bonds, the presence of outstanding credit card balances and consumer loans, and whether households have been denied credit. These specific variables are considered of lesser importance due to the lower participation rates of Greek households in the financial market and the low percentage of households with debt obligations. Furthermore, considering the significant impact of property prices on the differentiation of housing affordability, data on the estimated market values of properties from the Bank of Greece are used. As mentioned in the data section, the explanatory variable of property prices per square metre is the hedonic estimate at the regional unit (prefecture) level. In addition, a series of explanatory variables that can be used are publicly available macroeconomic variables (from Eurostat and the Bank of Greece), initially at the regional level, such as GDP per capita and the unemployment rate.

The general empirical methodology for a logit regression model with a binary dependent variable Y is typically of the form:

$$Pr[Y_i = 1|X1_i, \dots Xk_i] = \frac{1}{1 + \exp\left(-\sum_{j=1}^{k} \beta_j^0 X_{ji}\right)}$$

where one of the X_i equals 1 for the constant term and the β_j^0s are the true values of the parameters. This model is estimated using the maximum likelihood estimator and the coefficients of the variables can be interpreted as the log odds ratios. Subsequently, through logarithmic transformation, the average marginal effects of the variables on the probability of the variable Y taking the value of 1 are calculated as a function of the values of other variables. In our case, the value of the dependent variable $NAFF=1$ when the household, in line with Eurostat, spends more than 40% of its disposable income on housing needs. In a simplified analytical form, the logistic regression model adopted for estimating the marginal effects is as follows:

$$NAFF_i = \alpha + \sum_{h=1}^{H} \beta_h H_i + \gamma lnPS_n + \sum_{m=1}^{M} \delta_m M_{p,w} + \sum_{\substack{y \\ w=1}}^{w=2} \gamma_w Y_w + \sum_{n=1}^{N} \delta_n N_n + \varepsilon_i,$$

where the variable $NAFF_i$ equals 1 when access to housing for household i is considered unaffordable ($HAI_i \geq 0.4$). Subsequently, the various explanatory variables are separated into social, economic and financial characteristics of the households. In the model above, these characteristics are listed as the variable vector H.

These variables specifically, and according to the literature, are: age group, marital status, employment, education level, household size and housing tenure. Also, where available, we control for the effects of expectations regarding income and property price growth on the probability of unaffordable housing. The financial variables we use are whether the household holds stocks or bonds, has a credit card outstanding balance, loans and, finally, whether it has been fully or partially denied credit. Next, the variable *lnPS* represents the estimates of property values at the prefectural level n, from the hedonic pricing model. Finally, the variable vector M concerns macroeconomic-level variables, at the regional-prefecture level p, such as GDP per capita and the unemployment rate. Other variables which are at the national level, such as building permits, the size of the short-term rental collaborative economy based on data on the number of visits to short-stay accommodation and the average mortgage lending rate, were used in robustness checks. Yet, since these variables serve as further controls of the time effects, due to the reservations imposed by the cross-sectional nature of the data, the macroeconomic variables are differentiated by survey wave w and, ultimately, do not offer sufficient variability to provide additional explanatory power to the model. As additional controls, survey wave dummy variables Y were also used, which however are absorbed by the macroeconomic variables of GDP per capita and the unemployment rate but also at the prefecture level N_n. Finally, the residuals of the model are checked for heteroscedasticity and the regressions also take into account the household weights for the correct calculation of both the sample size and the standard errors.

For brevity, we show the results of the average marginal effects from a simpler to a more complex specification. This approach allows us to examine the magnitude and significance of each variable in the context of newly-added variables. Consequently, minor fluctuations in the size and significance of a variable suggest a robust effect on the probability of unaffordable housing. Table 5 presents the average marginal effects of independent variables on the probability of a household spending over 40% of its disposable income on housing (NAFF=1). Average marginal effects are estimated by first calculating the marginal effects for each household and then averaging these effects (coefficients). Starting with the age group, it is observed that, as the age of the household (or its representative) increases, the probability of unaffordable housing decreases, holding all other variables constant. Specifically, while in model (1) (see Table 5) households aged 30 to 54 are 14% less likely to have an affordability issue, households aged 55 to 84 and 85 and over are approximately 26% and 24% less likely, respectively. However, focusing on model (3), which includes macroeconomic variables at the regional level and, more importantly, housing tenure, given that older households are more likely to be homeowners (77% and 94.5% respectively), the effect of age diminishes, although remaining statistically significant at the 95% confidence level. Specifically, while the oldest age group, due to a very high rate of homeownership, no longer has a statistically significant association with the probability of housing unaffordability, it is observed that the second oldest age group (30 to 54 years) and the third oldest (55 to 84 years) are 5% and 7.2% less likely, respectively, to face an issue of access to affordable housing, compared to the youngest age group of 18 to 29 years. This result is expected, as younger households have not yet had time to accumulate high incomes or wealth. The marital status of the representative of the household (married or single) does not appear to affect the probability of unaffordable housing, as none of the models record a statistically significant coefficient for the variable. However, model checks show that the effect of this variable is absorbed by the size variable, as married households are on average larger in size. With regard to employment status, while, marginally, the self-employed and retirees, compared to employees, do not show differentiated trends regarding their access to affordable housing, holding all other variables constant at

Table 5 Average marginal effects on the housing cost overburden rate

NAFF = 1	(1)	(2)	(3)	(4)	(5)
30 to 54 years old	-0.141***	-0.053*	-0.052*	-0.029	-0.028
	(0.031)	(0.030)	(0.029)	(0.034)	(0.031)
55 to 84 years old	-0.259***	-0.069**	-0.070**	-0.071*	-0.066*
	(0.038)	(0.035)	(0.035)	(0.037)	(0.035)
85+ years	-0.236***	-0.002	0.007	-0.010	0.005
	(0.059)	(0.059)	(0.059)	(0.059)	(0.057)
Married	0.008	0.008	0.008	0.015	0.015
	(0.026)	(0.023)	(0.023)	(0.020)	(0.019)
Self-employed	-0.063***	-0.011	-0.009	0.004	0.004
	(0.023)	(0.021)	(0.021)	(0.020)	(0.020)
Retired	-0.096***	-0.031	-0.024	0.005	0.008
	(0.027)	(0.024)	(0.024)	(0.022)	(0.021)
Unemployed	0.171***	0.147***	0.150***	0.151***	0.154***
	(0.029)	(0.026)	(0.026)	(0.024)	(0.024)
ISCED 2	-0.023	-0.030	-0.028	-0.046*	-0.045*
	(0.029)	(0.024)	(0.024)	(0.024)	(0.025)
ISCED 3-4	-0.070***	-0.054**	-0.057***	-0.052**	-0.051**
	(0.025)	(0.021)	(0.022)	(0.022)	(0.023)
ISCED 5-8	-0.121***	-0.098***	-0.101***	-0.088***	-0.086***
	(0.025)	(0.022)	(0.022)	(0.022)	(0.023)
Single-parent household	-0.013	0.007	0.004	-0.021	-0.015
	(0.065)	(0.044)	(0.046)	(0.042)	(0.041)
Two adults	-0.218***	-0.146***	-0.146***	-0.142***	-0.139***
	(0.029)	(0.026)	(0.026)	(0.026)	(0.026)
Two adults with children	-0.222***	-0.178***	-0.177***	-0.174***	-0.173***
	(0.038)	(0.034)	(0.034)	(0.031)	(0.030)
More than 3 people without children	-0.330***	-0.207***	-0.204***	-0.199***	-0.198***
	(0.028)	(0.029)	(0.028)	(0.027)	(0.027)
More than 4 people	-0.277***	-0.194***	-0.193***	-0.171***	-0.169***
	(0.041)	(0.039)	(0.039)	(0.038)	(0.036)
Homeowner with mortgage		0.441***	0.445***	0.448***	0.456***
		(0.032)	(0.031)	(0.032)	(0.030)
Renter		0.410***	0.412***	0.363***	0.373***
		(0.021)	(0.021)	(0.028)	(0.027)
Ln (property values by prefecture)			0.054*	0.093***	0.072**
			(0.031)	(0.029)	(0.035)
Ln (GDP per capita)			-0.080***	-0.086***	-0.160
			(0.030)	(0.031)	(0.357)
Unemployment rate			-0.006**	-0.010***	-0.011***
			(0.003)	(0.003)	(0.004)
Income expectations = Same				0.027*	0.024*
				(0.014)	(0.014)
Income expectations = Better				-0.097***	-0.100***
				(0.027)	(0.026)
Property value expectations = Same				-0.024	-0.019
				(0.018)	(0.018)
Property value expectations = Better				-0.064***	-0.057***
				(0.022)	(0.022)
Has stocks/bonds				0.219**	0.201**
				(0.089)	(0.082)
Has credit card outstanding balance				-0.063***	-0.057**
				(0.021)	(0.022)
Has consumer loan				-0.002	0.006
				(0.028)	(0.028)
Was denied credit				-0.030	-0.024
				(0.038)	(0.038)
Observations	5,365	4,758	4,758	3,842	3,842

Standard errors are in the parentheses: *** p<0.01, ** p<0.05, * p<0.1.

their averages, households whose representative is unemployed are approximately 15% more likely to spend over 40% of their income on covering their housing needs. The value of this variable when the household is unemployed remains statistically significant at the 99th percentile of significance regardless of the model, while its size also remains relatively stable, from 14.7% to 17.1%. This result is expected, as unemployed households have, on average, lower levels of disposable income in both waves of the survey. They also have the third highest average housing cost burden, after employees and the self-employed. This is consistent with the fact that retirees spend the smallest percentage of their income on covering their housing needs, as they are predominantly homeowners, as mentioned above, and are also not burdened by loan payments.

Another feature is that the probability of unaffordability decreases as the representative person of the household has more years of education, a relationship that is statistically significant in all models for International Standard Classification of Education (ISCED) levels 3 and above. According to model (3), graduates of upper secondary and post-secondary non-tertiary education (ISCED 3-4) are approximately 5.7% less likely to face an issue of housing affordability, while graduates of tertiary education up to and including doctoral degrees (ISCED 5-8) are about 10% less likely, compared to households where the representative person has completed up to primary education (ISCED 0-1). Looking at the demographic profile of the household, we observe that single-person and single-parent households are most likely to face an issue of housing affordability; as the size of the household increases, the probability of housing hardship decreases accordingly. More specifically, according to model (3), this probability decreases by approximately 15% when the household consists of two adults, almost 18% when they also have children and even more when the household consists of three adults without children (approximately 20% less likely to lack affordability). Finally, households consisting of four or more people (with the presence of children) are almost 20% less likely to face an issue of affordable housing. Lastly, beyond the demographic characteristics of households and how these affect the probability of lack of affordable housing, we examine housing tenure, which, based on the descriptive characteristics, also presents particularly large variation. The results are in line with the literature, as homeowners with a mortgage or renters have a much higher probability of facing housing constraints. In conclusion, we argue that the single most important household characteristic that imposes housing affordability constraints is the homeownership status of the household, as the coefficient of the tenure status remains highly significant across all the model specifications. Therefore, and also in line with the empirical evidence from other papers, the transition to homeownership provides a hedge against the lack of affordable housing due to higher housing costs or even shocks to household income.

7 CONCLUSIONS

Housing affordability in the Greek context poses a significant challenge to domestic households, more so than in any other Member State of the European Union, as evidenced by EU-SILC data. This study adds to the discussion by utilising HFCS data to analyse households' ability to meet housing needs amid rising property prices, costs and inflation. It constructs a harmonised housing affordability index that adds geographical granularity to Eurostat's findings, presents descriptive characteristics of households facing affordability issues and empirically analyses the probabilities of households facing such issues, using a logistic regression model. The study confirms the existence of a housing unaffordability issue, which worsened from 2018 to 2021, with significant regional heterogeneity. The combination of higher shares of income spent on housing and a rising housing cost overburden rate suggests

structural changes in housing costs, household incomes and population composition. More specifically, descriptive evidence and our empirical study reveal that renters, theunemployed, younger households, those with less education, and smaller households face the most barriers to affordable housing. Furthermore, in line with the findings of Eurostat releases, albeit at a higher geographical level, we find that the degree of urbanisation greatly affects housing affordability, as in urban areas, and especially in Greece's two largest cities, Athens and Thessaloniki, households are faced with increased housing costs in comparison to the rest of the country, making housing less affordable.

This study, drawing on descriptive and empirical evidence in line with international best practices, opens the discussion on several policy options to address Greece's housing affordability challenges. These might span from targeted support for vulnerable households through housing allowances and homeownership incentives to the strategic expansion of social housing programmes and the strengthening of real estate market regulations to stabilise rental and housing markets, while increasing supply. Furthermore, while Greece's current social housing policy primarily relies on housing benefits, revising income criteria is essential for improving the efficacy of those programmes. Another option could be to normalise the real estate market through enhanced tenant protections (as in Sweden and Germany). Addressing supply-side issues includes offering long-term visibility on building rules and zoning regulations, simplifying real estate transfer procedures, as well as mitigating the impact of vacant housing and the short-term rental market or the effects from the Golden Visa programme, as evidenced by Portugal's recent policy changes. Other ways to deal with the issue could be via the collection and monitoring of rental lease data, as international examples demonstrate the effectiveness of robust lease agreement data collection; tax incentives for official registration of vacant properties or a tax thereon; and targeted tax reforms to stimulate rental market investment. Ultimately, housing in Greece represents a significant financial burden for many households, impacting their consumption, wealth accumulation and resilience to economic shocks. A comprehensive and balanced policy approach is therefore essential.

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APPENDIX

HEDONIC PRICING METHODOLOGY

The data from the Bank of Greece include detailed information on all types of residences (apartments and houses) for which there has been a mortgage application to a Greek commercial bank, from 2006 to 2023. To reduce the impact of extreme values, we follow the methodology of the Bank of Greece by removing properties smaller than 15 square metres and larger than 400 square metres. Additionally, from this specific sample, we remove observations below the upper limit of the 1st and above the 99th percentile, using the price per square metre as the criterion.

These data are analysed through hedonic pricing methods, which control for differences in sample quality over time and also remove temporal trends (Hill 2013 and Eurostat 2013, among others). Thus, we arrive at a price per square metre by prefecture, which is the estimator of the average price of the sample. Below, we present the hedonic price index methodology, which controls for changes in the sample, but also, as the indices are constructed exclusively for each prefecture (NUTS3), they allow for different covariate pricing.[i]

$$lnPS_{i,y,q} = \alpha_0 + \sum_{x=1}^{X} \beta_x X_{i,y,q} + \sum_{y=1}^{Y} \gamma_y Y_y + \sum_{q=1}^{Q=4} \delta_q Q_q + \varepsilon_{i,y,q}$$

where, for each property i in year Y_y and quarter Q_q, the dependent variable is the natural logarithm of the price per square metre $lnPS$. The adjustment initially takes into account the X characteristics of the residence, such as the type of residence, the floor and the year of construction. Regarding the vector X, the database contains a multitude of additional variables but we end up with a model without many explanatory variables of property characteristics, so as not to lose information from variables for which there is little data available. For the year of construction, we resort to a binary variable that groups observations that do not record a year of construction, so as not to lose almost 50% of the sample (147 thousand observations). Subsequently, the vectors of variables Y_y and Q_q are control variables for temporal trends for the year and quarter, respectively. The standard errors of the equation take into account heteroskedasticity but are also grouped by postal code to control for spatial autocorrelation.

In a second step, through the estimates of the coefficients, for each property i, the prediction of $\widehat{PS}$ is estimated, in average values for each independent variable:

$$ln\widehat{PS}_{i,y,q} = \hat{\alpha}_0 + \sum_{x=1}^{X} \hat{\beta}_x \bar{X}_{i,y,q} + \sum_{y=1}^{Y} \hat{\gamma}_y \bar{Y}_y + \sum_{q=1}^{Q=4} \hat{\delta}_q \bar{Q}_q$$

The property price index for each period and by prefecture ultimately results from the average of the adjusted estimated prices.

$$\widehat{PS}_y = {}^{1}/_{N} \sum_{i=1}^{N} \exp\left(\widehat{PS}_{i,y}\right)$$

i According to the typology of the European Union (NUTS3), the number of prefectures is 52.

AUXILIARY TABLES

Table A1 Structure of housing cost and disposable income variables

Housing Cost	Source	Level
First home loan instalment[1]	HFCS	Monthly (converted to annual)
Rent payment[3]	HFCS	Monthly (converted to annual)
Utility costs (electricity, water, gas, telephone, internet and television)[1,2,3]	HFCS	Monthly (converted to annual)
Fiscal fees (ENFIA)[1,2]	Bank of Greece	Annual (authors' estimates)
Disposable income		
Salaried employees	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Self-employed	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Public pensions	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Private pensions	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Unemployment benefit	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Other income		
Income from regular private transfers	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Financial assistance from relatives and friends	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Gross income from property rentals	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Gross income from financial investments	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Gross income from private business other than self-employment	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)
Gross income from other sources of income	HFCS – Bank of Greece	Monthly (converted to annual), Gross (converted to net)

1 Refers to owners with a mortgage for their primary residence.
2 Refers to owners without a mortgage for their primary residence who are not burdened with mortgage payments.
3 Refers only to households that rent the space they live in.

Table A2 Number of households by region and wave of the HFCS

	Survey wave	
	3rd wave – 2018	4th wave – 2021
Country total	3,007	3,338
Athens	936	1278
Eastern Macedonia and Thrace	163	190
Attica	218	249
Northern Aegean	90	105
Western Greece	157	139
Western Macedonia	67	54
Epirus	88	158
Thessaly	203	137
Thessaloniki	183	240
Ionian Islands	57	96
Central Macedonia	271	241
Crete	145	84
Southern Aegean	135	110
Peloponnese	129	170
Central Greece	165	135

Sources: HFCS, Bank of Greece, and IOBE calculations.
Notes: The table refers to the sample of households. Each household is assigned a weight, which scales the sample to the total population of households in Greece. The descriptive data, as well as the empirical analysis, include the weights of the households in their calculations.

Table A3 Annual disposable income of households by region and wave of the HFCS

(EUR)

	Survey wave			
	3rd wave – 2018		4th wave – 2021	
	Mean	Median	Mean	Median
Country total	14,681	13,039	16,573	14,400
Athens	15,058	12,792	18,671	16,800
Eastern Macedonia and Thrace	14,132	12,285	15,058	13,219
Attica	13,936	12,505	16,361	14,196
Northern Aegean	12,873	11,451	15,064	13,300
Western Greece	14,254	13,538	15,248	15,000
Western Macedonia	13,872	12,251	13,390	12,399
Epirus	13,902	11,612	13,840	12,343
Thessaly	16,713	15,069	17,441	15,624
Thessaloniki	14,526	12,701	16,098	13,802
Ionian Islands	13,461	11,880	15,792	14,000
Central Macedonia	12,444	10,910	15,593	13,864
Crete	17,701	15,469	17,666	15,142
Southern Aegean	12,886	11,928	17,378	13,344
Peloponnese	14,899	13,920	16,579	12,416
Central Greece	15,076	13,880	18,678	16,009

Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: With a view to reducing the variance of the sample and the effect of extreme values on the calculation of the affordability index, but also in order to maintain the same statistical treatment, observations falling within the bottom and top percentiles have been removed.

Table A4 Annual housing costs of households by tenure status, region and wave of the HFCS

(EUR)

	3rd wave – 2018				4th wave – 2021			
	Renters		Owners		Renters		Owners	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Country total	5,029	4,800	3,246	2,694	5,967	5,568	3,778	3,239
Athens	5,056	4,800	3,216	2,678	6,579	6,336	3,890	3,277
Eastern Macedonia and Thrace	4,595	4,800	3,435	2,744	5,236	5,040	3,347	2,727
Attica	5,381	5,400	3,069	2,612	5,929	6,000	3,746	3,229
Northern Aegean	4,256	4,260	2,607	2,503	5,114	4,800	2,875	2,639
Western Greece	4,466	4,440	3,624	2,757	5,138	4,800	3,376	2,779
Western Macedonia	4,517	3,600	3,839	3,226	4,885	4,656	3,212	2,637
Epirus	4,919	4,800	2,831	2,244	5,548	5,400	3,244	2,669
Thessaly	5,462	5,040	3,791	2,733	5,706	5,400	4,041	3,348
Thessaloniki	5,096	5,160	3,209	3,032	6,188	6,000	4,053	3,339
Ionian Islands	5,072	4,440	2,447	2,171	5,758	5,520	3,586	2,838
Central Macedonia	4,455	4,200	3,075	2,619	5,125	4,800	3,292	2,728
Crete	5,123	4,920	3,459	3,269	6,141	5,705	5,006	3,989
Southern Aegean	5,709	6,000	3,043	2,678	5,708	5,352	4,242	3,698
Peloponnese	4,973	4,800	2,983	2,578	6,201	6,000	3,657	3,262
Central Greece	5,405	5,760	3,009	2,613	5,585	5,400	3,513	2,705

Sources: HFCS, Bank of Greece, and IOBE calculations.
Note: With a view to reducing the variance of the sample and the effect of extreme values on the calculation of the affordability index, but also in order to maintain the same statistical treatment, observations falling within the bottom and top percentiles have been removed.

Table A5 Median housing consumption, measured in square metres of floor area, by survey wave and tenure status

	3rd wave			4th wave		
	Total	Renters	Owners	Total	Renters	Owners
Country total	81	70	86	85	70	90
Athens	77	65	80	80	70	85
Eastern Macedonia and Thrace	85	68	90	90	78	98
Attica	85	75	90	90	70	95
Northern Aegean	74	60	80	80	70	80
Western Greece	90	80	90	90	70	90
Western Macedonia	88	80	90	85	70	90
Epirus	82	70	98	80	70	85
Thessaly	90	75	96	100	80	108
Thessaloniki	75	70	77	75	65	81
Ionian Islands	75	70	85	90	68	100
Central Macedonia	85	70	90	80	70	85
Crete	90	65	90	80	64	82
Southern Aegean	80	75	80	80	58	85
Peloponnese	85	80	93	88	78	90
Central Greece	90	80	96	90	80	92

Sources: HFCS, Bank of Greece, and IOBE calculations.

Table A6 Descriptive statistics of explanatory variables

Variable	Observations	Mean	Standard Deviation	Min	Max
Demographic variables					
Age group	6,121	2.418	0.659	1	4
Marital status	6,121	0.596	0.491	0	1
Employment status	5,365	2.137	1.091	1	4
Education level	6,121	2.768	1.032	1	4
Household size	6,121	3.208	1.531	1	6
Housing status and expectations					
Housing status	5,448	1.539	0.834	1	3
Income expectations	5,897	1.765	0.473	1	3
Property price expectations	4,864	1.908	0.603	1	3
Financial variables					
Stocks/Bonds	6,121	0.009	0.097	0	1
Credit card outstanding balance	6,121	0.055	0.228	0	1
Consumer loan	6,121	0.055	0.228	0	1
Credit denial	6,121	0.014	0.118	0	1
Property prices					
Logarithm of property value per sq.m. (by Prefecture, NUTS3)	6,121	6.886	0.274	6.217	7.555
Macroeconomic variables					
Logarithm of GDP per capita (NUTS2)	6,121	9.701	0.272	9.278	10.056
Unemployment rate (NUTS2)	6,121	17.451	2.491	14.914	19.896

Sources: HFCS, Bank of Greece and Eurostat.
Note: The statistics listed in the table are weighted to the population.