European Commission

ISSN 2443-8022 (online)

Assessing House Prices: Insights from “Houselev”, a Dataset of Price Level Estimates

Jean-Charles Bricongne,
Alessandro Turrini and Peter Pontuch

DISCUSSION PAPER 101 | JULY 2019

EUROPEAN ECONOMY

Economic and Financial Affairs

European Economy Discussion Papers are written by the staff of the European Commission's Directorate-General for Economic and Financial Affairs, or by experts working in association with them, to inform discussion on economic policy and to stimulate debate.

Authorised for publication by Mary Veronica Tovšak Pleterski, Director for Investment, Growth and Structural Reforms.

LEGAL NOTICE

This paper exists in English only and can be downloaded from https://ec.europa.eu/info/publications/economic-and-financial-affairs-publications_en.

Luxembourg: Publications Office of the European Union, 2019

PDF ISBN 978-92-79-77438-6 ISSN 2443-8022 doi:10.2765/807 KC-BD-18-028-EN-N

European Commission
Directorate-General for Economic and Financial Affairs

Assessing House Prices: Insights from "Houselev", a Dataset of Price Level Estimates

Jean-Charles Bricongne, Alessandro Turrini and Peter Pontuch

Abstract

House price assessments relying on price indexes only have a number of limitations, especially if the available time series are short and series averages cannot be taken as reliable benchmarks. To address this issue, the present paper computes house prices in levels for 40 countries: all the EU countries and a number of other advanced and emerging economies. The baseline methodology makes use of information on the total value of dwellings in national accounts statistics and on total floor areas of existing dwelling stocks from census statistics. This top-down methodology simply consists of estimating the average house price per square metre dividing the total value of dwellings for the total floor area. For some countries, the information to carry out the baseline method is not available. In such cases, price level estimates are based on property advertisements on realtors' websites. A correction factor is applied to address the upward bias of prices asked by sellers as compared with transaction prices and improve cross-country comparability. House price level estimates make it possible to compute price to income (PTI) ratios yielding a clear interpretation: the average number of annual incomes needed to buy dwellings with a floor area of 100 m2. Using a signalling approach aimed at identifying PTI threshold that maximises the signal power in predicting downward price adjustments, it is found that a PTI close to 10 works as an across-the board rule of thumb for identifying potentially overvalued house prices. Moreover, when price levels are used in regression-based models to estimate fundamentals-based house price benchmarks, they allow us to exploit the cross-section variation in the data thereby providing additional insights compared with analogous benchmarks based on indexes.

JEL Classification: E01, R30.

Keywords: house prices in levels, national non-financial assets, value of the dwelling stock.

Acknowledgements: We thank for useful comments and discussions experts in DG ECFIN of the European Commission, Eurostat, IMF, Eurostat, OECD, national EU central banks and academia, in particular Mary Veronica Tovsak Pleterski, Stefan Zeugner, Jürg Bärlocher, Prakash Loungani, Denis Camilleri, Christophe André, Anne Laferrère, Lise Patureau, Anne Epaulard, Frédérique Savignac, Joyce Sultan-Parraud, Rui Evangelista, Aldis Rausis, Rita Petersone, Marc Ferring, Jana Supe, Gregg Patrick Cvetan Kyulanov Duncan Van Limbergen, Karl Pichelmann and participants to workshops at the European Commission, ECB, Autorité de Contrôle Prudentiel et de Résolution (ACPR), Banque de France, and Paris Dauphine University. We are deeply grateful to Alexandre Godard for his key contribution.

Contact: Jean-Charles Bricongne is affiliated to the Banque de France, Tours University, the Laboratoire d'Économie d'Orléans (LEO) and LIEPP and is the corresponding author (jean-charles.bricongne@banque-france.fr). This paper was prepared while Jean-Charles Bricongne was a national expert at the European Commission.

CONTENTS

LIST OF TABLES

LIST OF GRAPHS

1. INTRODUCTION

Assessing house price developments has become an integral component of macro-financial surveillance. Accordingly, the framework for macroeconomic surveillance in the EU was enriched in 2011 to include a procedure to prevent and correct macroeconomic imbalances (the Macroeconomic Imbalance Procedure, MIP) which also has among its aims also the identification of potential risks linked to house price developments.

The housing sector is not only an important component of the transmission channels between the credit and the business cycle and may act as a propagation mechanism for shocks (e.g. Kiyotaki and Moore, 1997), but it can also play a key role in the origin of financial crises. Housing markets can be subject to bubbles, with house prices developments becoming disconnected from the fundamental drivers of housing demand and supply, and driven by expectations that are self-fulfilling up to the point when events occur that lead agents to suddenly revise their expectations and behaviour (e.g., Case and Shiller, 1989; 2003). The bursting of housing bubbles can be associated with sharp and major corrections of prices, leading to mortgage distress and deterioration in the quality of banking sector balance sheets. Banking sector bankruptcies are generally followed by deep and long recessions, and the weakening of banks' balance sheets may imply subdued credit growth and very protracted slumps in economic activity.([1])

The analysis of house prices from a macroeconomic perspective normally makes use of house price indexes only. While the analysis of index numbers makes it possible to assess price dynamics for a single economy, cross-country comparisons can be problematic. Such a drawback implies a substantial limitation in the use that can be made of house price data, the information that can be extracted and the conclusions that can be drawn.

Despite house price indexes only allow measuring *changes* in the underlying variable (a direct comparison of levels is impossible because values in base years differ across countries), these data are often used to compare the housing market situation of different countries and make indirect inference on levels by means of measures of "valuation gaps", i.e., percentage differences between actual and benchmark house price indexes, with benchmarks obtained from price-to-income or price-to-rental ratios, or from prediction using regressions capturing relevant economic fundamentals that explain house prices (among recent cross-country work see e.g., Girouard et al., 2006; Gros, 2008; Gattini and Hiebert, 2010); Dokko et al., 2011; Agnello and Schuknecht, 2011; Philiponnet and Turrini, 2017; Igan and Loungani, 2012; Knoll et al., 2017).

However, the use of valuation gaps built from house price indexes has however a number of limitations. First, in the presence of short time series valuation gaps may have limited reliability. Price-to-income and price-to-rent ratios are supposed to remain stable over the long-term, to ensure, respectively, the affordability of housing, and the absence of relevant arbitrage opportunities between renting and owning a house. The percentage difference of these ratios from their long-term country-specific average are therefore used as valuation gaps, and when compared across countries, could provide information on cross-country differences in house price misalignments. Benchmarks built as long-term averages of price-to-income or price-to-rent ratios build on the assumption that such ratios are broadly stationary and mean reverting over a sufficiently long time span. However, if the available time span for house price index time series is short, these benchmarks may have limited representativeness. Second, there could be serious issues of cross-country comparability if time series length varies largely across countries because this affects the representativeness of long-term

([1]) In the same vein, in a period of loose monetary conditions, booms in real estate lending and house prices' bubbles are more likely to happen and heighten the risk of financial crises (Jorda et al. (2015)).

averages used as benchmarks and their comparability. A similar reasoning applies to regressions based benchmarks estimated at country level.

It must be added that in cross-country comparisons, information on *levels* matters because of two main reasons. First, levels make it possible to check in the cross-section the relation between house prices and fundamentals. Second, levels make it possible to gauge the extent to which arbitrage limit large discrepancies in house price valuations across different locations, since differences in the cost of housing services are taken into account both by households and firms in their location decisions.([2])

Motivated by the limitations of house price indexes in performing cross-country comparisons, the aim of this paper is to build a database of estimates of house price data in levels for a number of advanced and middle-income economies according to harmonised criteria, and to assess their properties and the analytical insights provided as compared with those yielded by standard house price indexes. With a view to having country coverage providing insights into multi-country surveillance, all countries in the European Union are included in the database, as well as most OECD countries and a number of non-EU emerging economies (Australia, Canada, Hong Kong, Iceland, Japan, New Zealand, Norway, Russia, Korea, Switzerland, Turkey and US).

A total of 40 countries are included in this database of house price level estimates, dubbed as *HouseLev*. Years of reference depend on data availability and differ across countries, with the earliest and the most recent years being, respectively, 2001 and 2016, and 80% of countries having observations for years between 2009 and 2014. On the basis of existing house price index numbers, entire series which are cross-country comparable are subsequently constructed and analysed.

Unlike existing work aimed at building house price data in levels (e.g., Dujardin et al., 2015), this paper uses a baseline top-down methodology which simply consists of estimating the average house price per square metre dividing the total value of dwellings for the total floor area. Hence, this method builds price level data on the basis of the prices recorded in actual transactions rather than on the basis of prices asked by owners and reported by realtors, which limits the risk of overvaluation. The sources used for the total value of dwellings are generally national accounts or more directly transaction data; the sources used for the total floor area are generally census data. In some cases, what is available is individual transaction data rather than information on the aggregate value of dwellings. In such cases, estimates of average price levels have been constructed.

With a view to ensure sufficient country coverage, in the cases where the baseline estimation method cannot be implemented due to missing data, estimates are obtained using a fall-back methodology based on property advertisements made public on the websites of real estate agents and constructing price averages at sub-regional level subsequently turned into country-level averages. By estimating price levels using both the baseline and the fall-back methodology for a number of countries it is possible to compute the median level of upward bias arising from the use of property advertisements rather than transactions and use this as a correction factor to improve comparability of price level data obtained with the two methods. A number of robustness checks of the estimated price are performed to assess how the results would be affected by using alternative data sources and valuation methods, notably available estimates of price level data obtained by means of survey data.

We show that the availability of a multi-country dataset of house price in levels makes it possible to gain insights into the assessment of housing market conditions. Price-to-income ratios with a clear

([2]) See, e.g., Borck et al. (2010) for a theoretical framework. As shown in Alun (1993) for the UK case, active non-job movers and retirees are influenced in their destination choices by regional house prices. Location decisions in turn have implications for the housing market, with house prices increasing in the long-run by 0.6% in response to a 1% increase in economic activity (Adams and Füss, 2010).

interpretation have been constructed and used to identify rule of thumb thresholds that maximise the signal ratio for the risk of sudden downward correction in house prices. The paper also shows that the conclusions about possible overvaluation using data in levels are not always closely aligned with those obtained by relying on valuation gaps constructed using house price indexes.

The remainder of the paper is organised as follows. The next section presents the methodology followed for the estimation of house price levels. Section 3 presents the results. Section 4 presents the implications for the assessment of house price levels. Section 5 concludes.

2. COMPUTING HOUSE PRICES IN LEVELS

2.1. INTRODUCTION

House prices in levels have been so far estimated using alternative methods, each presenting a number of drawbacks. Ideally, estimates based on individual real estate price data should make use of transaction prices. However, such information is seldom available and, if available, is not always representative of house price levels at the national level. As a fall-back approach, data on property advertisements published by real estate agents have been used (e.g., Dujardin et al., 2015, or Kholodilin and Ulbricht, 2015). The drawback with this approach is that it leads to some degree of upward bias as compared with prices resulting from actual transactions, and that such bias may not be equally strong in different countries. Another alternative is to draw on surveys, such as the Eurosystem HFCS survey, where individuals are directly asked about the value of the properties they occupy.([3]) The problem related to this approach is that the information stems from households' subjective assessment of the value of owned or occupied dwellings; an assessment that may not necessarily reflect current housing market conditions.

This paper takes a straightforward approach to the estimation of house prices in levels as the main method used. The baseline estimate of the average price of dwellings per square metre consists of the ratio of the aggregate value of dwelling assets (including underlying land) held by the total economy, to the estimated total floor area of dwellings. The source of the needed information are generally national accounts and censuses.

As information on housing stock value and floor area is not available for all EU countries and for a small number of non-EU countries included in the 40 countries sample considered, a fall-back method is also employed, based on prices asked by sellers published on realtors' websites. Although prices from property advertisements contain an upward bias as compared with prices of actual transactions, this method is expected to be superior to the only alternative, namely relying on available surveys, because surveys hardly reflects faithfully current market valuations.([4])

([3]) See box "Dwelling Stock in the euro area - new data from the Eurosystem Household Finance and Consumption Survey", pp. 51-55, in the July 2013 ECB Monthly Bulletin: https://www.ecb.europa.eu/pub/pdf/mobu/mb201307en.pdf).

([4]) The HFCS covers euro-area countries plus a few others. The questions relate to wealth, including housing assets, and surface of main dwelling. The calculation can only be made with owner-occupiers. There may thus be a bias when their proportion is low and when the value of their assets is not representative for the whole population. Besides, a corrective factor is included in the sample to correct for possible mis-representation of wealthiest households, with methods that may vary from country to country. Surveys other than the HFCS are available, but their coverage is generally less complete, using for example information from banks, meaning that only transactions made with credit are included. An exception is the survey "Real Estate Agencies", performed by the NSI of Estonia, which provides a good national coverage.

2.2. BASELINE TOP-DOWN ESTIMATES: AVERAGE PRICE PER SQUARE METRE FROM NATIONAL ACCOUNTS AND CENSUSES

The average price per square metre *p* is obtained as:

$$p = \frac{P}{F} = \frac{\sum_{i=1}^{n} f_i * p_i}{\sum_{i=1}^{n} f_i}, \quad (1)$$

Where *P* is the *total value of dwellings*, which is obtained as the aggregation of the market price per square metre p_i for each dwelling *i* times the floor area of dwelling f_i, while *F* is the total floor area in the economy, obtained from the aggregation of the equivalent useful floor area of each dwelling.

P is available from national accounts for most European countries. National account-based data for *P* in the present paper are provided from OECD whenever available; as an alternative, the source is national statistical institutes. For the countries for which national account-based information is not available, data on *P* have been estimated in ad-hoc studies by central banks or national statistical institutes or calculated using transaction data.([5]) The baseline method has been used for most EU countries and more than 80% of the countries in the sample.

The valuation of dwellings is based on market prices derived most of the time from official sources (such as the land registry when updated with market prices) or from professional bodies (typically surveys with realtors). When surveys are used in national accounts, their scope and coverage are usually substantially higher than most alternative sources aimed at estimating house prices, such as the HFCS.

The data used in the present paper for *F* are from Eurostat for EU countries whenever available, or, alternatively, either from national censuses or, from an ad-hoc survey on housing conditions. In both cases, the definition of floor area is harmonised, and corresponding to the notion of *useful floor area* (see Annex 5 for definitions).([6]) For countries outside Europe for which the concept of floor area is a different one, corrective conversion factors are applied to ensure homogeneity with the useful floor area concept (see Annex 1 for values of floor areas and Annex 2 for conversion factors).([7])

For some countries the value of dwellings and associated land is available at the level of the total economy. However, for the majority of countries, national accounts report both the value of dwellings and that of the associated land for the household sector only, while for the rest of the economy the value of land is not reported. To make it possible cross-country comparability in the value of *p*, whenever for one country the value of land for the rest of the economy is not reported, it

([5]) However, survey data, mainly the HFCS survey from the Eurosystem, is used, as well country-specific surveys and ad-hoc studies to countercheck results and assess robustness with respect to alternative methods. Sources are the OECD, for the few countries that send these data to this institution, otherwise statistical institutes, central banks or other sources (usually working papers from these latter two institutions that perform a punctual assessment of housing assets). When available, the figures obtained from these sources are compared with the ones displayed in the WidWorld database (Facundo Alvaredo, Anthony B. Atkinson, Thomas Piketty, Emmanuel Saez, and Gabriel Zucman, The World Wealth and Income Database, http://www.wid.world/#Database) which is an international network of over ninety researchers that aims at covering wealth and income data for a number of developed or emerging countries. The results are most of the time consistent.

([6]) For EU countries, irrespective of the source used, to ensure harmonised figures corrective factors are applied to be consistent with harmonised Eurostat figures (see Annex 2).

([7]) The conversion factors are those used in the TABULA project ("Typology Approach for Building Stock Energy Assessment", TABULA Calculation Method – Energy Use for Heating and Domestic Hot Water- Reference Calculation and Adaptation to the Typical Level of Measured Consumption, see page 28:http://episcope.eu/fileadmin/tabula/public/docs/report/TABULA_CommonCalculationMethod.pdf).

is estimated using the assumption that the value of dwellings and that of the associated land are in the same proportion in the household and the non-household sector. Usually, this hypothesis appears reasonable as households hold the vast majority of dwelling assets (usually more than 85%, see Annex 1, Table A1.3).

For Luxemburg and Malta, the total value of dwellings is not directly available from national accounts and has been estimated on the basis of official transaction data and censuses.([8]) For France and Ireland, transaction data have been used as an additional source and are consistent with the results from housing assets. Czechia, Hungary, Hong Kong and New Zealand also display direct estimates derived from transactions data.

The baseline estimation approach has a number of advantages. First, the price level estimate is based on a large sample, thus overcoming possible sample biases of estimates based on surveys. Second, the average prices per square metre reflect market transactions rather than prices asked by sellers, the latter being likely biased upward (though the bias remains limited as shown in Table 3.2). Third, the aggregation of prices into a single indicator is obtained on the basis of the number of existing dwellings, thus overcoming the limitation of estimates based on sale offers, which reflect housing market turnover which is normally higher in large urban areas.

2.3. FALL-BACK METHOD: PROPERTY ADVERTISEMENTS FROM REAL ESTATE AGENTS' WEBSITES

For a number of countries in the sample the baseline method could not be implemented because of lack of available data. This is the case for Bulgaria, Estonia, Croatia, Cyprus, Latvia, Romania and Turkey. Calculations based on property advertisements from realtors' websites have therefore been carried out for these countries. Calculations using the fall-back method have been performed also for a number of countries for which estimates based on the baseline approach are available with a view to assess the extent of the upward bias associated with the fall-back methodology and apply a correction factor for such bias. These countries are Ireland, Greece, Lithuania, Luxemburg, the Netherlands, Austria, Poland, Portugal, Slovenia, Slovakia, Finland, Sweden, Switzerland and Iceland. Results derived more directly from real estate agents are also available for Belgium, Germany, Spain, France, Italy (see Dujardin et al., 2015), jointly with the baseline method.

The price estimate used for the fall-back method follows a two-step approach. First, the average price per square metre p_g across a number of dwellings i is computed for a given geochartical location g,

([8]) The algorithm employed is described in equations (2) and (3).

$$p_g = \frac{\sum f_{i \in g} * p_{i \in g}}{\sum f_{i \in g}}, \quad (2)$$

where f_i is the area of the dwellings and p_i their price reported on websites from real estate agents. Second, an overall national-level price is computed from the average price of dwellings in each geochartical location

$$p = \frac{\sum_{g=1}^{G} f_g * p_g}{\sum_{g=1}^{G} f_g}, \quad (3)$$

where the weights f_g represent the total floor area of dwellings in each geochartical location as reported in most recent available census data.([9])

Data from realtors' website have been collected via web scrapping algorithms for what concerns both price and floor area.([10]) In order to ensure that the data collected are sufficiently representative, following the rule of thumb in estimations of house price levels from transaction data (for example for France or Ireland), the number of observations collected for each country should correspond ideally to around 1% of the total stock of dwellings present in the country or at least of few tenths of percent. The degree of geographical disaggregation at which price levels p_g are computed differs across countries and depends on the level of disaggregation at which census data on floor area are available. For all the countries analysed, disaggregation is at regional level as a minimum, and where possible at sub-regional level, i.e., at the level of counties or main metropolitan areas.([11]) We checked that the information collected does not over-represent prime dwellings, and that the information on surfaces provided is consistent with the concept of useful floor area based on law or common practice. It is also checked that average and median floor areas are consistent with aggregate results from Eurostat. Details of estimates from sale offer from realtors' websites are reported in Table A3.1 in Annex 3.

([9]) In calculating average prices by area (municipality, department, region) prices are added up and divided by the sum of floor areas, as opposed to arithmetic averaging to limit the weight given to small surfaces.

([10]) The data so obtained have been cleaned from duplications and outliers. Typically, surface areas under $5m^2$ or above $2000m^2$ have been deleted, and also prices in levels which were too low or too high. Observations which had in common the same location, the same price and the same surface, being potential duplications of the same good, have also been deleted. Keeping them in an alternative approach would induce a limited difference though.

([11]) To ensure a homogenous representation of all geographical locations for which average prices are computed, it is made sure that a minimum number of prices and floor areas are collected for each location (in no case, even at the smallest locations, not inferior to 5).

2.4. CROSS-COUNTRY COMPARABILITY AND CAVEATS

The presence of two alternative methodologies for the computation of house price levels raises the issue of cross-country comparability within the *HouseLev* database. Such comparability is imperfect in light of the expected upward bias associated with prices posted by sellers as opposed to transaction data. Comparability is therefore improved by scaling down price level estimates obtained with the fall-back method based on property advertisements by a factor representing an estimate of the upward bias associated with this methods as compared with baseline method based on transaction data. We can compute such upward bias by carrying out estimation of price levels with both methods for a number of countries. The cross-country median of the computed bias (equal to 7%, see Table 3.2), is used as correction factor.

One limitation of the price level estimates in *HouseLev* is that price levels are not adjusted for quality differences across countries. Ideally, the comparison across countries should be limited to dwellings of similar quality, as house quality can differ across countries and such differences contribute explaining price differences. Such a limitation is however common to methodologies to estimate house price levels.([12]) A further limitation is that the absence of the value of land for the non-household sector could raise an issue of comparability across countries. The issue appears nonetheless of limited relevance, as dwellings held by sectors different from households are a minority (only two countries out of the 26 for which this information is available in Annex 1 have a fraction of dwelling assets held by households that is well below 80%) and price levels obtained by alternative methods and sources are very strongly correlated with those computed with the baseline method.

Finally, figures of average floor area that are used for the estimates of *F* cover in general occupied dwellings only. If unoccupied dwellings (second homes) are of a smaller surface area compared with those that are occupied, a downward bias may arise as the total value of dwellings covers also unoccupied ones. When information is available on the average difference in floor area for occupied and unoccupied dwellings the indication is that such difference is quite small, which suggests that, if bias is present, it is likely to be of a limited magnitude. ([13])

([12]) A further apparent limitation is that dwellings may not be of domestic ownership, knowing that in national accounts, the criterion for recording an entity is the one of residence, not the one of nationality. Hence, by dividing dwelling assets by total floor area, including the one held by non-residents, there may be a discrepancy between the perimeter of numerator and denominator. However, the treatment of non-financial assets in national accounts is such that dwellings located on a given territory and held by non-residents are considered as the granting of a service of housing by a (fictive) residential unit. This treatment is consistent with ESA2010, which states in its Part7.06: "The rest of the world balance sheet is compiled in the same manner as the balance sheets of the resident institutional sectors and subsectors. It consists entirely of positions in financial assets and liabilities of non-residents vis-à-vis residents […]". Hence, total floor area includes all dwellings inside the country, whatever the owner.

([13]) In the case of Italy, for example, the difference of average floor area covering all dwellings or only occupied ones is only a few percent (see Cannari and Faiella (2008)). When an information is available that enables to have a figure for all dwellings and not only occupied ones (IT or AT), it is taken into account.

3. RESULTS

The price levels obtained from the application of the baseline method are reported in Table 3.1, which also reports information on the year of reference, the total value of dwellings and their surface. Using the level calculated for a given year, time series of price data in levels can be constructed using the available price indexes (the sources used being Eurostat). As a complement to further extend the time dimension, OECD and BIS data have also been used.([14])

Table 3.1 reports all price level estimates in euro obtained using both the baseline method and the fall-back method for the same year, namely 2016. It turns out that when both prices obtained with the baseline and with the fall-back methodology are available for the same country, discrepancies between the two estimates are usually moderate despite the expected upward bias of estimates based on sale offers. In no case, percentage differences exceed 12% (see Graph 3.2).

The comparison of price level estimates obtained with the different approaches, baseline vs. fall-back, is further illustrated in Graph 3.1, that reports price level estimates in log scale. This finding suggests that, although cross-country comparisons within the *HouseLev* database need to take into account heterogeneous estimation approaches, comparability issues remain relatively limited.

([14]) Since indexes control for quality changes, time series obtained starting from a level in a given year will show levels with a quality corresponding to the one of the basis year, which may be different between countries.

Table 3.1: **Price level estimates: results from the baseline method**

Country	Year	Total value of dwelling assets, in (billion national currency) (1)	Equivalent useful floor area (million m²) (2)	Price level estimate (3)=(1/)/(2)	Prices levels obtained from data on transactions (national currency) (4)
			EU countries		
BE	2011	1178.9	608.5	1937.2	
CZ	2011	6105	371	16455.5	17149.8 (NSI/Ministry of Regional Development)
DK	2011	4536.1	341.1	13298.8	
DE	2011	6267.3	3894.6	1609.2	
IE	2006	509.1 (a) (b)	120.3	4231.1	4246.7 (own calculation)
EL	2001	572.4 (a)	462.1	1251.4	
ES	2012		2447.8	1517.7 (c)	
FR	2012	8104.2	3109.9	2605.9	2564.2 (own calculation)
IT	2011	6244.8	2996.7 (d)	2083.9	
LT	2011	42.2	87.8	481.2 (e)	
LU	2016				4371.3 (own calculation)
HU	2011				155269.3 (NSI)
MT	2012				1017.3 (own calculation)
NL	2011	1796.4	815.6	2202.6	
AT	2011	754.8	401.8 (d)	1878.5	
PL	2012	2951	1022.7	2885.6	
PT	2011				1111.7 (own calculations based on NSI data)
SI	2014	75.8	69.4	1092	
SK	2011	110.5	174.4	633.5	
FI	2012	401.7	254.3	1579.7	1556.5 (Tax Administration)
SE	2013	7687.8	444.8	17282	
UK	2011	4281	2521.2	1698	
			Non-EU Countries		
AU	2006	3501.7	780.7	4485.2	
CA	2011	4096.7	1550.7	2641.8	
HK	1997	4125.5 (g)	30.9	133511.3	139084.6 (NSI)
IS	2016	4188.9	17.1 (f)	244703.6	
JP	2013	988231.2	5638.5	175263.4	
NZ	2010	602	155.5	3871.4	3669.6 (Real Estate Institute)
NO	2011	5215.3 (d)	281.6	18518.1	
RU	2012	115204.7	2631.4	43781.5	
KO	2010	2765008.8	995.6	2777268	
CH	2013	2484.1 (a), OECD	477.3	5204.8	
US	2009	22764.2	17672.6	1288.1	

(1)"NSI" stands for "national statistical institute". (a) The figure for total value of dwellings relates to holdings by households. When the holdings are those of households, they are corrected to have the corresponding figure for the whole economy; (b) In the case of IE, the total value of dwelling is based on estimates from Cussen and Phelan (2011); (c) The average price of dwellings for ES is directly available from "Ministerio de Fomento"; (d) For IT and AT, the surface of all dwellings including unoccupied ones has been used and NO includes a correction for secondary dwellings; (e) For LT, prices for dwellings are directly obtained from State Enterprise Centre of Registers and total assets are recalculated on this basis. They are based on Sabaliauskas (2012); (g): In the case of Hong Kong, the result from the Hong Kong Monetary Authority (2001) for the private residential sector is consistent with a more recent alternative source (average transaction price from NSI), which is the one used.(f) The figure is obtained multiplying 128,710 dwellings (reported by Registers Iceland https://www.skra.is/library/Samnyttar-skrar-/Fyrirtaeki-stofnanir/Fasteignamat-2017/Fasteignamat%202017%20FRTKL.pdf)), by the average useful floor area calculated from census data 2011 (132.9 m2), supposing the average floor area did not change between 2011 and 2016 (a likely assumption, being the average floor area from the fall-back method in October 2017 equal to 134 m2).

Source*:* See Table A1.1 for the sources and valuation methods used for the total value of dwelling assets. To calculate the total floor area, the number of dwellings of related year has been multiplied by the closest estimate of average surface area from census or from an ad-hoc 2012 HC020 Eurostat module on housing conditions. See Annex 1 and Table A1.2 for the sources used for total floor areas.

Table 3.2: **Price level estimates: results from the baseline method and from the fall-back method, price per square metre in euro, year 2016.**

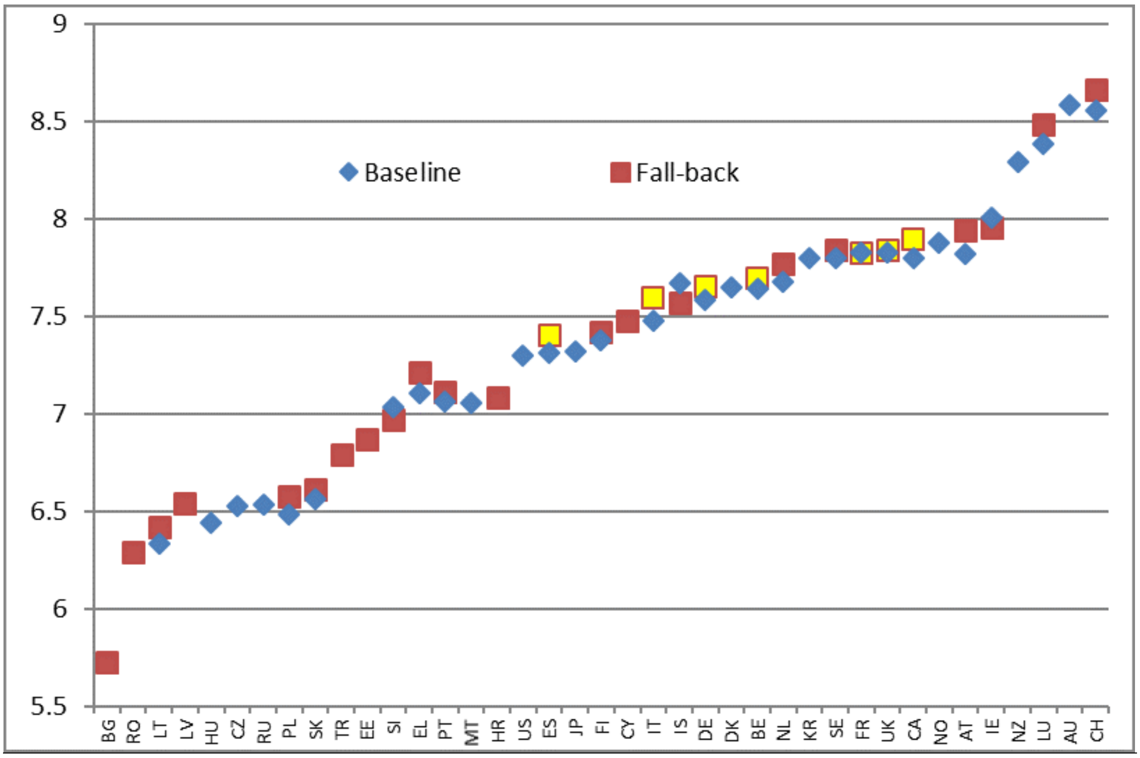
	Baseline price level estimate: national accounts and census (1)	Fall-back price level estimate property ads from real estate agents' websites (2)	Discrepancy (2)/(1)	Fall back price level estimate correcting for the median discrepancy between (2) and (1)
		EU countries		
BE	**2079.6**	2195.3 (f.i.)		
BG		306.8		**286.7**
CZ	**685**			
DK	**2101.1**			
DE	**1965.2**	2111.5 (f.i.)		
EE		965.9		**902.7**
IE	**3001.1**	2845.7	0.95	2659.5
EL	**1218.4**	1360.4	1.12	1271.4
ES	**1499.4**	1643.2 (f.i.)		
FR	**2503.5**	2504.5 (f.i.)		
HR		1195.4		**1117.2**
IT	**1763.8**	1983.5 (f.i.)		
CY		1769.2 (a)		**1653.5**
LV		694		**648.6**
LT	**565**	615.1	1.09	574.9
LU	**4371.3**	4828.9 (b)	1.1	4513
HU	**628.2 (e)**			
MT	**1159.2 (e)**			
NL	**2164**	2354.7	1.09	2200.7
AT	**2498.5**	2805.5	1.12	2622
PL	**653.3**	716.8	1.1	669.9
PT	**1166.5**	1226.1	1.05	1145.9
RO		541.9		**506.4**
SI	**1136.6**	1061.4	0.93	992
SK	**709.1**	744.9	1.05	696.2
FI	**1602**	1674	1.04	1564.5
SE	**2432**	2541.3	1.04	2375
UK	**2500.8**			
EA-19	1966.7 (g)			
		Non-EU countries		
AU	**5351.5**			
CA	**2442.1**			
CH	**5190**	5775.6	1.11	5397.8
HK	**29836.3** (c)			
IS	**2148.6**	1945.3	0.91	1818
JP	**1510**			
KR	**2438.5**			
NO	**2640.7**			
NZ	**3977.1**			
RU	**686.7** (d)			
TR		890.1		**831.9**
US	**1474**			

(1)"NSI" stands for national statistical institute. Bold values are the ones retained for HouseLev. Figures are converted in euros for 2016 and the surface of census is for main dwellings only. Unless otherwise stated, calculations are performed harmonising for floor area to be consistent with the concept of useful floor area.
(a): for Cyprus, the median value has been retained instead of the average due to possible overrepresentation of premium goods, at least in Limassol district.
(b) Data are from Observatoire de l'Habitat, LISER.
(c) For HK, the transaction price by class of saleable area from the NSI, combined with corresponding stock of dwellings has been retained instead of the one from housing assets because the latter is based on a 1997 figure. The two estimates are quite close though (discrepancy around 4%).
(d) For Russia, the main figure comes from ROSTAT (2014) and WidWorld database and is consistent with an alternative source, Tsigel'Nik (2013), harmonising for floor area.
(e) For HU and MT, the figures come from calculations based on transactions.
(f.i.) For information, the figures based on realtors', from Dujardin et al. (2015), updated with Eurostat indexes.
(g) Combining information from EA countries. An estimate of 1932.7 is provided in Balabanova and van der Helm (2015).
(2) Results for the euro area can be obtained using two different sources, either combining results from individual euro area Member States or using the results from Balabanova and van der Helm (2015). The two methods give very close results (1966.7 and 1932.7€/m2 respectively) and confirm the consistency of national figures.
Source: See Table A1.1 for method and sources regarding prices computed according to the baseline method. See Annex 3 and Table A3.5 for methods and sources regarding prices computed from property ads on real estate websites. Data are extrapolated to obtain the series on the basis of house price indexes from Eurostat complemented with OECD and BIS.

Furthermore, comparing price level estimates obtained with the two methods with further available estimates from surveys, it appears that: (i) figures from surveys do not present a specific bias with respect to the baseline approach; (ii) the average difference in absolute value between prices from surveys and figures obtained with the baseline method (12.3%) is higher than the average difference between prices obtained with the baseline and the fall-back approach (equal to 7.6%, see Graph A4.1 in Annex 4).

Although the upward bias present in estimates obtained from the fall-back method using information from property advertisements appears rather limited, to limit cross-country comparability issues, the prices obtained by means of the fall-back approach based on property advertisements and included in the *HouseLev* database are scaled down by a factor equal to the *median* percentage difference of house price levels obtained with the baseline and the fall-back method (equal to 7%). The estimates reviewed and used in *HouseLev* and in the subsequent analysis are treated with this correction.

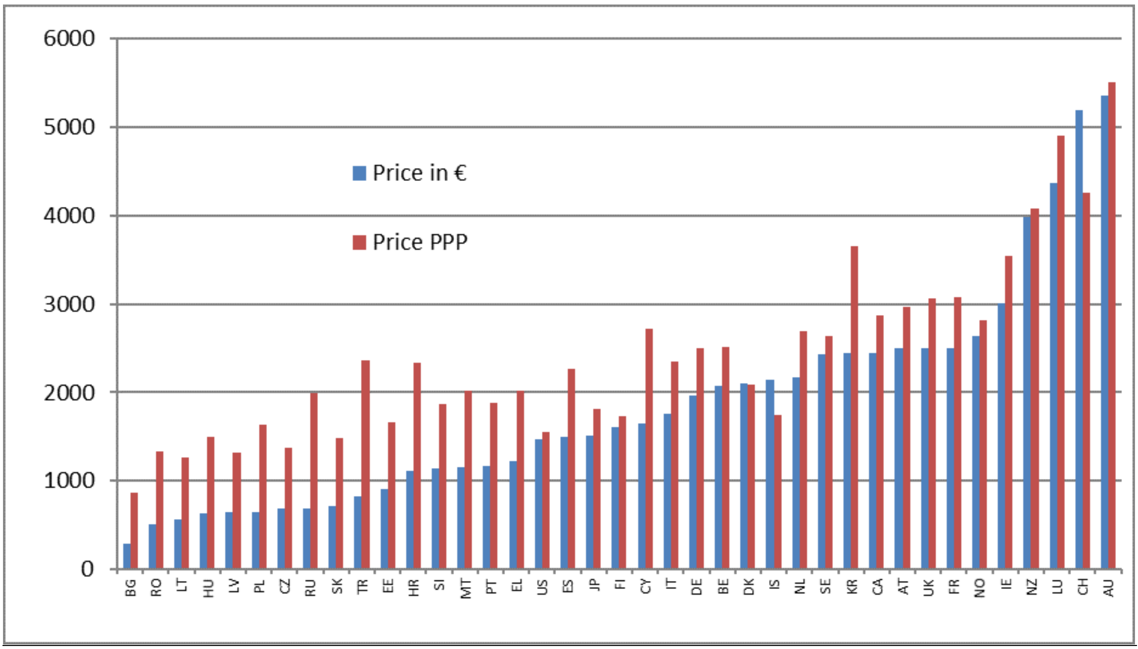
Graph 3.1: **Prices level estimates in euro per sqm; baseline and unadjusted fall-back method, log scale, 2016**



(1)Prices are in euro and in logarithm. A difference of 0.1 point between two sources means a difference by 10%. HK is not represented, because it would be out of scale and has only one source anyway. Realtors' data for BE, DE, ES, FR and IT are from Dujardin et al. (2015) and for UK and CA are directly from realtors and are represented in yellow.

Source: See Table 3.2.

Graph 3.2: **Price level estimates in HouseLev: prices per sqm in 2016, in € and in PPP (purchasing power parity, PPP=1 for the US)**



(1)Countries are ranked by increasing order with respect to price in euro. Hong-Kong is not reported on the Graph because its price level would be out of scale.

Source*: See* Table 3.2.

Cross-country comparisons of house price levels including the baseline and the adjusted fall-back method are reported in Graph 3.2. Values are reported both in euro and in PPPs converted into current euro, for 2016.

The house price levels reported in Graph 3.1 are interpreted as the average of house dwellings price per square metre in different countries at the same point in time. House price differences across countries appear to broadly reflect differences in per-capita income. Differences range from values around 300 €/m^2 in Bulgaria up to more than 5000 €/m^2 in Australia in 2016. A number of Eastern European countries display house price levels at the bottom of the cross-country ranking, while particularly high prices are recorded in Hong-Kong (which is not reported in the Graph being an outlier with prices above 30000 €/m^2), Luxembourg, Switzerland and New Zealand. Rankings are not much altered when using PPP converted data.

4. ASSESSING HOUSE PRICES USIND DATA IN LEVELS

4.1. PRICE TO INCOME RATIOS

A prima-facie assessment of house prices is to relate them to households' income, with a view to comparing housing affordability across countries. Unlike house price indexes, which do not allow cross-country comparisons in price-to-income (PTI) ratios, but only comparisons of deviations from country-specific benchmarks (generally long-term averages), price level data allow for direct comparisons.

We compute PTI data from *HouseLev* as the ratio between the monetary value of 100 square metre house dwellings and yearly disposable income of households. *The ratio so obtained can be interpreted as the number of years of income needed to buy a 100 square metres dwelling.* These PTI ratios thus make it possible to define benchmarks in time series and also across countries, as shown in the following sections.

To calculate the PTI ratio, the concept of income used is per-capita gross disposable income of households (see definitions in Annex 5). This measure is preferred to GDP per capita because the proportion of GDP that is converted into household's incomes may fluctuate, especially for small open economies.

The results are displayed in Graph 4.2.1. A number of remarks are as follows.

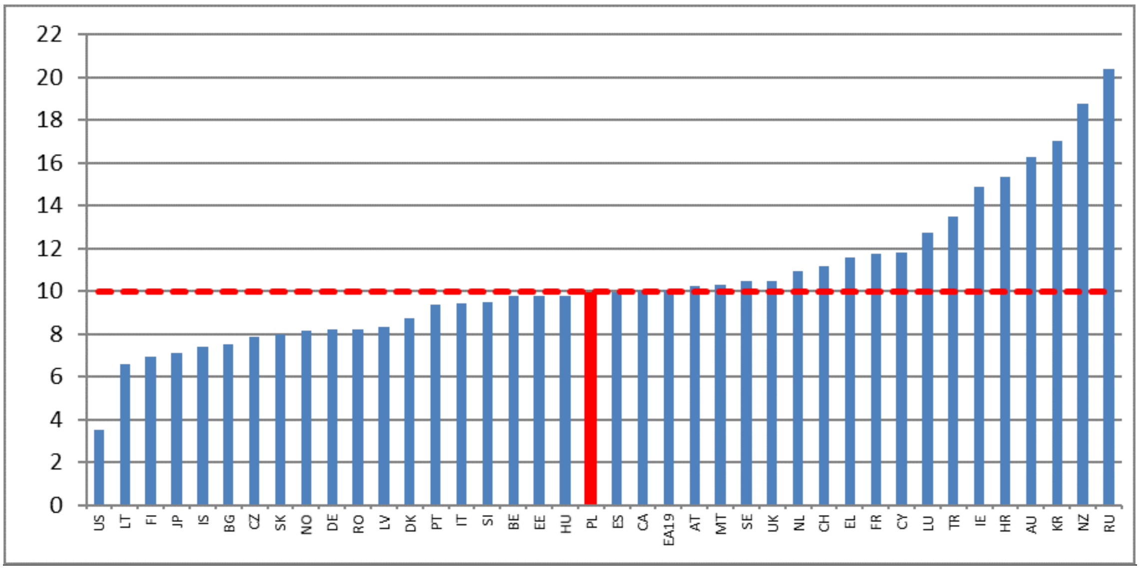
First, PTIs exhibit quite a wide variation across the countries included in the sample, with the number of years of income to buy a 100 square metre house ranging from below 4 years for the US up to around 20 years for Russia.

Second, despite such variation between maximum and minimum PTI ratios, for a majority of countries the PTI ratio is not far from the median value, which is close to 10; a majority of countries have PTI ratios between 8 and 12.

Third, PTIs display only a weak relation with income per capita, despite housing being generally considered a superior good, with prices reacting more than proportionally to income. This suggests that in the cross section there are other relevant factors that contribute to differences in PTI.

Fourth, PTI cross-country differences obtained from data in levels generally appear to be related to differences in PTI deviations from country-specific averages from price index data, but with exceptions. For instance, high PTI deviations that are generally found for Sweden and the UK (e.g., Philiponnet and Turrini, 2017) do not correspond to particularly high PTI ratios obtained from level data. Comparatively high PTI results are instead obtained for countries like Ireland or Croatia for which recent valuation gaps based on price to income obtained from price indexes are moderate of negative.

Graph 4.1.1: **Price-to-income ratios (number of yearly incomes required to purchase a 100 m2 dwelling), 2016.**



(1)Hong-Kong is not reported on the Graph because its PTI would be out of scale. The median value is signalled in red and is the one of Poland. The reference value of 10 years of income for PTI (see part 4.2) is signalled in red and with dashed line.
Source: See Table 3.2.

4.2. WHAT PRICE INCOME RATIO SIGNALS FORTHCOMING PRICE CORRECTIONS?

Prices in levels allow cross-country comparisons and permit to check which countries are at higher risk of being concerned by affordability constraints and downward corrections. But what is the level of house prices above which major downward corrections become likely? To answer this question, thresholds for the price to income ratios are estimated using a signalling approach. The aim of the analysis is to identify a threshold value for the PTI ratio above which price corrections become likely.

For a given value of this threshold, four cases may occur at each point in time (Table 4.2.1): (i) a false alert– the variable is above the threshold but no "crisis" occurs; (ii) a true positive signal is issued – the breach of the threshold is accompanied by a crisis; (iii) a true negative signal – the variable remains within the threshold and no crisis occurs; and (iv) a crisis is missed – the variables stays within the threshold but a crisis occurs. For a given indicator, each possible threshold is therefore associated with a number of false alarm (FA), when positive signals are issued although no crisis has occurred ("type I" error) and a number of missed crises (MC), when no signals were issued but a crisis has occurred ("type II" error).

Table 4.2.1: **Signalling: possible cases**

	No crisis episodes (NCE)	Crisis episodes (CE)
Crisis signal	False alert (FA)	True positive signal
No crisis signal	True negative signal	Missed crisis (MC)

The optimal threshold is the one that maximises the signal power, i.e., that minimises the sum of the shares of missed crises and false alerts (MC/CE+FA/NCE, where CE stands for the total number of crises episodes and NCE for the total number of non-crisis episodes).

For the present exercise, the crisis indicator is defined as a cumulative fall of at least 5% (with a possible exception for one year) in house prices. Only "crisis starts" are analysed, so that the sample excludes observations where prices drop by more than 5% for subsequent years. The comparison is made with "tranquil times", i.e., years where house prices do not fall, so that observations with price drops between 0 and 5% are also excluded from the sample.

The threshold is computed on the basis of the maximum PTI observed over the three years preceding the crisis.

The signal power of house prices in levels is compared with the one obtained using information available from price index data. In this latter case, since indexes are not comparable across countries, the ratio between PTI and the country-specific mean PTI is computed. We calculate the average from the start until the current year, to get "real-time" averages.

The findings, reported in Table 4, support the view PTI ratios computed directly from price levels make it possible to have a better gauge of affordability constraints that could contribute to severe house price corrections.

The threshold identified on the basis of PTI computed from levels is close to 10. In other words, when purchasing a 100 square metre large house requires more than 10 years of income, there is a significantly increased risk of a substantial downward correction in house prices in the subsequent three years. The signal power associated with PTI ratios estimated from levels is always between 0.40 and 0.45. This means that a PTI above threshold correctly predicts a crisis in at least 40% of cases. Still, the maximum PTI over three years has a percentage of missed crises between 0.25 and 0.3, which means that crises may take place even if the threshold is not broken. For instance, this would typically be the case of the United States during the subprime crisis, in which the adjustment originated in a given segment that spread over the whole country through the financial sector, without the PTI issuing a signal. Conversely, there may also be some false alerts (between 27% and 34% of cases), corresponding to countries that can afford higher PTI ratios, for example because financial conditions can alleviate, at least temporarily, the burden for households.

The signal power associated to price indexes is comparable to that obtained from PTI computed from price levels when considering the whole period, but decreases markedly when the period is truncated by five or ten years, in absolute and even more in relative terms (lower panel in Table 4.2.2). In other words, the signalling power of PTI ratios in levels is high whatever the length of available period: even a few points enable to qualify the situation of a country in terms of potential overvaluation, whereas indicators based on indexes need longer periods to get good results.

Table 4.2.2: **Threshold, signal power and other relevant statistics for price to income**

	Threshold	Signal power	% False alerts (type 1 error)	% Missed crises (type 2 error)	# Crisisyears	Size of the sample	2SD lowerbound	2SD upperbound
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Full sample								
PTI from level data								
PTI in level	9.77	0.4	0.34	0.27	34	683	8.79	10.74
PTI from index data								
PTI/real time mean PTI	1.06	0.39	0.46	0.15	34	698	1.03	1.09
Sample excluding first five years for each country								
PTI from level data								
PTI in level	10.02	0.43	0.27	0.3	27	541	8.67	11.37
PTI from index data								
PTI /real time mean PTI	1.04	0.29	0.53	0.19	27	556	1.01	1.07
Sample excluding first ten years for each country								
PTI from level data								
PTI in level	9.75	0.45	0.3	0.25	16	411	8.48	11.02
PTI from index data								
PTI /real time mean PTI	0.98	0.24	0.76	0	16	426	0.94	1.02

(1)Crisis periods are defined by a cumulated fall of prices of at least 5%. The price-to-income indicator taken as the maximum value over the three preceding years.
"Threshold": the threshold that maximises signal power over the sample. "Signal power": 1 minus the sum of "false alert" and "missed" shares. "% false alerts": the frequency of no-crisis episodes that have been wrongly signalled as crisis. "% missed": the frequency of crisis episodes that have not been signalled by the respective indicator. "# crisis years": number of observations in the sample with a cumulated fall of house prices (with a possible exception for one year) of at least 5%; falls that do not correspond to this condition corresponding to intermediate situations between crisis and no crisis episodes are excluded from the sample. "Size of the sample" denotes the number of observations with and without a crisis. The computation of standard errors for thresholds is based on 1000 random draws with each case omitting 20% of the countries in the sample. "2SD lower bound" and "2SD upper bound" denote the threshold is two times the standard deviation of the threshold over these 1000 random draws.
Data for HK, RU and KR have been excluded from the calculation because of the frequent presence of outliers. HR has also been excluded due to the existence of a very strongly segmented housing market between the coastal part and the rest of the country. Indeed, the coastal part being heavily invested by non-residents, using the national income to calculate price-to-income ratios leads to a biased result.
"PTI in level": maximum PTI in level over the previous three years. "PTI/real time mean PTI": maximum ratio over the previous three years between the current PTI and the mean PTI calculated from the start of the period until the current year.

Source*:* HouseLev (see Table 3.2) and Eurostat, OECD, BIS.Own calculations.

4.3. REGRESSION-BASED BENCHMARKS: DOES IT MATTER ESTIMATING THEM FROM PRICE INDEXES OR LEVELS?

Price-to-income ratios make it possible to assess house prices primarily in terms of affordability. However, a number of additional fundamental factors can justify cross-country divergences in price to income ratios. It has become therefore customary to estimate house price benchmarks on the basis of predictions from multivariate regressions that make it possible to control for interest rates, population growth, supply factors etc. These benchmarks are often used to provide a gauge of the extent of overvaluation or undervaluation of house prices as compared with what would be predicted on the basis of economic fundamentals.

The question we want to address in this section is the following: would standard regression-based house price benchmarks estimated from house price levels differ from those estimated from house price indexes? The question is a relevant one, since when price indexes are used to estimate benchmarks in panel data, cross sectional variations are to be controlled for by means of the use of country-specific fixed effects that absorb level difference in indexes, while full cross-sectional variation can be used in estimating benchmarks from levels. In other words, price level data make it possible to use variation in levels across countries to estimate price level determinants, which is not possible with price indexes, which could have implications for the estimation of house price benchmarks.

To this end, determinants of house prices are estimated on a panel of EU countries using alternatively house price levels and indexes, and benchmarks are obtained for the two cases and compared with actual house price data to compute valuation gaps. Restricting to EU countries allows to obtain a sample less affected by missing data. The house price model estimated is a parsimonious one, and the specification and estimation method borrows from Philiponnet and Turrini (2017). The dependent variable are real house prices, deflated by the price of private consumption (as in Philiponnet and Turrini (2017). This indicator, taken from national accounts in Eurostat, is available for all countries with a sufficiently long time history). The explanatory variables, mostly taken from national accounts, using European Commission, ECB and OECD sources, are as follows:

Population (LPOP): Demographic developments are expected to exert a strong long-term impact on housing demand by affecting the number of households. Agnello and Schnukecht (2011) point out that due to supply constraints, a rise in the population can have an inflationary impact on the housing market. Due to data availability constraints, the number of households is actually proxied by the actual population. While Eurostat compiles data on the size and number of households in European countries, this data is only available from 2005 onwards. Due to the trend reduction in the size of households, using total population could imply some bias.

Real disposable income per capita (RINC): As discussed in the previous section, the affordability of housing is one of the key factors to assess developments in house prices. The higher the disposable income of households, the more likely they can dedicate a part of income to purchase a house. A positive elasticity is expected between house prices and income, with the value depending on the specification of the regression equation and the statistical formulation of the relevant variables. In a review of empirical literature, Girouard et al. (2006) find that for OECD countries, the elasticity is positive with most studies finding a value between 1 and 2. For the euro area aggregate, Annett (2005) finds an elasticity of about 0.6. This is much lower than the values in Gattini and Hiebert (2010) and Ott (2014), which find an elasticity of 3.1 and 1.9 respectively.

Long-term interest rates (RLTR) also are expected to have an impact on the ability of households to obtain mortgages as the higher is the cost of credit, the less affordable are house purchases for households. Moreover, higher interest rates also decrease the present value of future (imputed) rents, thus reducing the gain expected by households from investing in a house. Altogether, interest rates can be expected to have a negative impact on housing prices. This is indeed the conclusions of the empirical studies reviewed by Girouard et al. (2006), although the magnitude of the impact is found to vary across studies.([15])

Housing investment (RHI): The impact of housing investment by households on housing prices can be ambiguous. As notably mentioned in Iacoviello (2004), housing investment is linked to the demand for new houses, notably by first-time buyers. Insofar as it is related to higher demand for housing, housing investment can thus be expected to have a positive relation with prices. In addition, part of the investment by households consists of renovation works which can be expected to improve the quality of housing and then prices. At the same time, the construction of new dwellings, which is the most important part in the household investment, increases the available stock of housing. This contributes to easing possible supply constraints, with a negative impact on house price. Consistently, using dwelling stocks, Ott (2014) finds a negative elasticity of house prices to supply of -2.6. Meanwhile, estimating the elasticity of real house prices to housing investment, Gattini and Hiebert (2010) find a negative elasticity of -2.2 suggesting that supply factors are predominant. The present analysis uses data on housing investment as data on stock are available for few countries only.

The following regression is implemented, with the index *i* corresponding to countries and *t* to years:

$$RHP_t^i = \alpha^i + b_{lpop}.LPOP_t^i + b_{rinc}.RINC_t^i + b_{rhi}.RHI_t^i + b_{rltr}.RLTR_t^i + FE_t + \eta_t^i$$

The same equation is estimated using price levels and price indexes as alternative measures of the real house price RHP_t^i, the only difference being that, while in the case of price indexes country fixed effects α^i are to be included, this is not the case when price levels are used. Time fixed effects are used in one of the two specifications to control for events such as global shocks for example. Moreover, to keep the advantage of having comparable levels across countries, the deflator used is based on purchasing power parity indexes (see Annex 5 for definitions) instead of the deflator based on the price of private consumption as in Philiponnet and Turrini (2017), except for interest rates, which are deflated using inflation rates form HICP of CPI data. This correction enables to measure all monetary variables in the same unit and also to adjust for price level differentials.

Regressions are performed using dynamic ordinary least squares (DOLS) as introduced in Stock and Watson (1993), to improve the efficiency of the OLS estimator in the case of non-stationary variables. Namely, explanatory variables are introduced in differences, with several leads and lags.

([15]) For instance, while Gattini and Hiebert (2010), which use a mixture of short and long term rates, find that a 1 pp increase in interest rates decreases house prices by 7%, Annett (2005) estimates an impact between 1 and 2% and Ott (2014) of only 0.4%. Due to high collinearity between short and long-term interest rates, only this latter is retained in the specifications.

Table 4.3.1: **Estimating house price determinants from price levels and price indexes**

Dependent variable / Explanatory variables	Log price levels		Log price indexes	
	(1)	(2)	(3)	(4)
Real disposable income (log)	0,965***	0.754***	0.277**	-0,2
	(0,085)	-0.101	-0.11	-0.172
Real housing investment (log)	(-0.113***	-0.024	0.687***	0.681***
	(0,042)	-0.049	-0.087	-0.093
Total population (log)	0.144***	0.078*	2.99***	2.812***
	(0,044)	-0.048	-0.55	-0.563
Real long-term interest rate	-0.032***	-0.004	0,003	0.012***
	(0,004)	-0.006	-0.004	-0.005
Time fixed effects	No	Yes	No	Yes
Country fixed effects	No	No	Yes	Yes
Nb of cross-sections	22	22	22	22
Nb of observations	325	325	325	325
R^2	0.867	0.892	0,994	0,973
Root mean squared error	0.076	0.072	0,042	0,038

(1)Estimation method: Dynamic OLS (DOLS). Regressions have been performed by excluding IE, EL, ES and SE from the estimation panel because of poolability issues. MT does not have a harmonised concept of disposable income for households and the series of housing investment is not available for HR.
Log of house prices, whether in index or in levels, disposable income and housing investment are calculated using purchasing power parity (PPP), mixing data in national currencies and PPP series from IMF WEO (US=1). The use of PPP enables to get comparable results across columns and is a source of difference with Philiponnet and Turrini (2017), who uses the deflator of private consumption. House price in index PPP has been calculated taking a value of 100 for house price in 2015, combined with PPP.
Standard errors are reported in parentheses. ***, ** and *: significance at the 1%, 5% and 10% levels respectively.
(2) Availability of series is quite different depending on countries, time series being relatively shorter for Central and Eastern European Countries (CEECs). The panel is thus unbalanced. Yet, constraining the panel to be balanced would align periods to the shortest one, namely Poland and Romania for which only the last ten years are available. The period would be focused exclusively on the crisis period, giving important weight to time fixed effects, in the context of a quite global adjustment in the housing market (with a few exceptions though). On this issue, it can be underlined that when the first ten years are deleted, which amounts to minimising or cancelling the influence of CEECs with short periods, the signalling approach indicates a still high signal power for prices in levels compared to indexes.

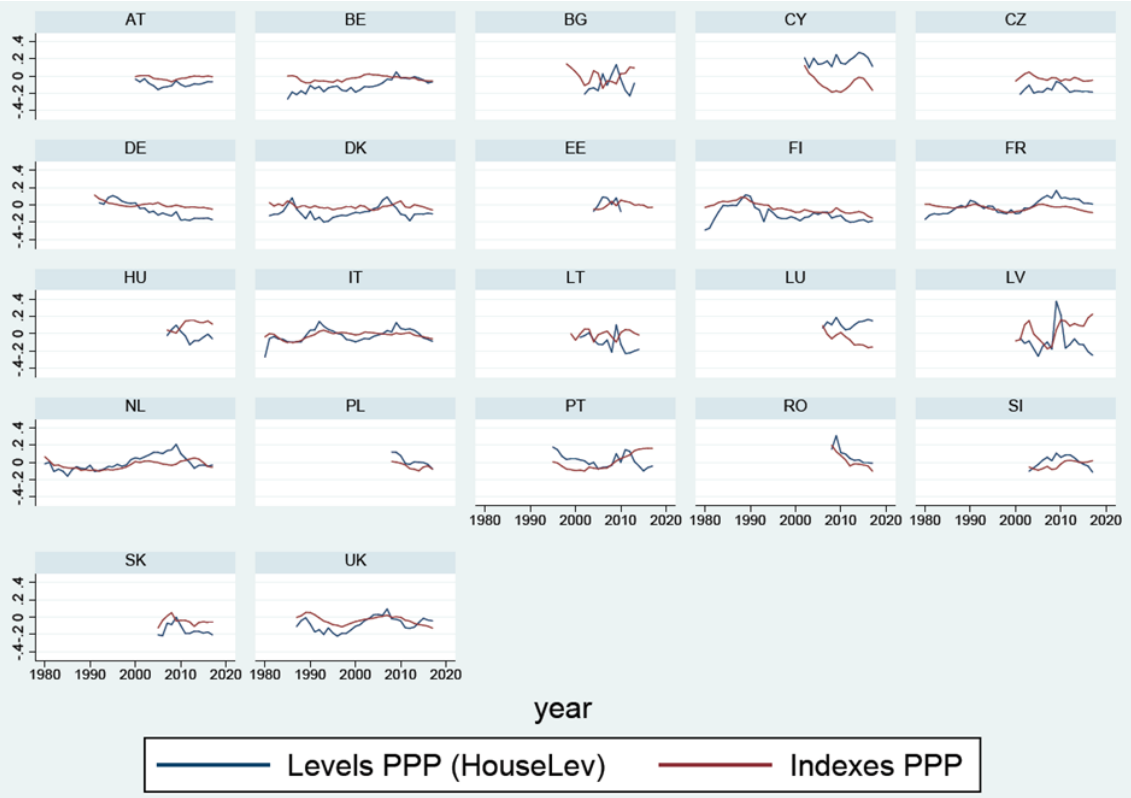
Source*:* HouseLev (see Table 3.2) and Eurostat, OECD, BIS, DG ECFIN AMECO Database, IMF WEO Database. Own calculations

Estimation results are displayed in Table 4.3.1. It appears that the results obtained using price levels as dependent variables display all coefficients as significant and with the expected sign, while this is not the case when the dependent variable builds on house price indexes. Using price levels, the impact of housing investment is found negative. This is consistent with the strand of literature that insists on the effects of the ease of supply constraints. Conversely, a positive sign for housing investment is obtained using price index data as dependent variable. Comparing with other findings in the literature, the magnitude of the semi-elasticity of long-term interest rates is somewhat smaller than the one found by Gattini and Hiebert (2010) (impact of 3.2% for a variation of 1pp, to be compared with 7%). The elasticity of income, around 0.97, is in the lower range found by Girouard et al. (2006) (between 1 and 2) and a little higher than the one from Annett (2005) for the euro area (about 0.6). The coefficient of population is positive and significant at the 1% level, but quite low in magnitude though. Finally, it appears that the inclusion of time effects (columns (2) and (4)) alters the significance of coefficients of main variables.([16])

([16]) To compare results with the ones from Philiponnet and Turrini (2017), the baseline specifications, used for computing house price benchmarks, are those excluding time effects.

The valuation gaps obtained from the difference between actual log price data and the benchmarks from specifications (1) and (3) from Table 4.3.1 above are displayed in Graph 4.3.1.

Graph 4.3.1: **Comparison between observed and estimated house prices in PPP levels from HouseLev and in PPP indexes**



(1)PPP House prices using house prices in national currencies and PPP series from IMF WEO (US=1). The estimates used for prices in levels are based on regressions without time or country fixed effects whereas estimates for indexes include country fixed effects, as in Philiponnet and Turrini (2017). In this second case, since country fixed effects coefficients have not been calculated for EL, ES, IE and SE, corresponding curves are not available. For HR and MT, some explanatory variables are not available and curves are thus not represented.

Source: HouseLev (see Table 3.2) and Eurostat, OECD, BIS, DG ECFIN AMECO Database, IMF WEO Database. Own calculations

It appears that the valuation gaps obtained from levels and indexes co-move quite closely but the dynamics are not always aligned. In the case of Cyprus, Bulgaria, the Netherlands, Slovenia or the UK for example, overvaluation before the onset of the financial crisis was signalled by price levels but not by indexes. More generally, over the whole period, times of overvaluation identified by regression-based approach (see Graph 4) are consistent with signals when PTI exceeds the threshold of 10. Overall, the valuation gaps obtained from level data appear somehow better able to predict subsequent downward corrections, thereby confirming the findings from the signalling approach using PTI ratios in the previous section. The two valuation gaps, the one obtained from levels vs. that obtained from indexes, in some cases display persistent differences in levels, e.g., in the case of Cyprus, Czechia, France, Latvia, Luxemburg, Romania.

5. CONCLUDING REMARKS

This paper presents a new database of estimates of house price levels that cover all EU countries, most OECD countries and a number of non-OECD emerging economies.

The baseline method to obtain price level estimates is new compared to that found in existing studies. Rather than relying on house prices quoted by sellers in realtors' websites (as, e.g., in Dujardin et al., 2015), the estimate is based on available data from national accounts and censuses that allow to compute house price levels as the ratio between the total value of dwellings and the total useful floor area.

The method based on house price offers by sellers on real estate agents' websites is also used as a fall-back for a minority of countries as available sources do not permit to perform the baseline method. The computation of both price level estimates using both the baseline and the fall-back method permits to gauge the upward bias associated with the latter method (which is nonetheless quite limited), and to apply a correction factor to take into account for such a bias and improve cross-country comparability.

Time series for house price level estimates are obtained on the basis of house price indexes. The *HouseLev* database incorporates information on house price levels in common currency for 40 countries going back to 1970 at the earliest.

Results indicate that house price levels display a considerable variation across countries, with countries characterised by higher per-capita income normally displaying higher price levels. Price-to-income (PTI) data estimated from price levels have a clear interpretation: they indicate the number of yearly incomes necessary to purchase dwellings of a size of 100 square metres. Cross-country comparisons show a great deal of variation, but about 75% of the countries display PTI values between 8 and 12, in general not far from the median value of about 10 years. Moreover, the ranking in PTI obtained from levels is not always coinciding with those obtained from price-to-income differences from country averages obtained from index data.

PTI data from levels appear better suited as a prima-facie gauge of house-price overvaluation as compared with equivalent indicators obtained from price index data. In particular, the need to compare price to income indexes to country specific averages affect the signal power of such an indicator in signalling forthcoming downward corrections in house prices. Thresholds obtained from PTI data estimated from levels make it possible to obtain a signal power which is at least as high as that obtained from metrics built from price indexes irrespective of sample size. Interestingly enough, the PTI threshold that maximises signal power in predicting price corrections is close the cross-country median value of the PIT, i.e., 10 years of yearly income. It is also checked that standard regression-based benchmarks for house prices yield different signals regarding misalignments with respect to economic fundamentals when estimated from house price data in levels as compared with the equivalent estimated from house price indexes because the former permit to exploit also the cross-country information of panel data. The signalling approach and regression-based benchmarks yield broadly consistent signals.

Overall, the availability of cross-country consistent price level estimates appears to improve the basis for macro-surveillance on the housing-related matters and to construct a wide range of useful indicators notably in the implementation of fiscal and macro-prudential policies aimed at addressing potentially harmful house price dynamics.

Further work should aim at enlarging the information basis for the construction of the estimates, and ensuring high quality and full comparability. Work should also aim at estimating price levels at sub-national level on a comparable basis.

REFERENCES

Adams Z. and R. Füss (2010), Macroeconomic determinants of international housing markets, Journal of Housing Economics, 19, 38-50.

Agnello L. and L. Schuknecht (2011), Booms and busts in housing markets: Determinants and implications, Journal of Housing Economics 20, 171-190.

Alun T. (1993), The influence of wages and house prices on British interregional migration decisions, Applied Economics, 25, 1261-1268.

Alvadero F., A.B. Atkinson, T. Piketty T., E. Saez and G. Zucman, The World Wealth and Income Database. http://wid.world/#Database.

Annett, A. (2005), House prices and monetary policy in the euro area, in Euro area policies: Selected issues, IMF Country report, IMF, Washington DC.

Balabanova Z. and R. van der Helm (2015), Enhancing euro area capital stock estimates, IFC Working Papers, Irvin Fisher Committee on Central Bank Statistics, No.13, March.

Borck R., M. Pflüger and M. Wrede (2010), A simple theory of industry location and residence choice, Journal of Economic Geography, 10, 913-940.

Cannari L. and I. Faiella (2008), House prices and housing wealth in Italy, from household wealth in Italy, Banca d'Italia.

Case K. and R. Shiller (2003), Is there a bubble in the housing market?, Brookings Papers on Economic Activity, 2, 299-362.

Case K. and R. R. Shiller (1989), The efficiency of the market for single-family homes, American Economic Review, 79, 125-137.

Cussen M. and G. Phelan (2011), The rise and fall of sectoral net wealth in Ireland, Quarterly Bulletin of the Central Bank of Ireland, 03, July.

Deutsche Bank Research (2017), Housing policy in Germany – Changing direction, Germany Monitor, August.

Dokko J., B.M. Doyle, M. T. Kiley, J. Kim, S. Sherlund, J. Sim, and S. Van Den Heuvel (2011), Monetary policy and the global housing bubble, Economic Policy, 26, 237-287.

Dujardin M., A. Kelber and A. Lalliard (2015), Overvaluation in the housing market and returns on residential real estate in the euro area: insights from data in euro per square metre, Banque de France, Quarterly Selection of Articles, Issue 37, 49-63.

ECB (2013), Dwelling stock in the euro area - New data from the Eurosystem Household Finance and Consumption Survey, Monthly Bulletin, July, 51-55.

ESRB (2015), Report on Residential Real Estate and Financial Stability in the EU, December.

European Commission (2016), Econmomic Forecast – Winter, Box I.4: Assessment of the housing markets outlook: new insights from house prices in levels, Institutional Paper No. 20.

Eurostat (2013), Handbook on Residential Property Prices Indices (RPPIs), Methodologies & Working papers. Eurostat.

Gattini, L. and P. Hiebert (2010), Forecasting and assessing euro area house prices through the lens of key fundamentals, ECB Working Papers Series No. 1249.

Girouard, N., M. Kennedy, P. van den Noord and C. André (2006), Recent house price developments: the role of fundamentals, OECD Economics Department Working Papers No. 475.

Gojević M., J. Jalava, I. Šutalo, and M. Suur-Kujala (2006), Flows and stocks of fixed residential capital: The Croatian experience, Paper prepared for the 29th General Conference of The International Association for Research in Income and Wealth, Joensuu, Finland, August 20-26.

Gros, D. (2008), Transatlantic differences in real estate bubbles?, Intereconomics: Review of European Economic Policy, 43, 66-67.

Gulde A. M. and M. Schulze-Ghattas (1993), Purchasing power parity based weights for the WEO, Staff Studies for the World Economic Outlook, pp. 106-123, IMF, December.

Hong Kong Monetary Authority (2001), The property market and the macro-economy, Quarterly Bulletin, 05.

Housing Europe (2015), The State of Housing in the EU, May.

Iacoviello, M. (2004), Consumption, house prices, and collateral constraints: a structural econometric analysis, Journal of Housing Economics 13, 304-320.

Igan D. and P. Loungani (2012), Global housing cycles, IMF Working Paper, No. 12/217.

Jordà O., Schularick M. and Taylor A. M. (2015), Betting the house, Journal of International Economics, v96, 2-18.

Kholodilin K. A. and D. Ulbricht (2015), Urban house prices: A tale of 48 cities, Economics: The Open-Access, Open-Assessment E-Journal, 9, 1-43.

Kiyotaki N. and J. Moore (1997), Credit cycles, Journal of Political Economy, 105, 211-248.

Knoll K., M. Schularick, and T. Steger (2017), No price like home: Global house prices, 1870-2012, American Economic Review, 107, 331-353.

Novokmet F., T. Piketty, and G. Zucman (2017), From soviets to oligarchs: Inequality and property in Russia 1905-2016, Appendix, WID.world Working Paper Series No. 2017/10.

Olesen J. O. and E. H. Pedersen (2006), An inventory of housing wealth, Danmarks Nationalbank Working Paper, No. 37

Ott, H (2014), Will euro area house prices sharply decrease?, Economic Modelling 42, 116-127.

Philiponnet N. and A. Turrini (2017), Assessing house price developments in the EU, European Economy, Discussion Paper No. 48.

ROSSTAT, Federal Service of State Statistics (2014), Methodological approaches to the evaluation of housing services produced and consumed by the owners of housing, in the system of national accounts, May.

Sabaliauskas K. (2012), Housing and Property Market in Lithuania, FIG Working Week, May.

Stock J. and Watson M. (1993), A simple estimator of cointegrating vectors in higher order integrated systems, Econometrica 61, 783-820.

Tsigel'Nik A. (2013), Statistics of Market Value of Housing, VoprosyStatistiki, 2013, No. 7.

ANNEX 1

Baseline method: average price per square metre from national accounts and censuses

Table A1.1 describes sources used to obtain information on the total value of dwelling assets and the valuation method adopted. Information on dwelling assets at market value (usually based on transactions) is taken from OECD or from national sources (usually the NSI or the Central Bank or from specific one-off studies). Information from WidWorld database is also used for robustness checks, or in few cases as the main source when some detailed compilations have been performed, not elsewhere available. For some countries, individual transactions data have been used (IE, FR, MT), calculating averages at sub-national level, and then a weighted national average, using weights in stocks.

Table A1.2 describes the sources of information for total floor areas. Depending on countries, different sources may be used to get a harmonised value for floor area:

For most EU countries Eurostat gives an average figure of useful floor area in census source for 2011 and/or in a survey on housing conditions (EU-SILC, HC020 module) performed in 2012.

If Eurostat data are not available, national censuses are used, corrected by a conversion factor if necessary to have a comparable concept of floor area to the concept of useful floor area used by Eurostat (see Annex 2).

Alternatively, heated areas may be used (usually available from ministries for equipment or energy or assimilated), using also a conversion factor.

For non-EU countries, censuses or alternative official or private sources are used, still using conversion factors if needed.

For some countries both the value of dwellings and associated land is available at the level of the total economy. However, for a majority of countries, national accounts report the value of land is for the non-household sector is not reported. To permit cross-country comparability, whenever for one country the value of land for the rest of the economy is not reported, it is estimated on the assumption that the value of dwellings and that of the associated land are in the same proportion in the household and the non-household sector. As show in the Table A1.3 households hold the vast majority of dwelling assets (usually more than 85%).

Table A1.1: **Total value of dwelling assets: sources and valuation method**

Country	Sectors covered	Source	Method of valuation used (including land if not specified)
		EU countries	
BE	All sectors	Registering by notaries, SPF Finances and the Direction générale Statistique et Information économique (DGSIE)	Value of transactions (keeping only significant values)
CZ	All sectors	Czech Office of Surveying, Mapping and Cadastre	Value of transactions for buildings and statistical survey for land
DK	1/ All sectors and households in Olesen and Pedersen (2006) and 2/ households in Statistics Denmark	Two sources: 1/ housing stock statistics supplemented with data from the Association of Danish Mortgage Banks' real-property price statistics covering traded prices per m^2 for one-family dwellings, freehold flats and holiday dwellings, 2/ Statistics Denmark Register with Official Real Estate Valuations, the Building and Real Estate Register, the Business Register and Register for Personal Data	Value of transactions in both cases
DE	Households	Bundesbank and NSI (Destatis), using a panel of experts for land prices ("Gutachterausschuss")	Dwellings excluding land valued at replacement costs and underlyir valued at transaction prices
IE	All sectors (main source) / Households (alternative source)	1/ Transactions from NSI (main source) and 2/ Housing assets from Cussen and Phelan (2011) (alternative source)	1/ Value of transactions (main source) and 2/ calculation of housing values based on the ESRI/Permanent TSB house price index (alte source)
EL	Households	Bank of Greece (November 2002 Monetary Policy Report)	Housing stock uses estimates from the NSSG (National Statistical Ser Greece) "Population-buildings" 1991 census, combined with new b permits and NSSG data on extensions, legalisations and demoliti buildings. House prices are calculated by Bank of Greece for wider Athe and other urban areas, based on Property SA and local branches of B Greece, respectively. Prices in semi-urban and rural areas use the Household Survey.
ES	Households	Ministry of Development: appraisal values from Professional Association of Valuation Companies (ATASA). Source replaced in 2015 by the NSI	Survey
FR	All sectors	1/ "Enquête Logement" from the NSI (INSEE) and 2/ transactions from notaries database	Survey for total dwelling assets, including land for the "Enquête Loge and 2/ market value for notaries database.
IT	All sectors	Istat / Observatory of the Real Estate Market (OMI, Directorate of the Revenue Agency)	Value of transactions
LT	All sectors	State Enterprise Centre of Registers	Value of transactions and market valuation
LU	All sectors	Acquisition price for dwellings (apartments) by STATEC and the Observatoire de l'Habitat	Value of transactions of apartments, based on the data fro "Administration de l'Enregistrement et des Domaines", completed by Ca and Topography Administrations data
HU	All sectors	NSI, based on stamp duty receipts, provided by the Hungarian Tax and Financial Control Administration	Value of transactions
MT	All sectors	Transactions from the national statistical office (Inland Revenue Department)	Value of transactions
NL	All sectors	Tax registers	Value of transactions
AT	Households	NSI	Value of transactions and cadastral data

(Continued on the next page)

Table (continued)

PL	All sectors	Central Bank (using NSI and PONT Info Nieruchomości containing data on offer home prices)	Transaction prices in main cities and replacement prices in remaining part Poland
PT	All sectors	Transactions from NSI	Value of transactions
SI	All sectors	Cadastre	Market value, using land cadastre and cadastre of buildings
SK	Households	NSI (supplied to OECD)	Market value
FI	All sectors	Statistics Finland, Cadastre and National Land Use Survey	Value of transactions
SE	All sectors	NSI (Statistics Sweden)	Value of transactions
UK	All sectors	NSI. Initial stock from Land Registry updated with the Department of the Environment, Transport and the Regions Mixed Adjusted Price Index (based on a 5% survey of all lenders)	Value of transactions
		Non-EU countries	
AU	All sectors	Australian Bureau of Statistics sectoral balance sheets & Australian Bureau of Statistics total value of the dwelling stock	Value of transactions
CA	All sectors for residential buildings, mixed with total housing assets of households	Survey on Financial security and real estate assessment data, compiled in Statistics Canada balance sheets	Survey giving market values
CH	All sectors for Wüest Partner AG and households for the Swiss National Bank	Wüest Partner AG and Swiss National Bank	Value of transactions
IS	All sectors	Registers Iceland	Market value using notarized purchase agreements (s https://www.skra.is/english/business/real-properties/property-valuation/)
HK	All sectors	NSI	Transaction price by class of saleable area, combined with correspondi stock of dwellings
JP	All sectors	Basic Survey on Land	Market value
KR	All sectors	NSI	Market value (stock of land available separately using a direct valuati method)
NO	All sectors	Norway Central Bank, using a cadastral database (consistent with the Income and Property Distribution Survey also from Statistics Norway),	Value of transactions
NZ	All private non-farm residential dwellings	Quotable Value Limited (State Owned Enterprise) and Reserve Bank of New Zealand	Value of transactions
RU	Households and public sector	ROSSTAT (2014) for privately held dwellings & WidWorld for privately and publicly held dwellings. Results consistent with Tsigel'Nik (2013)	Market value (see ROSSTAT (2014) and Novokmet et al. (2017), and a Tsigel'Nik (2013))
US	All sectors	Bureau of Economic Analysis (BEA, used by WidWorld Database)	Market value

(1)The method of valuation used has been reported only for countries for which the information related to the value of the dwelling and underlying land is available. Over the whole sample of 40 countries, 7 countries are not covered with non-financial assets or transaction data sources due to data which are not available or not market-valued: BG, EE, HR, CY, LV, RO and TR.

Source*:* See table above.

Table A1.2: **Sources used for floor areas and corresponding definitions**

Country	Useful floor area estimate, m^2. Source indicated in parentheses: Census, Eurostat (2011) / ad-hoc 2012 Eurostat module on housing conditions HC020	Estimate alternative to (1), (for comparison or as main source if Eurostat source is missing)	Alternative data source used in (2)	National definition of floor for alternative source
	(1)	(2)	(3)	(4)
		EU countries		
BE	124.3 (HC020)	119 (2011)	Realtor: Century 21	Living floor area
BG	73 (HC020)	73.1 (2012)	NSI	Useful floor space
CZ	78 (HC020)	65.3 for living area and 86.7 for total floor area	Census	Living floor area & total floc
DK	115.6 (HC020)	111.3 (2012)	NSI	Living floor area
DE	94.3 (HC020)	89.2 (2006)	NSI	Living floor area
EE	70.6 (census); 66.7 (HC020)	71.5 (2011, own calculations from ranges for occupied conventional dwellings)	NSI	Useful floor area
IE	80.8 (HC020)	112.5 (2012)	Energy use (SEAI, sustainable energy authority of Ireland)	Heated floor area
EL	90.6 (census); 88.6 (HC020)	90.8 (occupied conventional dwellings) / 84.3 (all conventional dwellings, including unoccupied) in 2011	Census	Useful floor area
ES	97.1 (census); 99.1 (HC020)	92.8 (2011) for main dwellings, calculated with the distribution of dwellings by useful floor area	Census	Useful floor area
FR	93.7 (HC020)	95 (occupied dwelling, 2012)	NSI (survey on income and life conditions)	Living floor area
HR	81.6 (HC020)	80.9	Census	
IT	100.2 (census); 93.7 (HC020)	100.2 (2011, occupied dwellings); 96 for occupied dwellings and 92 for all dwellings (Census, 2001, quoted in Cannari and Faiella (2008))	Census	Useful floor area
CY	141.4 (HC020)	147.9 (2011, Census) / 148.8 (own calculations using ranges)	Census	Useful floor area
LV	62.5 (HC020)			
LT	63.2 (HC020)	63.1 (2011)	Census	
LU	122.7 (census); 131.1 (HC020)	129.9 (2011)	Census	Living floor area
HU	77.4 (HC020)			
MT	Non reported due to missing values	137.7 (HFCS first wave, 2010) and 142.7 (2012, weighted median using transactions from NSI and number of rooms as weights)	HFCS and NSI	Not defined for HFCS
NL	112.4 (census); 106.7 (HC020)	120 (2011)	NSI	Useful floor area
AT	94.1 (census); 99.7 (HC020)	99 for main residences (housing conditions) and 89.8 for all dwellings / 93.4 for main residence (stock of dwellings) in 2011	Census	Useful floor area
PL	77.5 (census); 75.2 (HC020)	72.8 (2012)	NSI	Useful floor area
PT	104.7 (census); 106.4 (HC020)	109 (2011, continent)	NSI	Useful floor area
RO	49.1 (census); 44.6 (HC020)	47.1 (2011, all dwellings, including unoccupied)	Census	Useful floor area
SI	82 (census); 80.3 (HC020)	80 (2011)	Census + other sources (NSI, "Households and Housings in the Republic of Slovenia" & data collected with regular statistical surveys)	Useful floor area
SK	87.4 (HC020)	90.3 (2011, occupied dwellings)	Census	
FI	88.6 (HC020)	79.8 (2011) and 79.9 (2012)	NSI (Dwellings and Housing Conditions)	
SE	96 (census); 103.2 (HC020)	92 (2013)	NSI	Useful floor area

(Continued on the next page)

Table (continued)

UK	Not reported in light of reliable missing values	91 for England and 93.7 for Scotland (2011), for an average equal to 91.3	Government Department for Communities & Local Government, English Housing Survey	Total usable internal floo
		Non-EU countries		
AU	n.a.	143.2 (2006)	Energy use	Floor area including extern and enclosed garage
CA	n.a.	189.3 m^2 (heated surface, 2011) equivalent to 130 m^2 of useful floor area	Energy use (Office for Energy efficiency)	Heated floor area
CH	117.2 (HC020)	99 (2014)	NSI (Statistiques des Bâtiments et des Logements)	Living floor area (exclu independent living roo
HK	n.a.	54.1 (1997, private domestic - stock at year end by class), equivalent to a useful floor area of 32.8 m^2	NSI	Saleable area (see definit Annex 5): includes outer
IS	130.4 (HC020)	132.9 (calculated using floor area by occupant and number of occupants by dwelling)	Census	Useful floor area
JP	n.a.	92.5 (2003) and 92.4 (2008)	Census	
KR	n.a.	78.9 (2010)	Census	Total floor area
NO	120.2 (census); 122.7 (HC020)	133.4 m^2 (2012): own calculations using the number of dwellings by range of utility floor space	NSI (survey of living conditions)	Utility floor space (=usefu area + store rooms, utility boiler rooms...) from 2001 floor area before
NZ	n.a.	149 (2010), value corrected for harmonization	Other source (PropertyIQ/CoreLogic, Joint-Venture partly owned by Quotable Value Ltd, State-Owned Enterprise)	Floor area including extern and enclosed garage
RU	n.a.	Total living floor space equal to 3231 and 3349 million m2 in 2010 and 2012 respectively	NSI	Living floor area
TR	101.9 (HC020)			
US	n.a.	192.9 in 2009 (correction for basement: 172.9 m^2, and from living to useful floor area: 135.9 m^2)	Census (Census Bureau & U.S. Department of Housing and Urban Development, American Household Survey)	Living floor area (including and unfinished baseme

(1)National concepts of living floor area and useful floor area may differ from harmonised concepts on some points. For the definition of useful floor area from Eurostat, see Annex 5.
The useful floor area in SILC HC020 (2012) uses the same definition as for the population and housing census. Differences with Census data may come from the fact that they relate to different years (2011 and 2012) and that SILC results come from a survey, whereas Census is based on a wide proportion or even full population. Useful floor areas from Census relate to occupied conventional dwellings, which may induce a (limited) discrepancy with the floor area of all dwellings including unoccupied ones.
NSI: National statistical office.

Source: See table above.

Table A1.3: **Households' dwelling assets compared to total sectors' (%)**

	BE	CZ	DK	DE	EE	EL	FR	IT	LV	LT	LU	HU	NL	AT	PL	PT	SI	SK	FI	SE	UK	AU	CA	JP	KR	US
1995	96.4	73	69.3	82.2		98.6	81.5	89.4	85.5	97.2		94.7	72.3	83.2	52		90.8	84.4		59.5		94.5	85.9	84.9	95.1	96.5
1996	96.3	73.6	69.8	82.5		98.7	81.1	89.4	84.6	97.1		95.1	72.8	83.1	51.4		90.8	83.8		61.4		94.5	86.2	85.3	95	96.5
1997	96.3	74.2	69.9	82.7		98.7	80.7	89.5	84.7	97		95.2	73.5	83.2	50.9		90.8	83.9		62.7	91.5	94.8	86.5	85.4	95	96.6
1998	96.4	74.6	70	83		98.8	80.3	89.5	84.8	97		95.4	74.1	83.3	49.8		90.8	84.2		63.2	92.1	94.8	86.8	85.5	94.9	96.6
1999	96.3	75.5	70.1	83.3		98.9	80.3	89.6	85	97		95.4	74.8	83.4	49.1		90.9	84.6		61.8	93	95.1	87.1	85.7	94.9	96.7
2000	96.1	77.6	70	83.6	94.7	98.9	80.5	89.6	85.2	97	96.2	95.7	75.4	83.6	48.8		90.8	85	81.5	63.4	93.4	95.2	87.4	85.9	94.9	96.7
2001	95.8	78.2	69.9	83.8	94.6	99	80.7	89.7	85.4	97	96.2	95.9	75.9	83.8	49.6		90.7	85.2	81.7	62.2	93.3	95.3	87.6	86.1	94.8	96.7
2002	95.5	79.2	69.8	84.1	94.5	99	80.9	89.7	85.5	97	96.4	96	76.2	84	49.9		90.6	85.8	82	63.2	93.8	95.4	87.8	86.2	94.8	96.8
2003	95.3	79.4	69.8	84.4	94.3	99	81.2	89.7	85.7	97	96.4	96.1	76.8	84.1	49.6		90.6	85.9	82.3	63.4	93.9	95.6	88.2	86.4	94.8	96.8
2004	95	80.2	69.4	84.7	94.3	99.1	81.5	89.6	86.1	97.1	96.5	96.3	77.4	84.2	84.4		90.6	86.4	82.7	65.8	94	95.7	88.5	86.4	94.8	96.8
2005	94.9	80.8	69.1	84.9	94.1	99.1	81.7	89.6	86.6	97.1	96.6	96.3	78	84.4	86		90.6	86.6	83.1	64.5	93.8	95.7	88.8	86.4	94.9	96.9
2006	94.7	81.1	69.1	85.2	94.3	99.2	81.9	89.6	86.7	97.1	96.8	96.4	78.5	84.5	89.1		90.6	86.8	83.5	64.3	94.4	95.7	89	86.4	94.8	96.9
2007	94.5	79.5	68.9	85.4	94.5	99.2	82	89.6	86.7	97	97	96.5	79.1	84.6	89.1		90.5	86.9	83.9	64	94.5	95.8	89.2	86.3	94.9	96.9
2008	94.3	79.2	68.8	85.6	94.7	99.3	82.2	89.7	86.8	97	97.2	96.5	79.5	84.7	88.8		90.4	87	84.3	64.3	94	95.8	89.5	86.3	94.9	96.9
2009	94.1	81.5	67.5	85.7	95	99.2	82.3	89.9	86.8	97	97.3	96.6	79.6	84.8	88.1		90.3	87.1	84.6	63.7	94.5	95.7	89.9	86.3	94.8	96.9
2010	93.9	82.9	66.6	85.9	95.2	99.2	82.2	90.2	86.8	97	97	96.7	79.6	84.9	89.7		90.2	87.3	84.8	62.6	94.8	95.7	90.1	86.3	94.7	96.9
2011	93.6	83.2	66.9	86.1	95.5	99.3	82.1	90.6	86.9	97	97	96.7	79.5	85	90.6		90.1	87.5	85	62.4	95	95.8	90.3	86.4	94.6	96.9
2012	93.4	84	66.7	86.2	95.6	99.3	82.1	90.8	86.8	97.1	97	96.7	79.4	85.1	90.7	91.8	89.9	87.7	85.1	61.6	95	95.8	90.3	86.5	94.6	96.9
2013	93	84.4	66.7	86.4		99.3	82.1	91.1	86.7	97.1	96.9	96.8	79.2	85.1	91.5	91.9	89.7	87.5	85.3	60.9	95.1	95.8	90.4	86.6	94.5	96.9
2014	92.8	84.9	67	86.5			82.1	91.2			96.9		79.1	85.2				87.3	85.5		95.4	95.9		86.5	94.4	96.9
2015		85.1												85.3					85.6						94.4	
Average	94.9	79.6	68.8	84.6	94.7	99	81.5	89.9	86	97.1	96.8	96.1	77	84.2	70.5	91.9	90.5	86	83.8	62.9	94	95.4	88.4	86.1	94.8	96.8
Median	95	79.5	69.2	84.8	94.6	99.1	81.6	89.6	86.1	97	96.9	96.3	77.7	84.4	84.4	91.9	90.6	86.5	84.1	63.2	94	95.7	88.5	86.3	94.8	96.9

(1)Some countries of the sample are not covered in this table: BG, IE, ES, HR, CY, MT, RO, IS, NO, CH, TR, HK, NZ and RU.
Averages and medians are calculated over the whole available period, for some countries since 1970 (not displayed in this table).

Source: OECD, own calculations, for countries for which information is available.

ANNEX 2

Conversion factors for floor areas

For countries outside Europe, national sources for floor areas are used usually based on a concept of floor area that differs from the one of useful floor area used by Eurostat. Therefore, some corrective factors based on the TABULA project have been applied. This project, co-funded by the Intelligent Energy Europe (IEE) Programme of the European Union, has developed residential building typologies for energy purposes, incidentally defining some conversions between different concepts of floor areas.([17])

Based on these conversion factors, coefficients are applied to convert different notions of floor area into them into the corresponding concept of conditioned floor area:

- External dimensions (including walls) should be multiplied by 0.85.
- Conditioned living area should be multiplied by 1.1.
- Conditioned useful floor area should be multiplied by 1.4.

Equalling these expressions, different concepts of floor areas are in turn converted into useful floor areas based on the following conversion factors:

- External dimensions (including walls) should be multiplied by 0.85/1.4 (=0.607).
- Conditioned floor area should be multiplied by 1/1.4 (=0.714).
- Conditioned living area should be multiplied by 1.1/1.4 (=0.786).

To confirm the magnitude of these conversion factors, useful floor areas obtained with the conversion of conditioned floor areas by country from Tabula are compared with the results of Eurostat (EU-SILC survey), for two types of dwellings (see Table A2.1). ([18]) Single-family houses from Tabula are compared with detached houses from Eurostat and terraced houses are compared with semi-detached houses.

([17]) See "Typology Approach for Building Stock Energy Assessment", TABULA Calculation Method – Energy Use for Heating and Domestic Hot Water- Reference Calculation and Adaptation to the Typical Level of Measured Consumption, page 28.

([18]) See Table 4 from : EPISCOPE Project Team (2015), Evaluation of the TABULA Database, Comparison of Typical Buildings and Heat Supply Systems from 20 European Countries, December.

Table A2.1: **Comparison of useful floor areas from Tabula (April 2015, multiplying conditioned floor area by 1/1.4) and from Eurostat (EU-SILC survey, 2012)**

	TABULA single family house (a)	EU-SILC detached house (b)	(a)/(b)	TABULA terraced house (c)	EU-SILC semi-detached house (d)	(c)/(d)
EU28 (Eurostat) & 20 countries (TABULA)	110.71	119.1	0.93	127.14	110.7	1.15
Median over all countries			0.9			0.93
Average over all countries			0.94			1.15

(1)Units: number of square metres of useful floor area for (a), (b), (c) and (d).
The 20 countries covered by Tabula are BE, BG, CZ, DK, DE, IE, EL, ES, FR, IT, CY, HU, NL, AT, PL, SI, SE, UK and RS (Serbia). EU countries not covered by Tabula are thus: EE, HR, LV, LT, LU, MT, PT, RO and SK, whose limited weights should make the perimeter of Tabula for 20 countries comparable with the one of EU28 and, conversely, NO and RS are covered by Tabula and are not in EU28. Inertia of average surfaces should also make the figures comparable for 2012 and April 2015.

Source: TABULA/EPISCOPE, Eurostat, own calculations

ANNEX 3

Fall back method: price estimates from property advertisements on real estate agents' website

Table A3.1: **Coverage, sources, and results**

Country	Period	Sample size (total number of dwellings in the country in parenthesis: source Eurostat for EU countries, 2011 by default)	Coverage	Weights / stratification used for calculations	Results	Remarks
BG	Oct-17	2744 (3882810)	All but one regions (Yambol, the fifth least constructed one in terms of floor area) are covered	Useful floor areas by region, supplied by NSI	Excluding regions for which less than 10 observations are recorded, a figure of 670.3 BGN/m^2 is found (equivalent to 580.6 in 2012).	Concentrating on flats in district centres, which would give a perimeter comparable with the one of the NSI ("market prices of dwellings") gives 959.6 (equivalent to 831.1 in 2012, close to the NSI figure (881.4 BGN/m2))
EE	Oct-17	14535 (649746)	All regions are covered	Square metres by region, putting apart the capital	The weighted average gives 1046.5 €/m^2 in October 2017. Results are close using median values. Weighted median surfaces are consistent with NSI figures for 2011 (72.7 m^2 and 70.6 m^2 respectively).	
IE	2011	11374 (1649408 dwellings in 2011)	All counties are covered	Number of rooms by county	1768.8 €/m^2 (average) and 1721.2 €/m^2 (median) without correcting for floor area. 2462.8 €/m^2 (average) and 2396.5 €/m^2 (median) correcting for floor area.	Transaction data from NSI. Floor areas correspond to heated floor area, not to useful floor area.
IE	Oct-17	7683 (1697665 dwellings in 2016)	All counties are covered	Number of rooms by county	2383.3 €/m^2 (average) and 2389.2 €/m^2 (median) without correcting for floor area. 3318.3 €/m^2 (average) and 3326.5 €/m^2 (median) correcting for floor area.	Floor areas usually used in Ireland correspond to heated floor area, not to useful floor area.
EL	Nov-17	133324 (6371901)	308 municipalities are covered over 325 (coverage in terms of dwellings: 99.5%)	Square metres by region	1350.1 €/m^2	
FR	2012	290174 (27095096)	All regions are covered except Corsica (representing around 0.8% of dwellings)	Square metres by region	2529 €/m^2 (average) and 2398.4 €/m^2 (median)	Transaction data from notaries-INSEE BIEN / PERVAL
HR	Feb-14	149000 (1730000)	All counties are covered	Floor areas of census by county	1205.7 €/m^2	
CY	Oct-17	6249 (431049)	All districts are covered	Floor area of occupied dwellings, for rural and urban areas of each district	The weighted average gives 2411.1 €/m^2 and the weighted median 1857 €/m^2 (the discrepancy between the two figures signalling a potential over-representation of prime goods)	The median value is retained, due to the potential over-representation of prime goods

(Continued on the next page)

Table (continued)

LV	Jul-16	12971 (1018532)	All regions are covered. Stratification has been made with 8 groups: the capital (Riga), Jurmala (3rd city of the country and main city on the coast), Liepaja (other big city on the coast), big cities except the previous ones, intermediary cities, big regions, intermediary regions and small regions.	Number of houses and flats for all areas except Riga and surfaces by quarters of Riga	Mean price: 703.9 €/m^2	Prices may be overestimated compared to transaction values, due to high unoccupied rates. Besides, stratification may need to be refined using floor areas instead of number of dwellings
LT	Oct-17	18370 (1374233)	All municipalities are covered	Number of square metres by municipality	682.5 €/m^2 (average) and 635.4 €/m^2 (median)	
MT	2012	3493 (223850)	All regions are covered. Inside regions, only the municipality of Fontana (613 dwellings in 2011) did not register any transaction	Number of rooms by region	1017.3€/m^2 for the mean and 949.4€/m^2 for the median (for flats only: 1161.8€/m2 for the mean and 1094.6€/m2 for the median)	Data come from NSI, registering transactions and not from realtors. Surfaces for houses may, sometimes, be wrongly filled and include external surface
AT	Jul-16	25175 (4441408)	All regions are covered. Offers represent between 0.14% (Vorarlberg) and 0.98% (Wien) of the stock of dwellings, for an average of 0.57%	Floor area by region and, for Vienna, by area	2828.7 €/m^2 (average) and 3125.3 €/m^2 (median)	
PL	Jul-16	361345 (12965598)	All regions are covered and main cities are considered separately. The number of offers by region/city ranges from 761 up to 75795, with a median value around 4200.	Number of dwellings by region and main cities	3215.2 PLN/m^2 (average) and 3715.1 PLN/m^2 (median)	Comparisons with transactions prices, weighted with the share of housing in the market stock, from Polish Central Bank, for Warsaw, the 6 following main cities and the 10 following other main cities, give close results (these 17 cities represent around 25% of total stock of dwellings)
PT	Oct-17	69776 (5690222 in 2016)	All municipalities are covered	Number of useful square metres by municipality	1385.7 €/m^2 (average)	Floor areas may correspond to gross or useful floor areas, which counterbalances the positive bias of realtors offers compared to transaction price to surface
RO	Oct-17	54214 (8722398)	All municipalities and towns are covered	Number of square metres by municipality or town	566.9 €/m^2 (average) and 610.9 €/m^2 (median)	
SI	Oct-17	4024 (534462)	All statistical regions and main municipalities are covered	Number of square metres by municipality and statistical regions	1193.1 €/m^2 (average)	
SK	Jul-16	25714 (1941176)	All regions are covered	Number of square metres by region	752.4 €/m^2 (average)	Results are different from the one published by the central bank because this uses transactions as weights. Using the same weights, the two sources would be consistent.
CH	Oct-17	15171 (4300000)	All cantons are covered	Floor areas of cantons, putting apart Geneva and Basel	7608 CHF/m^2 (average) and 6833.6 CHF/m^2 (median)	
IS	Oct-17	2549 (126211 dwellings from Census 2011)	Cities covered represent 96.2% of dwellings	Floor area by city	289327.1 ISK/m^2 (average)	
TR	Oct-17	51018 (19454000 main dwellings in 2011)	All provinces are covered. Inside provinces, only 4 cities are not covered, representing 324000 dwellings	Number of rooms by province (26 provinces)	2696.3 LT/m^2 (average) and 2306.2 LT/m^2 (median)	The median value, consistent with the perimeter from the Central Bank (CBRT) is 12% above

Source: Real estate web sites (BG: mirela.bg; EE: kinnisvaraportaal-kv-ee.postimees.ee; IE: myhome.ie; EL: en.tospitimou.gr and xe.gr; HR: dogma-nekretnine.com, realestatecroatia.com; CY: aloizou.com.cy and incyprusproperty.com; LV: ee24.com; LT: alio.lt; AT: immobilien.net; PL: domy.pl, oferty.praca.gov.pl and otodom.pl; PT: casa.sapo.pt and idealista.pt; RO: homezz.ro and magazinuldecase.ro; SI: nepremicnine.si21.com; SK: reality.sk; IS: fasteignir.visir.is; CH: homegate.ch; TR: hurriyetemlak.com), own calculations, Eurostat, national censuses for non-EU countries.

ANNEX 4

Comparison of price level estimates from alternative methods and sources

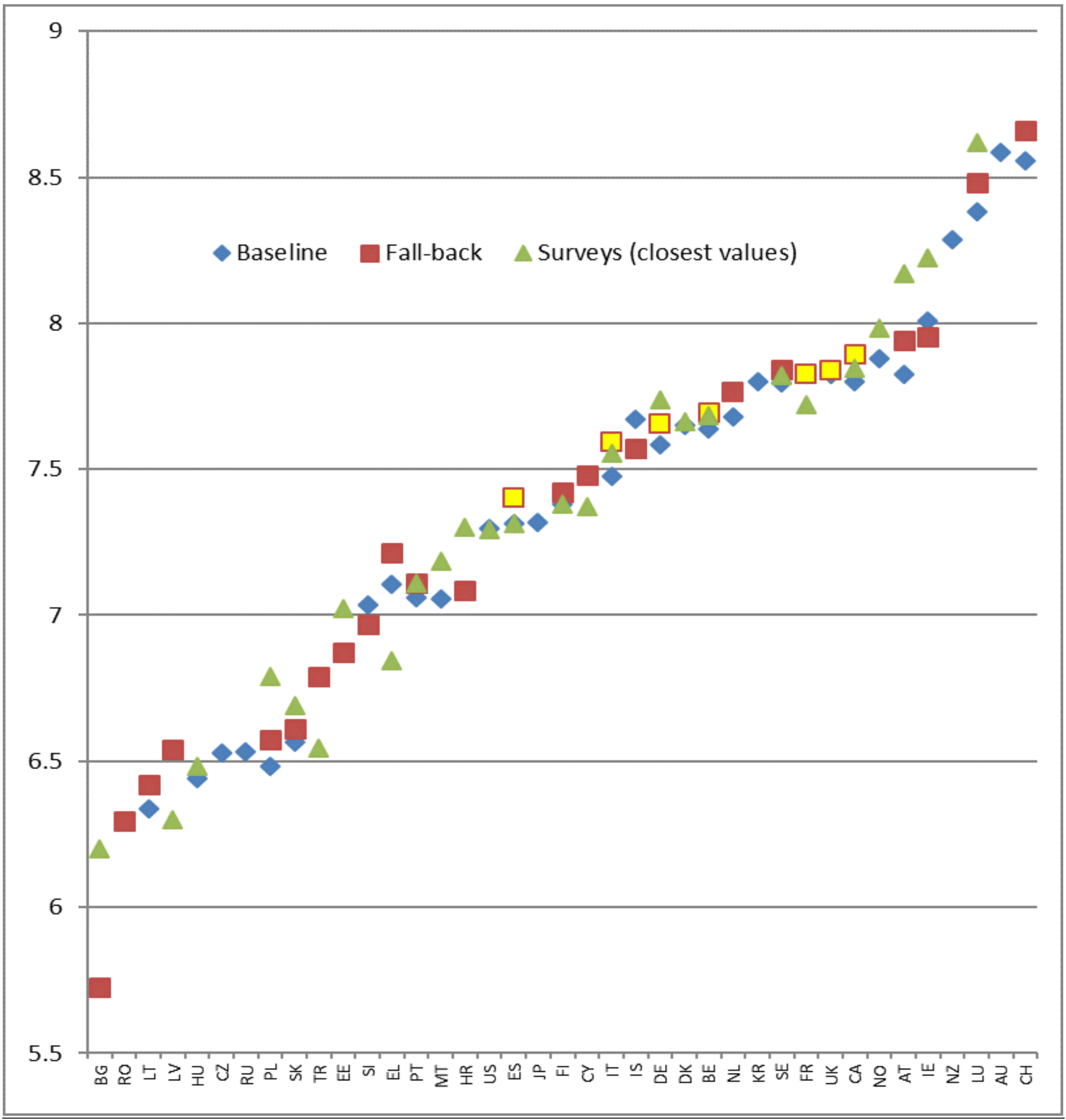
Table A4.1: **Price level estimates in euro per sqm from different methods and sources, 2016**

Country	Baseline method	Fall back method	Surveys
		EU countries	
BE	2079.6	2195.3 (source: Dujardin et al. (2015))	2171.6 (HFCS, 2nd wave)
BG		306.8 (439.3 for flats in district centres)	491.8 (NSI, average "market price of dwellings" (flats) in district centres)
CZ	685		
DK	2101.1		2126.5 (Danish Mortgage Banks data)
DE	1965.2	2111.5 (source: Dujardin et al. (2015))	2295.9 (HFCS, 1st wave)
EE		965.9	1123.4 (NSI, based on the survey "Real Estate Agencies", harmonizing for floor area) and 1378.4 (HFCS, 2nd wave)
IE	3001.1	2845.7	3730 (HFCS, 2nd wave)
EL	1218.4	1360.4	938.5 (HFCS, 2nd wave)
ES	1499.4	1643.2 (source: Dujardin et al. (2015))	1499.4 (Ministry of development, based on appraisals, Professional Association of Valuation Companies (ATASA))
FR	2503.5	2504.5 (source: Dujardin et al. (2015))	2255.1 (HFCS, 1st wave) and 2935.4 (HFCS, 2nd wave)
HR		1195.4	1484.7 (NSI: new dwellings sold)
IT	1763.8	1983.5 (source: Dujardin et al. (2015))	1608.1 and 1511.6 (source: Cannari and Faiella (2008), using the Survey of Household Income and Wealth, the Osservatorio Mercato Immobiliare dell'Agenzia del Territorio and Il Consulente Immobiliare); 1907.4 (HFCS, 1st wave) and 2117.1 (HFCS, 2nd wave)
CY		1769.2	1592 (HFCS, 1st wave) and 1573.4 (HFCS, 2nd wave)
LV		694	543.5 (HFCS, 2nd wave)
LT	565	615.1	
LU	4371.3	4828.9	5535.1 and 5554.4 (HFCS, 1st and 2 waves, harmonizing for floor area)
HU	628.2		652.5 (HFCS, 2nd wave)
MT	1159.2		1321.8 (HFCS, 2nd wave)
NL	2164	2354.7	
AT	2498.5	2805.5	3530.6 (HFCS, 2nd wave)
PL	653.3	716.8	889.9 (NSI, new residential buildings, harmonizing for floor area) and 1085.4 (HFCS, 2nd wave)
PT	1166.5	1226.1	1160.4 (NSI, Survey Inquérito à Avaliação Bancária na Habitação) and 1226.6 (HFCS, 2nd wave)
RO		541.9	
SI	1136.6	1061.4	
SK	709.1	744.9	805 and 771.9 (HFCS, 1st and 2nd waves)
FI	1602	1674	1601.6 (HFCS, 1st wave) and 1810.8 (HFCS, 2nd wave)
SE	2432	2541.3	2489.1 (average purchase price for one and two-dwellings buildings, source: NSI)
UK	2500.8	2538.8 (Halifax-financed transactions, existing homes)	
		Non EU countries	
IS	2148.6	1945.3	
NO	2640.7		2925.7 (NSI: freeholders, using average price per m2 for detached houses, row houses and multi-dwellings, weighting by stocks of floor areas)
CH	5190	5775.6 (harmonizing for floor area)	
TR		890.1 (median: 793.8)	696.8 (Central Bank: stratified median price using the appraisal value of houses from approval of individual loans)
AU	5351.5		
CA	2442.1	2678.8 (Canadian Real Estate Association, sale prices)	2552.2 (National Household Survey, harmonizing for floor area)
HK	29836.3		
JP	1510		
NZ	3977.1		
RU	686.7		
KR	2438.5		
US	1474		1467.4 (Census, new single-family houses sold, harmonizing for floor area)

(1)"NSI" stands for national statistical institute.
Figures are converted in euros for 2016 and the surface of census is for main dwellings only. Unless stated, calculations are performed harmonising for floor area to be consistent with the concept of useful floor area. See Tables A1.1, A1.2, A1.5 for sources and methods.

Source: See table 3.1 and references found in the table above (column 3)

Graph A4.1:**Price level estimates in euro per sqm (in log) from different methods and sources, 2016**



(1)Prices are in euros and in logarithm. A difference by 0.1 point between two sources means a difference by 10%. HK is not represented, because it would be out of scale and has only one source anyway. BG displays an important discrepancy between realtors and survey data because the latter covers only flats in district centres: comparing the two sources in this latter perimeter would lead to a much reduced discrepancy, around 6%.
Realtors data for BE, DE, ES, FR and IT are from Dujardin et al. (2015) and for UK and CA are directly from realtors and are represented in yellow.

Source: See Table A.4.1.

ANNEX 5
Definition of statistical concepts

Conditioned floor area: floor area based on internal dimensions, measured to the inside surface of external walls. It is generally equal with the heated area or with the air-conditioned area, dependent of which is the bigger one.

Gross disposable income per capita: Calculated as the ratio between gross disposable income of households and non-profit institutions serving households (NPISHs) and total population. Source: national accounts.

Living floor space: The living floor area is obtained by adding to the surface of living rooms (kitchens above $4m^2$, dining rooms, livings, bedrooms…) the floor area of kitchens smaller than $4m^2$, bathrooms, toilets, corridors and halls, covered terraces and swimming pools inside dwellings. The floor area is measured inside outer walls, excluding cellars and attics. This definition may vary marginally for non-EU Countries.

Purchasing Power Parity (PPP): Expressed in national currency per current international dollar. The source is World Economic Outlook (WEO, IMF), using primary source information from: OECD, the World Bank, and the Penn World Tables([19]).

Saleable area (in the case of Hong-Kong): floor area exclusively allocated to the unit including balconies, verandas, utility platforms and other similar features but excluding common areas such as stairs, lift shafts, pipe ducts, lobbies and communal toilets. It is measured to the exterior face of the external walls and walls onto common parts or the centre of party walls.

Useful floor space: according to Eurostat, useful floor space is defined as the floor space measured inside the outer walls excluding non-habitable cellars and attics and, in multi-dwelling buildings, all common spaces; or the total floor space of rooms falling under the concept of 'room'. A 'room' is defined as a space in a housing unit enclosed by walls reaching from the floor to the ceiling or roof, of a size large enough to hold a bed for an adult (4 square metres at least) and at least 2 metres high over the major area of the ceiling. The useful floor area in SILC HC020 (2012) uses the same definition as for census.

([19]) For further information see Box A2 in the April 2004 World Economic Outlook, Box 1.2 in the September 2003 WEO for a discussion on the measurement of global growth and Box A.1 in the May 2000 WEO for a summary of the revised PPP-based weights, and Annex IV of the May 1993 WEO. See also Anne Marie Gulde A.-M. and Schulze-Ghattas M. (1993), Purchasing Power Parity Based Weights for the WEO, in Staff Studies for the World Economic Outlook (Washington: IMF), pp. 106-123, December.

Table A5.1: **Price level estimates (€/m2)**

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT
1980	426,6			404,6	857,0		460,8		214,2	559,3		454,0			
1981	399,4			382,9	961,8		562,1		217,9	594,4		567,8			
1982	354,4			366,2	1032,5		597,3		195,5	596,9		623,3			
1983	342,8			441,2	1054,7		611,6		218,6	592,8		649,7			
1984	360,5			521,5	1043,8		650,2		248,3	622,4		667,7			
1985	366,5			612,7	1055,0		658,8		245,9	655,0		626,3			
1986	396,1			692,7	1112,8		632,5		274,3	668,5		663,5			
1987	422,2			634,7	1111,9		615,7		379,4	704,9		667,0			
1988	451,8			635,1	1121,5		670,2		501,8	768,5		748,3			
1989	526,3			642,4	1188,5		732,9		627,2	883,2		889,9			
1990	587,7			594,0	1270,8		835,6		727,8	956,9		1028,2			
1991	616,4			598,2	1332,3		860,9		838,0	1006,1		1189,5			
1992	686,2			616,0	1461,9		904,6		773,2	1024,2		1179,6			
1993	720,7			611,8	1548,1		867,6		671,9	1023,4		1156,7			
1994	788,9			693,3	1637,8		904,1		663,5	1021,8		1092,4			
1995	834,5			765,1	1680,9		931,2		697,3	1033,8		1055,9			
1996	822,7			829,6	1605,1		1113,0		690,3	1023,5		1193,3			
1997	828,7	90,9		915,3	1552,9		1232,6	867,6	687,8	1011,0		1215,9			
1998	890,7	104,5		1008,1	1555,0		1499,8	939,0	724,1	1040,7		1219,0			
1999	954,0	105,4		1076,9	1556,6		1822,3	1020,7	799,2	1111,3		1231,8			211,4
2000	1005,8	104,6	247,2	1143,9	1563,8		2198,5	1093,9	867,8	1209,5	736,9	1280,0		213,8	206,0
2001	1054,2	105,4	296,8	1215,2	1565,3		2530,0	1251,4	952,6	1303,7	773,9	1354,5		222,1	245,1
2002	1121,3	95,6	338,4	1260,3	1543,6		2642,5	1424,7	1099,2	1417,7	802,9	1515,8	1376,4	295,3	264,1
2003	1199,5	106,6	363,2	1297,4	1549,7		3021,2	1501,6	1288,1	1586,2	810,5	1609,0	1362,2	330,3	289,8
2004	1303,6	157,1	388,0	1414,8	1526,3	383,2	3358,6	1536,4	1508,0	1826,7	897,6	1708,2	1519,9	327,0	313,2
2005	1468,8	214,5	413,9	1658,8	1544,3	508,5	3683,4	1703,8	1712,3	2106,7	1038,5	1838,5	1633,4	406,3	393,6
2006	1612,0	246,1	470,2	2059,2	1538,8	760,2	4231,0	1929,3	1941,9	2362,0	1226,3	1944,0	1812,2	629,6	505,2
2007	1737,6	317,3	579,2	2113,8	1505,4	918,1	4546,9	2044,1	2132,4	2498,3	1377,7	2041,0	2000,6	859,0	638,2
2008	1814,2	396,5	647,6	2006,6	1525,8	829,8	4231,3	2078,5	2101,8	2518,7	1412,8	2094,9	2113,5	853,9	695,5
2009	1805,7	315,6	632,0	1768,4	1538,8	521,1	3420,9	2001,2	1963,0	2362,8	1352,3	2084,6	1974,8	534,6	487,3
2010	1862,4	283,5	655,9	1815,1	1555,4	550,6	2959,2	1908,1	1928,3	2476,3	1252,5	2067,9	1861,7	475,9	451,3
2011	1937,2	267,9	638,1	1788,9	1609,2	597,4	2453,7	1803,8	1781,0	2620,0	1229,0	2083,9	1831,9	533,0	481,2
2012	1980,6	262,8	644,7	1734,2	1664,8	640,9	2123,6	1593,5	1517,7	2605,9	1206,5	2025,2	1776,0	550,2	480,0
2013	2003,9	257,0	591,2	1802,3	1716,7	709,1	2150,2	1420,6	1379,3	2555,6	1148,4	1909,6	1703,3	583,6	485,9
2014	1992,7	260,7	598,9	1873,8	1770,5	806,4	2505,7	1314,5	1383,6	2515,7	1125,7	1826,1	1673,2	618,6	517,1
2015	2026,1	267,9	639,0	1999,6	1853,9	861,7	2792,8	1248,9	1433,1	2478,5	1095,9	1778,1	1649,0	597,8	536,0
2016	2079,6	286,7	685,0	2101,1	1965,2	902,7	3001,1	1218,4	1499,4	2503,5	1117,2	1763,8	1653,5	648,6	565,0
2017	2156,0	311,6	809,4	2190,8	2043,0	952,3	3328,4	1206,2	1592,2	2585,6	1178,6	1756,7	1690,6	705,9	615,3

	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	NO	CH	TR
1980	430,1			497,1							303,2	501,7	358,4		311,6	978,3	
1981	442,6			465,2							370,1	481,4	367,3		368,2	1278,2	
1982	393,7			436,8							405,5	409,2	354,9		371,3	1356,0	
1983	389,8			445,5							521,9	438,9	417,3		424,5	1511,1	
1984	423,4			445,6							606,8	467,9	426,8		479,7	1566,6	
1985	448,2			456,7							608,8	460,9	459,9		553,8	1641,6	
1986	515,3			502,2							594,9	455,7	443,4		617,7	1844,6	
1987	557,3			532,1							661,7	493,7	538,8		646,6	2052,8	
1988	638,9			549,9			465,7				940,7	614,0	738,4		709,2	2231,9	
1989	782,5			601,8			527,5				1159,0	706,3	769,7		646,2	2404,1	
1990	901,5			609,1			594,2				1074,1	762,6	797,9		589,6	2537,7	
1991	979,5			627,5			720,8				823,3	839,7	777,4		553,7	2390,7	
1992	1127,5			710,1			820,2				598,7	662,7	669,7		502,7	2357,1	
1993	1109,4			779,7			749,2				535,1	542,1	696,0		507,2	2384,9	
1994	1161,7			870,6			770,9				628,5	574,2	685,4		578,8	2440,7	
1995	1178,9			928,3			780,2				617,6	607,6	641,1		621,7	2501,9	
1996	1213,1			992,5			795,1				640,3	617,5	763,7		698,8	2119,6	
1997	1236,2			1089,1			798,8				730,8	650,5	918,7		777,1	2155,3	
1998	1293,9			1221,3			841,3				811,1	655,6	967,8		789,7	2133,5	
1999	1377,1			1420,4			916,9				883,6	794,5	1217,7		963,9	2134,1	
2000	1477,0		374,3	1679,0	1389,5		987,9				934,2	856,8	1394,0	999,7	1096,0	2249,8	
2001	1685,3		418,5	1839,4	1400,1		1041,7				919,4	878,1	1545,9	912,2	1213,1	2332,1	
2002	1827,5		450,1	1956,2	1409,1		1047,6				977,7	949,3	1679,3	1036,5	1392,0	2377,0	
2003	2032,5		507,6	2004,3	1412,6		1059,2		743,3		1039,0	1019,6	1794,4	1098,6	1223,7	2247,2	
2004	2316,6		589,6	2084,4	1386,1		1066,3		804,7		1122,6	1122,6	2006,4	1302,7	1377,3	2351,7	
2005	2580,9		642,3	2183,7	1455,1		1090,8		921,7	344,1	1214,1	1182,9	2306,0	1895,0	1537,9	2419,3	
2006	2868,3		770,0	2277,0	1515,2		1113,0		1076,1	441,8	1298,7	1381,3	2537,9	1772,5	1694,8	2486,0	
2007	3068,7	669,2	931,7	2387,2	1585,9		1128,3		1330,3	584,2	1375,3	1488,4	2554,2	1965,0	1974,8	2555,8	
2008	3171,4	651,8	1034,9	2439,6	1601,8	768,8	1171,0	914,9	1423,5	767,9	1386,2	1306,8	1877,9	1128,5	1594,6	2955,7	
2009	3134,7	609,1	990,1	2330,9	1665,3	756,2	1160,2	662,1	1288,6	670,0	1406,1	1426,8	1835,1	962,9	1909,0	2972,0	
2010	3304,6	578,4	1000,8	2290,6	1768,0	751,6	1169,1	608,5	1290,3	643,2	1494,8	1762,1	2001,8	1092,0	2198,1	3623,8	796,3
2011	3426,2	493,6	987,2	2245,4	1878,5	670,7	1111,7	526,0	1325,3	633,5	1542,4	1817,0	2032,8	1106,3	2388,2	3964,9	723,8
2012	3570,1	511,5	1017,3	2094,5	2015,9	708,3	1033,1	485,7	1233,9	616,4	1579,7	1909,1	2089,0	1106,4	2690,9	4186,4	821,7
2013	3747,9	490,5	1013,1	1968,9	2120,2	664,2	1013,7	481,6	1169,2	622,0	1597,9	1950,8	2097,4	1253,6	2459,6	4239,8	722,3
2014	3912,4	481,1	1039,0	1984,9	2194,6	652,0	1056,7	470,5	1092,0	630,7	1592,3	2012,7	2425,1	1396,4	2336,9	4446,1	847,4
2015	4123,5	543,3	1099,3	2055,6	2302,1	663,4	1089,0	479,5	1100,8	664,6	1592,3	2327,2	2726,9	1650,0	2334,6	5062,5	865,1
2016	4371,3	628,2	1159,2	2164,0	2498,5	653,3	1166,5	506,4	1136,6	709,1	1602,0	2432,0	2500,8	2148,6	2640,7	5190,0	831,9
2017	4617,5	680,7	1215,7	2338,5	2630,4	716,4	1274,3	523,3	1228,1	750,9	1625,2	2511,0	2526,0	2446,5	2559,7	4855,7	749,4

	AU	CA	HK	JP	NZ	RU	KR	US
1980		331,6		602,4				316,1
1981	747,1	460,4		744,5	307,6			400,5
1982	754,3	469,4		842,2	402,1			464,1
1983	854,9	574,3		1045,8	463,7			563,9
1984	1021,9	628,7		1162,6	443,6			686,5
1985	742,8	499,7		1190,0	425,6			576,2
1986	642,1	488,0		1272,2	409,4			510,3
1987	606,1	493,3		1477,5	492,0			446,1
1988	977,1	703,4		1690,3	590,9			522,3
1989	1103,7	801,2		1552,4	580,3			538,7
1990	960,3	682,9		1639,5	531,4			487,7
1991	987,9	727,0		1887,2	485,2			502,6
1992	1005,2	753,3		2012,7	515,1			570,5
1993	1102,9	797,5		2333,3	631,8			634,2
1994	1185,5	707,7		2317,5	746,8			594,6
1995	1077,7	650,8		2063,0	779,9			570,9
1996	1218,8	678,7		1882,5	977,2			616,4
1997	1179,6	754,4		1884,2	968,3		933,1	719,5
1998	1127,4	652,5		2004,1	816,2		1130,2	713,9
1999	1489,2	828,9	10923,7	2509,6	951,5		1376,4	879,8
2000	1483,2	904,2	10524,0	2320,6	868,2		1354,2	1013,8
2001	1601,1	939,4	9760,0	2056,6	880,2		1426,4	1144,5
2002	1770,5	863,4	7290,2	1805,0	1029,9	258,8	1553,7	1029,7
2003	2308,0	953,6	5353,1	1559,7	1278,9	287,4	1398,8	920,6
2004	2359,8	1020,5	6280,4	1416,3	1524,6	359,5	1504,5	934,3
2005	2604,4	1318,1	8574,5	1354,6	1907,6	494,2	1809,9	1191,5
2006	2687,2	1322,4	7717,2	1163,3	1944,0	716,2	1867,1	1130,3
2007	2958,5	1560,2	7688,9	1095,8	2122,5	997,1	1825,4	1011,5
2008	2541,8	1398,6	9528,9	1442,3	1595,6	1081,2	1464,6	983,4
2009	3349,5	1527,7	9257,0	1287,0	1917,7	1028,2	1630,2	894,1
2010	4558,5	1889,2	12389,1	1600,1	2250,8	1177,5	1852,7	935,1
2011	4605,1	1999,1	15443,3	1736,3	2341,9	911,3	1943,8	925,5
2012	4594,2	2107,8	17196,1	1517,8	2558,4	1085,6	2097,1	934,4
2013	4037,5	1935,9	19324,3	1211,1	2670,7	1002,7	2010,5	958,2
2014	4579,4	2126,3	23256,2	1225,6	3071,0	636,8	2236,4	1144,5
2015	4970,0	2084,8	29986,0	1390,7	3347,0	578,0	2378,2	1345,6
2016	5351,5	2442,1	29836,3	1510,0	3977,1	686,7	2438,5	1474,0
2017	5514,9	2582,9	30381,4	1416,0		613,3	2448,3	1382,3

Source: See Table 3.2 for level estimates and Eurostat, BIS and OECD for house price indices series and exchange rates.

Table A5.2: **Price level estimates, purchasing power parity (national currency divided by PPP index using implied conversion rate compared to the US (US: PPP=1)**

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	NO	CH	TR	AU	CA	HK	JP	NZ	RU	KR	US
1980	518.514			469.044	1233.96		740.908		401.216	645.907		797.237				536.161			607.717							342.591	430.485	378.479		405.691	1227.39		678.787	462.172	4070.58	664.644	392.161		1340.86	413.96
1981	510.334			441.482	1383.25		832.225		395.942	701.603		982.675				561.965			566.917							384.736	452.558	389.699		432.452	1399.91		775.35	524.877	4926.78	783.362	466.573		1351.62	434.617
1982	485.019			415.998	1416.85		809.704		382.792	702.397		990.213				576.656			508.437							444.475	446.139	392.318		454.067	1454.73		761.21	483.905	4126.06	881.699	584.317		1421.07	449.117
1983	469.709			489.21	1430.54		816.927		422.817	700.165		965.135				558.892			526.544							516.452	423.42	432.164		471.572	1535.83		769.312	502.263	3503.95	951.676	613.572		1669.46	466.52
1984	470.744			551.734	1419.58		822.205		427.308	702.99		927.128				575.838			533.812							552.167	416.967	464.836		524.611	1619.75		839.047	499.881	3158.06	1002.53	665.941		1874.22	486.704
1985	471.064			638.982	1419.33		806.077		446.317	710.744		892.394				626.278			542.131							564.747	420.093	493.867		621.105	1714.46		906.37	525.902	3420.6	1046.65	678.809		1989.98	511.583
1986	489.617			711.56	1406.18		796.728		475.854	722.323		870.965				711.649			578.952							572.244	430.657	547.6		835.451	1799.63		931.836	605.463	3775.39	1078.27	671.605		2076.31	546.267
1987	525.206			645.05	1404.5		784.717		637.305	774.498		891.446				787.605			623.882							627.41	475.661	622.586		858.171	1927.83		943.287	687.904	4396.86	1190.39	692.838		2036.31	581.405
1988	574.794			649.566	1456.5		852.588		782.676	859.962		976.387				917.742			677.473			1035.97				813.277	545.084	776.189		878.889	2231.4		1096.28	800.32	5065.48	1295.97	733.705		2275.45	612.471
1989	649.118			638.297	1526.03		911.723		937.478	969.653		1126.79				1097.16			740.578			1148.86				970.03	622.924	894.701		808.94	2525.73		1320.98	896.852	5900.4	1421.35	773.307		2543.06	644.777
1990	723.915			596.542	1654.33		1069.15		1048.18	1064.97		1283.94				1267.07			770.931			1228.61				904.047	660.232	848.014		749.579	2498.42		1325.51	874.502	6336.32	1632.14	821.594		2806.67	664.829
1991	758.249			608.314	1557.95		1109.55		1155.86	1128.6		1429.16				1388.95			792.608			1367.42				792.031	672.989	810.372		710.955	2408.76		1384.78	914.371	8182.61	1708.79	825.575		2923.02	673.909
1992	799.354			602.081	1588.84		1124.63		1092.04	1105.23		1608.43				1509.43			856.905			1442.9				666.383	616.313	772.517		694.934	2307.5		1420.64	946.064	10623.5	1653.02	834.995		2593.53	690.819
1993	829.208			606.925	1636.93		1115.49		1055.53	1097.52		1660.87				1438.88			934.29			1418.92				610.78	547.884	757.259		701.981	2188.02		1475.45	976.937	10931.5	1610.78	870.988		2413.73	707.545
1994	882.352			685.092	1706.43		1176.22		1047.45	1108.58		1616.8				1445.8			1029.46			1387.14				649.333	570.51	785.292		812.708	2205.78		1540.83	1016.79	12971.5	1602.51	1002.68		2243.27	731.341
1995	904.548			742.993	1733.53		1208.07		1069.77	1108.04		1564.39				1446.12			1075.36			1363.22				612.857	562.63	787.223		864	2149.31		1548.01	967.048	11873.7	1618.47	1097.28		2138.7	750.3
1996	936.835			820.854	1732.62		1326.63		1072.59	1122.69		1580.91				1524.58			1198.45			1375.63				659.369	571.672	798.678		919.787	2070.99		1559.25	967.603	12441.2	1625.68	1207.06		2103.62	772.4
1997	967.055	562.908		912.881	1726.24		1487.92	1298.18	1082.8	1127.33		1621.68				1637.34			1329.54			1395.91				771.421	610.376	876.365		1018.8	2041.5		1631.02	997.414	16694.8	1622.2	1296.38		2117	794.449
1998	1021.45	491.333		993.298	1716.32		1747.97	1426.22	1117.39	1152.44		1597.66				1720.61			1460.94			1421.18				833.624	670.415	975.378		1152.29	2047.83		1753.72	996.989	11966.1	1612.84	1274.1		1857.19	832.906
1999	1104.15	469.432		1058.74	1735.29		2068.42	1522.08	1220.21	1247.26		1614.42			613.285	1765.57			1701.04			1520.52				912.789	737.559	1089.26		1218.88	2074.73		1893.34	1021.01	10817.4	1607.28	1314.61		1883.85	883.872
2000	1166.8	444.617	621.609	1119.47	1795.38		2389.64	1695.99	1308.85	1366.68	1689.11	1682.04		541.196	559.366	1805.67		672.91	1984.69	1606.4		1619.52				971.092	826.112	1253.62	861.881	1251.72	2090.83		2009.2	1043.54	10262.1	1604.21	1308.86		1940.8	943.303
2001	1225.82	430.134	663.671	1182.23	1817.96		2643.64	1916.39	1413.37	1476.44	1688.09	1768.32		542.672	646.119	2098.72		736.059	2133.86	1624.28		1682.88				946.84	889.684	1375.24	859.242	1346.42	2136.04		2208.08	1099.24	9383.51	1585.99	1305.78		1990.69	1008.65
2002	1300.78	383.745	738.993	1215.09	1796.94		2674.61	2142.48	1590.77	1598.31	1747.79	1943.34	2170.53	770.058	691.198	2273.06		817.918	2222.9	1642.31		1649.74				1012.07	946.012	1585.45	867.194	1460.18	2171.25		2586.83	1191.8	8767.63	1546.98	1449.71	1393.45	2287.49	1079.85
2003	1393.12	426.33	820.853	1260.01	1816.75		3006.18	2227.83	1829.7	1790.34	1768.8	2039.26	2122.42	916.173	778.941	2509.23		945.202	2274.97	1655.99		1644.78		1189.85		1094.8	1010.26	1830.24	984.957	1471.9	2219.99		3013.07	1275.24	8375.03	1504.54	1746.67	1531.7	2460.38	1162.67
2004	1524.71	610.756	815.356	1381.56	1810.59	939.228	3416.66	2272.78	2117.91	2082.85	1945.7	2167.76	2335.2	906.951	842.052	2852.94		1117.01	2398.65	1642.28		1660.93		1298.62		1208.35	1130.54	2050.15	1092.21	1574.25	2357.7		3186.39	1373.15	11309.1	1467.78	2027.52	1673.65	2471.52	1272.57
2005	1736.12	808.725	853.833	1629.59	1883.31	1213.63	3762.39	2542.91	2381.53	2432.71	2161.25	2366.19	2481.43	1042.82	1022.31	3151.28		1214.23	2542.15	1734.38		1696.45		1510.11	817.83	1335.66	1269.66	2303.67	1425.96	1617.49	2503.21		3195.25	1482.89	13789.5	1456.31	2339.76	1786.57	2551.44	1405.62
2006	1919.05	896.483	941.062	2041.43	1930.68	1716.08	4321.8	2870.99	2678.5	2752.93	2522.03	2527.91	2771.4	1483.67	1266.14	3370.51		1461.02	2666.32	1827.78		1731		1778.6	956.457	1459.17	1445.12	2484.26	1584.28	1742.35	2684.68		3354.68	1664.54	14398.1	1469.32	2604.14	2369.21	2809.36	1488.54
2007	2083.48	1068.17	1113.81	2100.94	1907.96	1908.71	4702.07	3019.32	2921.06	2915.21	2786.82	2661.08	3045.01	1729.98	1512.26	3648.88	1478.96	1764.52	2808.49	1919.98		1749.27		2166.69	1252.47	1543.49	1622.72	2734.49	1705.78	1953.96	2847.92		3645.32	1844.73	16005.1	1504.34	2841.52	3087.64	3098.01	1489.01
2008	2175.32	1258.88	1255.88	1950.77	1951.12	1636.61	4501.41	2999.35	2875.31	2925.27	2765.92	2717.15	3135.8	1596.54	1531.99	3700.57	1470.36	1941.63	2856.72	1939.21	1832.11	1818.27	2451.91	2263.08	1465.49	1540.27	1618.57	2588.52	1651.45	1784.82	2957.66		3631.62	1907.97	18761.8	1559.37	2665.74	3319.7	3285.57	1368.64
2009	2165.11	969.078	1185.64	1720.94	1950.26	1029.82	3861.02	2834.62	2700.11	2763.46	2576.13	2672.58	2951.94	1116.96	1120.32	3636.53	1349.34	1823.48	2739.01	1994.4	1729.24	1795.95	1810.66	1997.87	1303.55	1545.21	1640.46	2341.6	1363.23	1933.22	2979.19		3794.73	1911.53	19093.3	1489.14	2619.03	3260.4	3225.64	1288.1
2010	2219.83	871.886	1196.12	1734.88	1976.41	1083.95	3493.76	2718.05	2678.19	2899.62	2422.66	2675.16	2762.21	1013.43	1025.73	3742.44	1302.88	1796.79	2701.18	2125	1656.92	1821.05	1637.25	2044.81	1258.66	1657.24	1775.63	2464.98	1268.58	1998.48	3088.74	1770.1	4070.7	2049.51	23982.9	1558.6	2628.24	3130.57	3234.57	1249.46
2011	2308.94	793.888	1221.82	1729.59	2065.73	1139.99	2967.02	2602.87	2526.2	3100.62	2436.4	2713.41	2721.96	1073.82	1059.86	3781.7	1255.72	1769.14	2698.77	2263.25	1640.14	1770.26	1408.22	2120.45	1247.12	1700.6	1835.99	2432.67	1315.65	2063.76	3344.74	1791.72	3877.58	2125.34	28418.3	1619.11	2637.76	2194.3	3408.87	1197.49
2012	2357.81	781.088	1208.45	1674.11	2148.15	1206.91	2561.66	2350.26	2190.04	3105.96	2404.63	2647.35	2638.9	1088.03	1048.14	3914.61	1191.2	1819.86	2529.58	2423	1574.25	1682.58	1301.3	1999.86	1218.17	1722.68	1872.01	2449.43	1386.93	2171.49	3576.68	1858.89	3959.44	2242.07	31667	1646.85	2821.23	2357.52	3478.11	1232.88
2013	2399.83	781.786	1210.62	1751.83	2209.43	1310.76	2609.41	2178.88	2013.52	3071.62	2328.75	2506.1	2600.39	1160.27	1065.55	4104.98	1145.81	1805.92	2383.65	2548.34	1525.24	1640.32	1275.73	1894.95	1243.95	1727.41	1985.52	2505.21	1463.09	2238.49	3741.77	1963.53	4236.13	2299.76	37138.9	1706.56	3028.82	2359.45	3466.4	1321.47
2014	2412.49	802.942	1231.99	1831.55	2278.62	1496.12	3108.77	2093.1	2061.93	3060.44	2331.7	2415.45	2639.19	1232.37	1141.47	4289.89	1175.56	1842.12	2441.49	2634.55	1560.09	1729.51	1250.99	1787.26	1284.62	1723.25	2172.26	2706.21	1551.63	2332.99	3939.61	2088.62	4683.34	2417.28	38961.8	1733.95	3208.47	2263.49	3562.56	1389.51
2015	2452.96	816.309	1279.61	1966.57	2358.67	1595.8	3262.58	2030.74	2145.43	3015.21	2289.62	2355.06	2659.69	1202.9	1193.78	4511.49	1318.91	1925.23	2534.7	2730.82	1589.18	1764.94	1267.22	1804.63	1370.26	1708.45	2433.82	2888.04	1601.01	2574.83	4108.8	2243.32	5206.64	2595.88	43894.8	1757.41	3618.05	2144.93	3615.63	1464.97
2016	2508.61	865.525	1372.25	2085.82	2497.02	1665.44	3547.41	2023.97	2268.31	3071.83	2341.38	2348.67	2723.98	1318.29	1261.06	4906.09	1500.07	2023.07	2688.17	2967.28	1632.5	1884.49	1332.5	1869.41	1489.71	1728.15	2635.46	3067.5	1743.02	2822.15	4251.39	2357.88	5500.74	2873.05	42148.8	1814.36	4076.08	1992.4	3655.08	1553.75
2017	2600.75	946.42	1539.79	2183.13	2612.55	1722.07	4019.83	2027.21	2427.17	3203.94	2444.51	2364.38	2831.76	1417.42	1340.61	5241.2	1598.7	2114.31	2930.45	3131.38	1692.45	2068.68	1370.23	2016.55	1584.18	1768.49	2796.78	3206.27	2110.61	2918.63	4397.98	2389.33	5864.99	3204.94	48647.6	1899.14		1852.3	3656.14	1657.75

Source: See Table 3.2 for level estimates and Eurostat, BIS and OECD for house price indices series and exchange

Table A5.3: **Price level estimates (national currency/m2)**

Year	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
1980	437.1			3190.9	1124.1		403.8		133.6	506.4		285.4				440.7			629.6							256.6	2876.1	196.8
1981	413.4			3040.5	1202.0		490.2		138.2	562.0		382.3				458.0			566.4							294.3	2890.5	208.1
1982	398.2			2971.5	1214.2		525.5		142.8	593.5		426.8				442.3			503.9							348.9	2897.7	213.0
1983	391.7			3609.9	1217.4		566.1		170.4	623.8		460.4				445.4			512.9							421.9	2908.5	238.1
1984	399.7			4166.1	1191.0		590.3		183.3	648.2		472.8				469.3			509.3							472.7	2980.5	260.3
1985	405.6			4875.4	1178.0		597.3		201.7	669.5		481.9				496.0			510.1							493.0	3095.7	283.0
1986	424.5			5445.6	1181.2		614.3		232.7	700.7		495.6				552.2			534.4							513.3	3304.4	321.4
1987	451.7			5042.4	1171.4		608.2		320.6	750.5		524.2				596.2			559.6							572.2	3729.2	375.4
1988	488.0			5099.7	1191.4		662.5		400.7	831.6		591.7				690.1			585.3			398.8				771.0	4405.9	478.9
1989	555.6			5063.0	1230.0		715.7		494.1	931.8		697.5				826.2			624.3			471.0				943.8	5233.8	571.7
1990	614.6			4682.3	1326.8		814.7		571.3	1013.8		817.9				942.7			636.8			541.8				892.3	5853.0	564.8
1991	640.7			4743.0	1386.6		837.7		653.1	1066.5		947.5				1018.1			653.1			646.8				768.3	6256.1	556.7
1992	683.4			4666.1	1461.7		853.6		644.3	1041.1		1088.9				1123.0			707.8			727.2				637.7	5665.8	534.6
1993	719.8			4621.1	1532.2		871.2		641.8	1026.2		1141.0				1107.9			766.1			736.4				581.5	5039.4	525.5
1994	765.9			5187.5	1595.5		912.7		646.3	1024.3		1126.9				1127.7			843.1			753.2				616.2	5269.8	539.5
1995	800.5			5581.4	1619.1		970.1		668.6	1015.0		1135.7				1130.9			888.2			764.8				593.9	5284.2	543.2
1996	817.9			6177.7	1597.5		1053.3		681.1	1023.9		1179.4				1205.9			983.9			777.2				626.4	5327.4	563.1
1997	837.5	179.6		6890.4	1569.1		1208.2	794.5	691.9	1019.1		1219.5				1249.3			1100.9			805.4				735.9	5680.2	612.6
1998	890.7	204.4		7509.3	1555.0		1499.8	908.5	724.1	1040.7		1219.0				1293.9			1221.3			841.3				811.1	6220.1	682.8
1999	954.0	206.1		8015.7	1556.6		1822.3	989.4	799.2	1111.3		1231.8			245.9	1377.1			1420.4			916.9				883.6	6803.2	757.0
2000	1005.8	204.5	8664.6	8537.1	1563.8		2198.5	1093.9	867.8	1209.5	5585.9	1280.0		175.3	222.1	1477.0		355.3	1679.1	1389.5		987.9				934.2	7566.4	870.0
2001	1054.2	205.2	9486.5	9037.0	1565.3		2530.0	1251.4	952.6	1303.7	5687.2	1354.5		175.8	250.0	1685.3		389.4	1839.4	1400.1		1041.7				919.4	8167.3	940.7
2002	1121.3	186.9	10686.6	9362.3	1543.6		2642.5	1424.7	1099.2	1417.7	6001.9	1515.8	1347.9	258.0	264.0	1827.5		438.4	1956.2	1409.1		1047.6				977.7	8689.1	1092.4
2003	1199.5	208.5	11772.7	9659.2	1549.7		3021.2	1501.6	1288.1	1586.2	6196.1	1609.0	1364.7	316.1	289.8	2032.5		510.4	2004.3	1412.6		1059.2		734.1		1039.0	9258.0	1264.7
2004	1303.6	307.2	11821.0	10524.7	1526.3	383.2	3358.6	1536.4	1508.0	1826.7	6880.0	1708.2	1506.2	324.7	313.2	2316.6		596.5	2084.4	1386.1		1066.3		805.1		1122.6	10126.3	1414.6
2005	1468.8	419.7	12002.3	12375.1	1544.3	508.5	3683.4	1703.8	1712.3	2106.7	7655.1	1838.5	1600.5	402.5	393.6	2580.9		642.3	2183.7	1455.1		1090.8		921.2	432.6	1214.1	11105.7	1580.3
2006	1612.0	481.4	12922.7	15353.6	1538.8	760.2	4231.0	1929.3	1941.9	2362.0	9013.7	1944.0	1790.3	624.6	505.2	2868.3		770.0	2277.0	1515.2		1113.0		1076.1	505.0	1298.7	12487.3	1704.2
2007	1737.6	620.6	15422.9	15765.5	1505.4	918.1	4546.9	2044.1	2132.4	2498.3	10099.4	2041.0	2000.6	851.1	638.2	3068.7	169792.0	931.7	2387.2	1585.9		1128.3		1330.3	651.3	1375.3	14052.7	1873.1
2008	1814.2	775.5	17405.2	14950.7	1525.8	829.8	4231.3	2078.5	2101.9	2518.7	10391.6	2094.9	2113.5	860.5	695.5	3171.4	173826.1	1034.9	2439.6	1601.8	3193.4	1171.0	3680.3	1423.5	767.9	1386.2	14204.6	1788.7
2009	1805.7	617.3	16731.8	13160.0	1538.8	521.1	3420.9	2001.2	1963.0	2362.8	9871.7	2084.6	1974.8	539.5	487.3	3134.7	164710.8	990.1	2330.9	1665.3	3104.0	1160.2	2804.7	1288.6	670.0	1406.1	14628.0	1629.8
2010	1862.4	554.5	16438.2	13528.6	1555.4	550.6	2959.2	1908.1	1928.3	2476.3	9247.3	2067.9	1861.7	480.4	451.3	3304.6	160779.7	1000.8	2290.6	1768.0	2987.4	1169.1	2593.4	1290.3	643.2	1494.8	15797.8	1723.0
2011	1937.2	524.0	16455.5	13298.8	1609.2	597.4	2453.7	1803.8	1781.0	2620.0	9263.2	2083.9	1831.9	530.5	481.2	3426.2	155269.3	987.2	2245.4	1878.5	2990.0	1111.7	2274.3	1325.3	633.5	1542.4	16193.5	1698.0
2012	1980.6	514.0	16213.8	12939.2	1664.8	640.9	2123.6	1593.5	1517.7	2605.9	9118.4	2025.2	1776.0	546.2	480.0	3570.1	149518.6	1017.3	2094.5	2015.9	2885.6	1033.1	2158.9	1233.9	616.4	1579.7	16383.8	1704.8
2013	2003.9	502.7	16213.8	13443.6	1716.7	709.1	2150.2	1420.6	1379.3	2555.6	8758.4	1909.6	1703.3	583.6	485.9	3747.9	145690.5	1013.1	1968.9	2120.2	2759.2	1013.7	2153.4	1169.2	622.0	1597.9	17282.0	1748.6
2014	1992.7	509.9	16610.9	13950.9	1770.5	806.4	2505.7	1314.5	1383.6	2515.7	8620.3	1826.1	1673.2	618.6	517.1	3912.4	151801.7	1039.0	1984.9	2194.6	2786.3	1056.7	2109.2	1092.0	630.7	1592.3	18905.2	1888.9
2015	2026.1	524.1	17267.1	14922.4	1853.9	861.7	2792.8	1248.9	1433.1	2478.5	8370.9	1778.1	1649.0	597.8	536.0	4123.5	171663.1	1099.3	2055.6	2302.1	2828.7	1089.0	2169.5	1100.8	664.6	1592.3	21386.0	2001.4
2016	2079.6	560.9	18510.3	15620.7	1965.2	902.7	3001.1	1218.4	1499.4	2503.5	8445.4	1763.8	1653.5	648.6	565.0	4371.3	194631.7	1159.2	2164.0	2498.5	2881.4	1166.5	2298.6	1136.6	709.1	1602.0	23231.6	2141.1
2017	2156.0	609.5	20668.7	16310.1	2043.0	952.3	3328.4	1206.2	1592.2	2585.6	8768.5	1756.7	1690.6	705.9	615.3	4617.5	211231.5	1215.7	2338.5	2630.4	2992.2	1274.3	2437.6	1228.1	750.9	1625.2	24717.9	2241.2

Year	IS	NO	CH	TR	AU	CA	HK	JP	NZ	RU	KR	US
1980		2108.0	2264.5		624.5	517.2	16945.8	159909.4	328.6		635659.8	414.0
1981		2319.7	2494.6		718.7	592.6	20761.5	177422.1	405.0		683261.8	434.6
1982		2534.6	2618.5		744.5	559.9	17969.0	191309.3	531.7		720206.0	449.1
1983		2708.7	2726.1		787.0	591.7	15347.3	200529.5	584.7		853417.0	466.5
1984		3090.5	2879.9		877.6	588.4	14643.9	207011.2	659.9		966159.4	486.7
1985		3729.7	3020.9		967.1	620.0	16199.9	212058.4	753.5		1033727.0	511.6
1986		4890.7	3201.5		1034.3	721.1	18182.3	217599.0	830.8		1109653.0	546.3
1987		5252.9	3418.0		1094.2	837.2	22424.0	233876.9	972.7		1113705.0	581.4
1988		5450.9	3929.5		1340.8	983.6	27156.0	247546.7	1099.8		1287847.0	612.5
1989		5100.4	4430.1		1672.4	1111.2	34275.5	266846.0	1168.5		1469138.0	644.8
1990		4730.6	4419.7		1698.0	1080.0	38176.4	303188.7	1233.2		1721656.0	664.8
1991		4438.5	4345.4		1742.0	1127.4	52074.2	316195.4	1203.7		1899849.0	673.9
1992		4214.8	4155.8		1768.7	1157.0	72643.6	304042.9	1212.4		1775733.0	690.8
1993		4254.0	3940.6		1814.8	1182.1	79308.4	291033.8	1262.1		1714272.0	707.5
1994		4814.5	3937.3		1879.8	1222.2	97973.9	284258.7	1433.8		1686399.0	731.3
1995		5167.6	3784.9		1902.5	1165.3	91486.7	279724.6	1568.0		1684254.0	750.3
1996		5632.8	3584.9		1917.9	1165.0	99679.2	274564.5	1729.7		1696167.0	772.4
1997		6305.3	3460.3		1994.7	1193.9	139084.6	270721.6	1834.4		1746431.0	794.4
1998		7005.9	3430.1		2141.3	1178.4	99821.1	266150.5	1802.8		1585630.0	832.9
1999		7785.0	3425.4		2296.6	1210.9	85241.2	257814.8	1841.8		1565381.0	883.9
2000	78775.9	9023.7	3426.9		2487.4	1262.7	76381.0	248116.2	1833.7		1593967.0	943.3
2001	83448.7	9645.8	3458.2		2766.7	1322.4	67073.3	237183.0	1867.3		1656859.0	1008.6
2002	87833.8	10127.8	3452.3		3285.3	1429.0	59619.9	224528.3	2057.1	8674.2	1932486.0	1079.8
2003	98284.9	10295.9	3500.9		3877.8	1548.1	52486.3	210636.8	2461.1	10620.8	2107107.0	1162.7
2004	108904.6	11344.0	3628.5		4120.0	1675.2	66497.7	197790.9	2877.0	13585.0	2121471.0	1272.6
2005	141310.1	12280.0	3762.3		4195.4	1809.1	78434.5	188155.4	3294.4	16761.6	2143692.0	1405.6
2006	165077.5	13961.4	3994.8		4485.2	2020.8	79031.3	182549.6	3640.6	24836.4	2286823.0	1488.5
2007	180584.3	15715.7	4229.2		4957.6	2254.3	88268.2	180728.0	4037.8	35881.4	2515305.0	1489.0
2008	191812.1	15547.6	4389.2		5153.3	2377.3	102777.0	181933.1	3860.0	44633.4	2693623.0	1368.6
2009	173204.0	15844.6	4409.2		5361.9	2311.0	103409.3	171375.6	3797.6	44370.8	2717531.0	1288.1
2010	167945.6	17144.9	4531.2	1648.0	5988.0	2516.8	128668.2	173846.3	3871.4	48063.6	2777268.0	1249.5
2011	175722.4	18518.1	4819.8	1768.4	5859.0	2641.8	155220.6	173979.5	3919.7	38062.4	2913175.0	1197.5
2012	187865.5	19773.6	5053.9	1935.1	5840.2	2769.0	175846.9	172436.3	4104.9	43781.5	2949035.0	1232.9
2013	198691.1	20569.4	5204.8	2138.3	6227.1	2840.2	206640.9	175263.4	4476.6	45447.7	2917080.0	1321.5
2014	215427.9	21129.9	5346.1	2399.8	6790.8	2990.2	219004.0	177990.3	4767.8	46062.0	2962827.0	1389.5
2015	233185.0	22419.0	5485.3	2748.1	7403.8	3151.4	253009.5	182283.8	5329.4	46628.6	3045938.0	1465.0
2016	255967.1	23993.9	5573.6	3084.1	7811.1	3464.9	243914.8	186329.4	6028.5	44153.6	3095328.0	1553.8
2017	305938.7	25187.8	5682.2	3407.2	8463.2	3884.4	284734.3	191175.1		42556.5	3132854.0	1657.8

Source: See Table 3.2 for level estimates and Eurostat, BIS and OECD for house price indices series and exchange rates.

Table A5.4: **House price to income ratio estimates (number of yearly incomes to purchase 100 square metres)**

Year	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL
1980										9,1		10,1				6,6			9,7
1981				6,1						8,8		10,9				6,4			8,3
1982				5,2						8,2		10,3				5,4			7,1
1983				6,0						7,9		9,4				5,0			7,1
1984				6,4						7,7		8,5				4,7			6,8
1985	4,7			7,2						7,5		7,7				4,7			6,5
1986	4,7			7,6						7,5		7,4				4,9			6,6
1987	4,9			6,8						7,7		7,2				5,1			6,9
1988	5,2			6,5						8,1		7,4				5,3			7,1
1989	5,4			6,1						8,5		8,0				5,6			7,1
1990	5,6			5,5						8,7		8,6				6,1			6,7
1991	5,5			5,3	10,4					8,8		9,1				6,2			6,8
1992	5,6			5,1	10,2					8,3		9,9				6,7			7,0
1993	5,7			5,0	10,4					8,0		10,3				6,3			7,6
1994	5,9			5,5	10,5					7,9		9,7				6,1			8,0
1995	5,8			5,4	10,3				8,7	7,6		8,8				6,0			7,6
1996	5,9			5,9	10,0				8,5	7,5		8,7				6,3			8,1
1997	5,9	12,1		6,5	9,7			10,0	8,2	7,3		8,8				6,3			8,6
1998	6,1	11,3		6,9	9,5			10,5	8,2	7,2		8,7				6,3			9,1
1999	6,4	10,5		7,4	9,2		15,1	10,9	8,2	7,5		8,6			10,1	6,2			10,1
2000	6,4	9,5	6,6	7,7	9,1		16,5	11,7	8,2	7,8	20,0	8,5		9,6	8,4	6,0		7,6	11,4
2001	6,4	8,9	6,7	7,7	8,7		16,8	12,7	8,4	8,0	18,3	8,6		9,0	9,0	6,9		8,1	11,4
2002	6,8	6,8	7,3	7,6	8,6		16,6	13,5	9,3	8,5	17,8	9,3	12,7	11,5	8,9	7,2		8,6	11,9
2003	7,2	7,2	7,7	7,6	8,4		17,9	13,0	10,4	9,3	17,3	9,6	12,0	12,0	9,0	7,9		9,5	12,1
2004	7,7	9,6	7,3	8,0	8,1	10,1	18,8	12,4	11,6	10,3	18,0	9,9	12,0	10,5	8,2	8,2		10,8	12,5
2005	8,4	11,6	7,1	9,1	8,1	11,6	19,3	13,5	12,6	11,7	19,1	10,4	11,7	10,5	9,3	8,7		11,0	13,1
2006	8,8	11,6	7,1	10,8	7,8	14,8	21,1	14,1	13,8	12,6	21,2	10,7	12,3	12,7	10,2	9,6		12,6	13,1
2007	9,1	13,1	8,0	11,0	7,5	14,8	21,5	14,0	14,8	12,7	22,4	10,9	13,0	13,9	11,8	9,7	11,8	14,3	13,2
2008	9,1	13,4	8,5	10,2	7,4	11,8	19,3	13,5	14,1	12,5	21,3	11,0	12,6	11,8	10,7	9,9	11,7	14,9	13,2
2009	8,9	10,3	8,0	8,8	7,5	8,1	17,0	12,8	13,0	11,8	19,9	11,3	12,4	8,9	8,0	10,5	11,1	14,2	12,7
2010	9,2	9,1	7,8	8,6	7,4	8,6	16,1	13,3	13,0	12,1	18,5	11,3	11,7	8,5	7,2	10,6	10,6	13,4	12,5
2011	9,5	8,0	7,8	8,2	7,4	8,6	13,4	13,7	12,0	12,6	18,0	11,1	11,5	9,1	7,1	10,5	9,5	12,7	12,0
2012	9,6	7,8	7,6	7,9	7,5	8,7	11,2	13,2	10,6	12,5	17,6	11,2	11,5	8,7	6,8	10,8	8,9	12,5	11,2
2013	9,7	7,4	7,6	8,1	7,6	8,9	11,4	12,7	9,7	12,3	16,8	10,5	11,7	8,8	6,5	11,2	8,3	11,7	10,5
2014	9,6	7,5	7,6	8,2	7,7	9,6	13,3	11,9	9,6	12,0	16,5	10,0	12,1	9,0	6,7	11,5	8,2	10,8	10,4
2015	9,7	7,4	7,5	8,5	7,9	9,8	14,3	11,8	9,7	11,8	15,4	9,6	12,1	8,3	6,7	12,0	9,1	10,5	10,6
2016	9,8	7,5	7,8	8,7	8,2	9,8	14,9	11,6	9,9	11,7	15,4	9,4	11,8	8,3	6,6	12,7	9,8	10,3	10,9
2017	10,0	7,8	8,3	8,9	8,3	9,6	16,1	11,3	10,3	11,9		9,1	11,6	8,2	6,6	13,0	9,8	10,2	11,4

Year	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	NO	CH	TR	AU	CA	HK	JP	NZ	RU	KR	US
1980							6,3	7,6			5,4			8,5			10,8			87,7	4,5
1981							6,5	7,2			5,1			8,7	6,5		11,3			76,0	4,3
1982							6,8	6,7			5,1			8,3	5,7		11,6			71,4	4,2
1983							7,3	6,1			4,9			8,0	5,7		11,7			74,4	4,1
1984							7,5	5,7			5,1			8,4	5,3		11,6			73,7	3,9
1985							7,2	5,4			5,8			8,5	5,2		11,4			70,8	3,9
1986							7,1	5,4			7,0			8,6	5,8		11,4			65,7	3,9
1987							7,3	5,6	8,0		7,0			8,4	6,4		12,0			56,7	4,0
1988							9,2	6,3	9,2		6,8			9,2	7,0		12,0			56,5	3,9
1989							10,0	6,9	9,9		6,0			10,5	7,3		12,1			56,7	3,9
1990							8,8	6,9	8,7		5,3	15,2		10,3	6,9		12,9			56,0	3,8
1991							7,1	6,4	7,9		4,6	14,1		10,4	7,1		12,6			50,3	3,7
1992							5,9	5,5	7,0		4,2	13,0		10,3	7,1		11,7			41,7	3,6
1993							5,5	4,9	6,5		4,0	12,0		10,3	7,1		11,1			36,2	3,6
1994							6,0	5,1	6,4		4,4	11,8		10,2	7,3		10,7			31,0	3,6
1995			11,7				5,4	5,0	5,4		4,5	10,4		9,9	6,8		10,4			27,2	3,6
1996			11,4				5,6	5,0	5,3		4,7	9,7		9,5	6,8		10,2			24,2	3,5
1997			11,2				6,2	5,3	5,4		5,0	9,3		9,6	6,7	118,6	9,8			23,3	3,5
1998			10,8				6,5	5,6	5,9		5,1	8,9		10,0	6,4	88,1	9,6	10,5		20,5	3,5
1999			11,0				6,7	5,8	6,3		5,5	8,7		10,3	6,3	77,2	9,4	10,1		19,5	3,5
2000	8,2		11,3				6,7	6,1	6,7	6,9	6,0	8,3		10,3	6,2	68,0	9,2	10,3		18,8	3,6
2001	8,1		11,3				6,3	6,1	7,0	6,8	6,3	8,2		10,8	6,2	60,0	9,1	10,0		18,5	3,7
2002	8,1		10,9				6,5	6,2	7,9	6,6	6,1	8,3		12,5	6,5	55,5	8,6	10,8	96,0	20,3	3,8
2003	7,8		10,9		9,2		6,6	6,5	8,9	6,9	5,8	8,4		13,8	6,9	49,4	8,2	12,0	83,8	20,8	3,9
2004	7,5		10,4		9,4		6,8	7,0	9,6	7,0	6,1	8,6		13,8	7,2	60,4	7,7	13,3	69,2	19,6	4,1
2005	7,4		10,2		10,1	7,7	7,2	7,4	10,3	8,4	6,1	8,7		13,5	7,5	67,8	7,3	14,7	57,4	18,9	4,3
2006	7,4		10,1		11,2	8,3	7,4	7,9	10,7	8,7	7,3	8,9		13,4	7,9	63,4	7,1	15,2	48,9	19,3	4,3
2007	7,4		9,8		12,8	9,6	7,4	8,4	11,3	8,1	7,7	9,1		13,7	8,5	64,5	7,0	15,8	40,5	20,4	4,2
2008	7,3	15,3	9,8	23,8	12,6	10,3	7,1	8,0	10,5	7,6	7,2	9,3		13,3	8,5	71,4	7,1	15,0	34,1	20,6	3,7
2009	7,6	13,7	9,7	18,4	11,5	8,9	7,1	8,0	9,4	7,2	7,0	9,3		13,5	8,2	76,1	6,8	14,2	32,0	20,1	3,5
2010	8,0	12,7	9,5	16,3	11,4	8,4	7,3	8,4	9,9	7,8	7,4	9,5	15,0	14,4	8,6	89,8	6,8	13,9	28,5	19,5	3,4
2011	8,3	12,1	9,4	14,1	11,6	8,1	7,2	8,3	9,7	7,5	7,6	10,0	13,6	13,5	8,8	99,6	6,9	13,4	25,7	19,5	3,1
2012	8,6	11,2	9,0	13,1	11,1	7,7	7,2	8,1	9,3	7,4	7,8	10,3	13,5	13,3	9,0	109,7	6,8	13,9	23,4	19,1	3,1
2013	9,1	10,5	8,8	9,6	10,5	7,7	7,1	8,4	9,3	7,4	7,8	10,5	12,9	13,7	8,9	122,8	6,9	14,8	23,7	18,1	3,3
2014	9,3	10,3	9,2	8,7	9,6	7,6	7,1	8,9	9,8	7,6	7,7	10,7	12,9	14,6	9,2	123,6	7,0	15,6	23,0	17,6	3,3
2015	9,7	10,2	9,1	8,2	9,6	7,7	7,0	9,8	9,9	7,5	7,7	11,2	13,3	15,7	9,4	136,1	7,1	17,2	22,2	17,4	3,4
2016	10,2	9,9	9,4	8,2	9,5	8,0	6,9	10,5	10,5	7,4	8,1	11,1	13,5	16,3	10,0	125,2	7,1	18,8	20,4	17,0	3,5
2017	10,6	9,8	9,8	7,8	10,0	8,1	6,9	10,8	10,9	8,4	8,2	11,3	13,0				7,2		18,7		3,7

Source: See Table 3.2 for level estimates and Eurostat, BIS and OECD for house price indices series and exchange rates.

EUROPEAN ECONOMY DISCUSSION PAPERS

European Economy Discussion Papers can be accessed and downloaded free of charge from the following address:
https://ec.europa.eu/info/publications/economic-and-financial-affairs-publications_en?field_eurovoc_taxonomy_target_id_selective=All&field_core_nal_countries_tid_selective=All&field_core_date_published_value[value][year]=All&field_core_tags_tid_i18n=22617.

Titles published before July 2015 under the Economic Papers series can be accessed and downloaded free of charge from:
http://ec.europa.eu/economy_finance/publications/economic_paper/index_en.htm.

GETTING IN TOUCH WITH THE EU

In person

All over the European Union there are hundreds of Europe Direct Information Centres. You can find the address of the centre nearest you at: http://europa.eu/contact.

On the phone or by e-mail

Europe Direct is a service that answers your questions about the European Union. You can contact this service:

- by freephone: 00 800 6 7 8 9 10 11 (certain operators may charge for these calls),
- at the following standard number: +32 22999696 or
- by electronic mail via: http://europa.eu/contact.

FINDING INFORMATION ABOUT THE EU

Online

Information about the European Union in all the official languages of the EU is available on the Europa website at: http://europa.eu.

EU Publications

You can download or order free and priced EU publications from EU Bookshop at: http://publications.europa.eu/bookshop. Multiple copies of free publications may be obtained by contacting Europe Direct or your local information centre (see http://europa.eu/contact).

EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex at: http://eur-lex.europa.eu.

Open data from the EU

The EU Open Data Portal (http://data.europa.eu/euodp/en/data) provides access to datasets from the EU. Data can be downloaded and reused for free, both for commercial and non-commercial purposes.

Publications Office
of the European Union