Housing bubbles and land planning corruption: evidence from Spain's largest municipalities

Antonios Marios Koumpias
University of Michigan Dearborn, Dearborn, Michigan, USA

Jorge Martínez-Vázquez
International Center for Public Policy (ICePP), Georgia State University, Atlanta, Georgia, USA, and

Eduardo Sanz-Arcega
University of Zaragoza, Zaragoza, Spain

Abstract

Purpose – The purpose of this paper is to quantify to what extent the housing bubble in the early-to-mid 2000s in Spain exacerbated land planning corruption among Spain's largest municipalities.

Design/methodology/approach – The authors exploit plausibly exogenous variation in housing prices induced by changes in local mortgage market conditions; namely, the rapid expansion of savings banks (Cajas de Ahorros). Accounting for electoral competition in the 2003–2007 and 2007–2009 electoral cycles among Spanish municipalities larger than 25,000 inhabitants, the authors estimate a positive relationship between housing prices and land planning corruption in municipalities with variation in savings bank establishments using instrumental variables techniques.

Findings – A 1% increase in housing prices leads to a 3.9% points increase in the probability of land planning corruption. Moreover, absolute majority governments (not needing other parties' support) are more susceptible to the incidence of corruption than non-majority ones. Two policy implications to address

corruption emerge: enhance electoral competition and increase scrutiny over land planning decisions in sparsely populated.

Originality/value – First empirical evidence of a formal link between the 2000s housing bubble in Spain and land planning corruption.

Keywords Spain, Corruption, Housing bubbles, Savings banks, Land planning

Paper type Research paper

1. Introduction

The adoption of the euro and its circulation in 2002 led to significant changes in the financing systems of many European Monetary Union (EMU) countries. Cheap credit and the perception of a dramatic decrease in Southern European countries' financial risk loosened monetary conditions, leading to a surge in intra-EMU capital flows. As experienced by a number of EMU countries, one of the potential side effects of such a financial shock was the development of housing price bubbles (Jordà *et al.*, 2015; and specifically in Spain, Jimeno and Santos, 2014) [1].

In the case of Spain, it is widely accepted that the housing boom was "massive" (Martín *et al.*, 2021, p. 1014). Between 1999 and 2007, Spain recorded the third-highest average annual growth rate of loans for house purchase at 19.8% while the aggregate volume of mortgages in the EMU grew by 10.4%. Housing starts per 100 dwellings in Spain grew from 1.5 in 1999 to 1.6 in 2007, all this relative to a stable EMU average at 1.1 dwellings (ECB Structural Issues Report, 2009). Real residential property prices in Spain rose by 25.5% from 2003 till 2009 [2].

The housing boom did transform the Spanish economy, postponing structural reforms and making far more painful the recovery from the Great Recession (Fernández-Villaverde *et al.*, 2013). As a consequence, the literature has paid close attention to a wide variety of sociological, political and economic implications stemming from the housing bubble (Villoria and Jiménez, 2012; Costas-Pérez *et al.*, 2012; Esteban and Altuzarra, 2016; Puigmulé-Solà *et al.*, 2016; Jiménez *et al.*, 2020; Martín *et al.*, 2021), one of them being the connection between the housing boom and political corruption (Iglesias, 2007). As Jiménez (2009, p. 255) puts it, "Spain has been clearly suffering from a major problem of political corruption associated with urban development."

In this paper, we build on previous institutional analyzes which have provided solid theoretical links between the housing bubble and land planning corruption (Jiménez, 2009; Jiménez and Villoria, 2012: Romero *et al.*, 2012), with the aim of empirically validating those links and quantifying to what extent the surge in housing prices fueled corruption among land planning officials in Spain's largest municipalities. We use information on municipal corruption from 2003 to 2009 in electoral-term frequency from media reports, a widely used approach in the literature to measure land planning corruption by local officials in Spain (Costas-Pérez *et al.*, 2012; Costas-Pérez, 2013; Fernández-Vázquez *et al.*, 2016; Solé-Ollé *et al.*, 2018; Puigmulé-Solà *et al.*, 2016). We exploit variation in housing prices during the housing bubble years along with an instrumental variables (IVs) approach to estimate the relationship between housing prices and land planning corruption in Spain.

We find that a 1% rise in housing prices exacerbated zoning corruption incidence by 3.9% points. Absolute majority governments (not needing other parties' support) were more prone to engage in corruption than non-majority ones, although there are no statistically detectable differences in the probability of corruption in municipalities where incumbent mayors were affiliated with the Partido Socialista Obrero Español (PSOE) or the Partido Popular (PP) political party. In addition, we find policy-relevant evidence that densely or

highly populated areas are less negatively associated with zoning corruption, which is suggestive that the presence of an alert citizenry (more likely present in densely or highly populated areas) may serve as an effective component of the set of checks and balances that can stymie corruption.

The rest of the paper is organized as follows. Section 2 provides essential background information by reviewing the empirical literature on the determinants of corruption and information within Spain's institutional framework. Section 3 discusses the data and methodology. Section 4 presents the empirical findings and Section 5 concludes the paper.

2. Literature review and institutional background

The purpose of this section is threefold. First, building on previous institutional analyzes, we provide theoretical support for the link between housing prices and land planning corruption in Spain. Next, we discuss how the chosen empirical strategy for measuring corruption counts fits well with previous applied literature. And last, we document why the Spanish housing market in the 2000s offers an ideal setting for an empirical investigation in line with the literature using variation in corruption incentives through resource windfalls.

2.1 Theoretical link between the housing price bubble and corruption in Spain

The theoretical literature on corruption emphasizes the role of incentives and opportunity for the rise of corruption. The incentives involve a calculus of expected costs and rent-seeking from the illegal activity which in our context take the form of indictments of corrupt zoning officials following audits and bribes received from land developers. The housing bubble we examine provided strong incentives for developers and local officials to collude in fraudulent land planning (Romero *et al.*, 2012). A number of reasons have been proposed as complementary explanations to explain the rise in corruption in urban development in Spain.

First, the housing bubble created more rent-seeking opportunities for land developers and zoning officials. Surging housing prices in combination with stable, inflation-adjusted construction costs and decreasing lending costs also created increased profit opportunities for housing developers. As new housing construction projects became more profitable, this provided housing developers with larger incentives to bribe. In essence, the surge in housing prices increased the expected benefits to developers of extending a bribe to a zoning official (Becker, 1968). As Rose-Ackerman (1988, p. 278) puts it, "if bribes are offered there must be some prospective excess profits out of which to pay them." The size of the bribe may be related to the structure of uncertainty about the expected costs a corrupt zoning official faces (Bliss and Di Tella, 1997).

A second explanation is the abundance of discretion that municipalities in Spain enjoyed in making land planning decisions (Iglesias, 2007; Jiménez, 2009; Jiménez and Villoria, 2012; Esteban and Altuzarra, 2016). In other words, the institutional framework allowed municipalities to have full discretion in the exercise of their statutory duties on land planning, thereby, allowing politicians the opportunity to function as "discriminating monopolists" (Jagannathan, 1986). As Romero *et al.* (2012, p. 472) have put it, "the municipal plan thus became a truly powerful instrument for redistributing the economic power of land and, therefore, a battlefield for landowners and developers."

Another factor providing further opportunity for the rise in land planning corruption stems from the presence of a weak local accountability system without tighter penalties for misconduct (Jiménez and Villoria, 2012). As a result, expected costs to violators remained stable before, during and after the housing bubble (Aidt, 2003), while expected rents from corruption rose very significantly.

Moreover, political parties did not take strong actions to prevent land planning corruption due to the financial incentives at play from urban development (Jiménez, 2009). Bribing opportunities persisted as long as demand for new development land was high, while government-generated land shortages existed due to zoning laws and restrictive land-use regulations (Lee, 1994; Tanzi, 1998; Solé-Ollé and Viladecans-Marsal, 2012). Increasing housing prices sparked competition between localities for the creation of new residential areas with the goal of enlarging budget revenues (Gómez-Antonio et al., 2016). Earnings from urban development accounted for a significantly larger portion of local municipal budget earnings in 2004 relative to 1992 (Iglesias, 2007). Moreover, there is mixed evidence of how costly corruption scandals proved to be for politicians. Using 2007 and 2011 municipal election data, Fernandez-Vazquez et al. (2016) estimate relatively low vote losses (1.8%) for corrupt relative to honest politicians [3]. In contrast, Costas-Pérez et al. (2012) report higher political costs to incumbents in corrupt municipalities following media reports of a corruption scandal, leading to vote losses in the 2003 and 2007 municipal elections. These ranged from 4% to 9% based on the extent of media coverage, which may have permitted marginal, rent-seeking politicians to optimize between receive sufficiently small bribes and yet retaining their elected status.

Finally, from a financial perspective, the expansion of regional savings banks (Cajas de Ahorros, hereafter cajas) might have crucially eased fraudulent land development (Jiménez, 2009; Garicano, 2013; Cardenas, 2013). In this respect, Martín et al. (2021) document how the housing bubble improved the financial standing of the banking sector which responded by increasing credit to the housing sector (defined as the sum of mortgage credit and credit to construction and real estate firms) three times as much relative to credit to the non-housing sector between 2000 till 2007. Similar findings are shown by Jiménez et al. (2020).

In summary, as Jiménez and Villoria (2012, p. 130) argue, the institutional link between the housing bubble and corruption stems from a combination of four factors: an urban development system characterized by too much local discretion and monopolistic behavior, a weak local accountability system, the building boom that meant that significant rents were available for grab and the interest of political parties in keeping this (corrupt) system alive. Moreover, the adoption of the euro was the shock that eased the financing of the housing boom, while other aspects of the legal framework provided households with incentives for purchasing over renting real estate assets (Mora-Sanguinetti, 2010). As a consequence, urban planning was a "major source" of political corruption in Spain during the boom years (Jiménez and Villoria, 2012, p. 115), hitting most large Spanish urban regions and coastal zones (Romero et al., 2012).

2.2 Review of the literature on the measurement of corruption

The first wave of empirical studies of the determinants of corruption, often cross-national analyzes, used subjective measures of corruption from survey data from Transparency International Global Corruption Barometer, the United Nations World Value Survey and the World Bank Worldwide Governance Indicators, the World Competitiveness Report and the Economist Intelligence Unit [4]. Subjective measures of corruption rely on perceptions or on personal experiences of bribery. As respondents may be asked whether they have ever made an illegal payment to a public official, they may want to mask their actual behavior to avoid potential penalties or further actions. As a result, subjective measures of corruption may be plagued by imprecision (Kaufman et al., 2010; Gil-Pareja et al., 2019). In addition, systematic biases may undermine empirical analysis when different classes of respondents differ by design. Also, subjective assessments might be driven by "halo effects"; i.e. negative evaluations

when economic conditions are worsening and vice versa. Finally, when different data providers use each other's evaluations, endogeneity is introduced as perception errors are correlated.

A relatively recent and increasingly more prevalent trend is the use of objective measures of corruption based on audits or media reports (Ferraz and Finan, 2009; Brollo *et al.*, 2013). Diamond (2017) shows that increased land unavailability through restricted housing supply driven by topography constraints on real estate development increases the number of public corruption convictions of federal, state and local public officials in the USA. Glaeser and Goldin (2006) use newspapers to proxy for reported crimes pertaining to corruption. Similar data have been used to examine financial scandals and election law violations in Japan and oil revenue embezzlement in Brazil (Nyblade and Reed, 2008; Caselli and Michaels, 2013). Corruption data collection from media reports have also been extensively used in studies of public corruption in Spain (Costas-Pérez *et al.*, 2012; Costas-Pérez, 2013; Fernandez-Vazquez *et al.*, 2016; Solé-Ollé, and Sorribas-Navarro, 2018; Puigmulé-Solà *et al.*, 2016).

However, it should be noted that objective measures of corruption are also prone to measurement error issues. Audit-based measures are a function of the intensity of inspection which may not be necessarily uniform over time or across geographical units. As we discuss later on, we recognize that this limitation of objective measures of corruption by design are also applicable to our data, albeit their influence is limited following the adjustments we make such as the use of time fixed effects. Another potential concern with using objective counts of corruption from news reports is that they may be influenced by the ideological orientation of the organization behind them. For example, Gentzkow and Shapiro (2010) show that US media outlets are systematically biased in their coverage of political scandals driven by the ideological position of their audience. However, with respect to land planning corruption, ideological bias in the coverage of corruption scandals by party affiliation ("media slant") has been less of a concern in Spain. Costas-Pérez *et al.* (2012) find that the proportion of scandals accounted to each party does not differ when considering media reports stemming from the main left-wing newspaper ("El País") relative to the right-wing one ("El Mundo"). Moreover, land planning corruption cases may vary from simple complaints to court rulings and what is reported by the media can be arbitrary and driven by idiosyncratic factors of each corruption case such as the extent of bribery or the political connectedness of the land planning official facing charges. This is not an issue of major concern in this study that draws information from a sample of corruption cases based on media-reported *indictments* of land planning officials. Given the within-country study setting, all court rulings were based on uniform law, ruling out measurement error of the severity of each corruption case. Finally, one should note that, by design, objective measures of corruption are subject to Type II error in the form of failing to identify cases of corruption potentially due to underinvestment in an audit capacity. We recognize this is a limitation pertinent to our analysis, albeit an unavoidable one when using observational data.

In addition, the past literature on corruption has struggled with the lack of proper identification strategies. Due to the practical difficulties in conducting randomized control trials on corruption outcomes, only very limited evidence from the field exists. By design, the scope of these findings may only reveal effective approaches to curbing corruption rather than identify its causal determinants. For example, Olken (2007) conducted a field experiment on over 600 Indonesian village road projects to examine the effectiveness of government audits and increased grassroots monitoring participation in reducing corruption. Ferraz and Finan (2009) used experimental variation from audits of randomly selected municipalities in Brazil. The absence of clear-cut comparative case study settings has prevented the use of standard quasi-experimental techniques to study corruption.

As a result, the literature first turned to use an IV approach and dynamic panel techniques. Based on reduced-form and IV techniques, Brollo *et al.* (2013) report that a 10% increase in federal transfers leads to 16% more severe corruption in Brazil. Using the same methodology, Dong and Torgler (2013) report that Chinese provinces with resource abundance exhibit greater corruption, whereas higher educational attainment and fiscal decentralization lead to significantly less corruption. Batzilis (2019) uses an IV approach to show that electoral competition at the municipality level reduced public spending corruption in Greece. In addition, he finds a higher incidence of corrupt spending in less populated, more rural municipalities. Del Monte and Papagni (2007) apply an autoregressive distributed lag model to regional data from 1963 through 2001 in Italy to investigate the determinants of corruption, defined as crimes against the public administration reported to the police. They find that per capita GDP, public expenditure on consumption goods and services, and institutional and judiciary changes are the most important contributors to public corruption in Italy.

A recent development in the empirical analysis of corruption has been the focus on within-country variation from natural, exogenous sources that may have altered the returns from corruption. Natural resource windfalls has been a commonly-used mechanism that this strand of the empirical literature has used to examine corruption. Maldonado (2010) exploits exogenous variation in economic conditions in Peru from mineral price shocks due to the relative abundance of mineral resources across regions. Following an IV approach, his results suggest that the increases in transfer funds due to positive shocks in international mineral prices affected corrupt practices in citizens' interactions with public officials and that these corrupt practices differed according to the size of the shock. Caselli and Michaels (2013) use variation in oil output among Brazilian municipalities that was exogenously dictated by world oil prices along with IV techniques to find evidence of embezzlement in oil-rich municipalities. Thus, it is in this latter strain of the empirical literature where our paper fits. Similar to those previous papers, we exploit variation in corruption incentives (rents reflected by housing prices) that naturally occurred following the adoption of the euro and the arrival of cheap and easily accessible credit in Spain combined with IV methods to address concerns common to observational studies. As documented below, we focus on a period of steep acceleration of housing prices in Spain that created windfalls for housing developers and corrupt zoning opportunities for officials.

2.3 Housing market developments in Spain
There are many potential determinants of housing prices and causality between interest rates and housing prices cannot be established from observational inference. Low-interest rates do not necessarily lead to housing price increases as the recent housing markets in the USA and Spain have shown. However, a link between monetary policy and housing prices has been firmly documented (Sutton, 2002; Tsatsaronis and Zhu, 2004; Holt, 2009). For instance, Oliver Hülsewig and Rottmann (2021) find that real house prices in the EMU rose in response to expansionary monetary policy shocks. Also, several studies have identified a positive relationship between housing prices and the availability of credit (mortgage lending) in Spain (Gimeno and Martínez-Carrascal, 2006; Gentier, 2012). The unprecedented supply of cheap credit due to the adoption of the euro added impetus to the pre-existing inflationary trend of nominal housing prices in Spain.

The transition to the euro and the associated windfall in mortgage lending in Spain caused an exogenous shock that amplified risky lending behavior, especially among the *cajas* (Jiménez *et al.*, 2020). In addition, regional policymakers had extensive oversight over the legal framework governing cajas and regulatory capture of these institutions by local political leaders took place (Jimeno and Santos, 2014, p. 131).

This interpretation of the role played by the associated drop in mortgage lending costs is supported by the data. The most widely used benchmark in retail-banking in Spain, the one-year EURIBOR, dipped from 5.25% in August 2000 to as low as 2.01% in June 2003, stabilized at historically low levels by 2006 (Bank of Spain, 2013). It rebounded to its 2000 levels by August 2008 after which it began its free-fall in response to the global financial crisis. Spanish households, which typically were lending in mortgages featuring a variable (or adjustable) rate, were able to capitalize from these developments through cheaper mortgages. The main takeaway is that once the cost of mortgage credit stabilized around 5%, the housing market took off in 1999–2001 and the ensuing housing bubble lasted until 2008 when the great recession hit.

In what follows we show the existence of a structural break in housing prices in the past 30 years as an indication of a housing bubble in Spain. Figure 1 datestamps the start and end of the Spanish housing bubble based on the national housing price index. We use the innovational outlier (IO) unit root test statistic by Clemente *et al.* (1998) to assess whether a gradual shift in the mean of the housing price index series took place [5].

The beginning of the housing bubble is documented by a precisely estimated upwards break ($d_1 = 1.99$, $p = 0.000$) in the time series of housing price growth at the third quarter of 2001 shortly after the adoption of the euro. A less pronounced negative structural break ($d_2 = -1.20$, $p = 0.005$) in the third quarter of 2010 confirms the housing bust that occurred following the 2008 great recession. These results provide strong formal evidence that the sector underwent substantial changes following the adoption of the euro.

3. Empirical analysis

3.1 Identification strategy

We are interested in the impact of housing prices on local land planning corruption. There are two primary threats to interpreting the observed changes in corruption as causal effects of the increase in housing prices. First, we cannot exclude the possibility that land planning corruption itself may have had an effect on housing prices (reverse causality). On the one hand, land planning corruption could be an indicator of strong demand for housing and
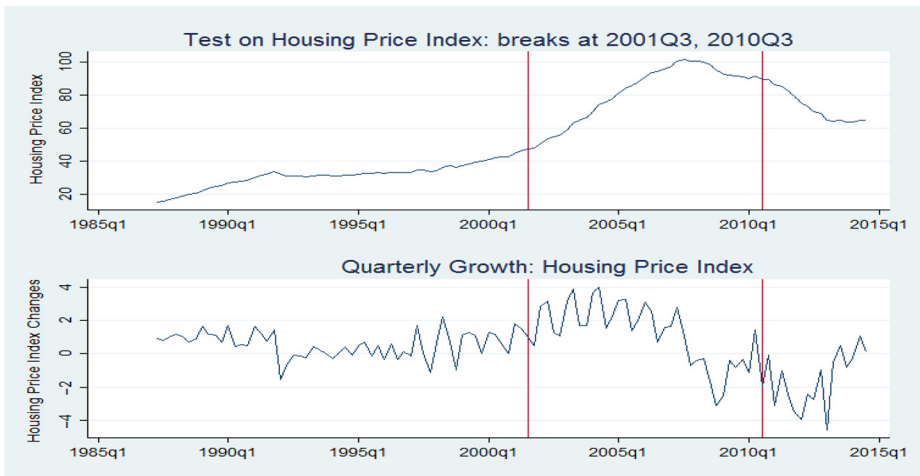
Figure 1.
Unit root test in 1987–2015 time series of national housing price index in Spain

Source: Own elaboration with data from the Spanish Ministry of Public Works

further increase housing prices. Conversely, land planning corruption works to increase the supply of housing – shifting the supply curve rightward as more buildable land becomes available – and therefore, reducing housing prices. It should be noted that if the latter causal loop between housing prices and land planning corruption is at play, the direction of the bias suppresses the magnitudes of our estimates, and thus, making our results more conservative. In any case, regression estimates may be biased because of reverse causality. To overcome this endogeneity concern, IVs which are predictive of housing prices but unrelated to land planning corruption are needed to obtain unbiased estimates of the relation of interest. Arguably, mortgage lending supply-related and housing market demand proxies may serve as plausible IVs. We instrument housing prices using the number of savings banks' branches (cajas), in each municipality, a stock variable. This is a reasonable instrument given that, relative to commercial banks, they were responsible for a disproportionately large share of mortgage lending from 1992–2004 while also relying on riskier lending practices (Illueca *et al.*, 2014; Cuñat and Garicano, 2010). Moreover, it has been documented that the cajas served as the main contributors to financial inclusion and, especially so, in low-income municipalities (Bernad *et al.*, 2008). Still, to address any concerns about potential influences between political parties and cajas at the regional level, we use a second IV, housing market transactions per capita. Housing market transactions, as a direct proxy of demand for housing, is clearly driving housing price levels but may be subject to the previous reverse causality arguments. To insulate housing market transactions from these concerns, we normalize by municipal population and use housing market transactions per capita as our second IV.

The second source of concern for our identification strategy is related to the potential that housing price variation may in part reflect heterogeneity in housing supply availability. As Glaeser *et al.* (2008) note, fewer and shorter bubbles with smaller price swings should be expected in regions with more elastic housing supply. Sowell (2009) finds that the largest housing price increases occurred in housing markets where local governments imposed land-use restrictions which reduced the supply of available land for housing. To account for differences in housing market area and size characteristics, our estimates are obtained from comparisons of municipalities *within* four different population groupings.

3.2 Data

Our main corruption outcome is a binary variable capturing whether *any* local officials were indicted for different types of land planning laws violations in a given municipality during an electoral cycle. Land planning corruption cases considered include illegalities related to land classification, urban planning, planning execution, building permits, municipal landholdings, urban planning agreements and environmental legislation. The original information on land planning corruption was developed in a report by Fundación Alternativas, a Spanish think-tank, which commissioned journalists to track and report the universe of corruption-related newswires published in national, regional and local media from January 1, 2000, through February 1, 2007 (Iglesias, 2007). A team of researchers at the University of Barcelona extended the database by conducting a bibliographical news search for the years till November 2009, well after the housing bubble burst. This data collection enterprise generated a reliable land planning corruption database that has been extensively used in previous research of corruption in Spain and is used in this study, as well (Costas-Pérez *et al.*, 2012; Costas-Pérez, 2013; Puigmulé-Solà *et al.*, 2016; Solé-Ollé and Sorribas-Navarro, 2018). The advantage of this database lies in its non-partisan reliability and in that it contains rich, granular information on corruption at the municipal level which is the appropriate level of geographical disaggregation as zoning decisions are made at the municipal level. We track this information during the 2003–2007 and 2007–2009 electoral cycles giving rise to a municipality-electoral cycle panel of 554 observations.

To a large extent, the legal framework governing urban planning inspections remained unchanged until May 28, 2007, when the Land Law (Act 8/2007) introduced measures to combat land planning corruption more aggressively. As a result, it could be argued that the inspection intensity in the second study period, 2007–2009, is higher than in the initial period, 2003–2007. However, as the date of the introduction of the Land Law nearly coincides with the 2007 local elections in Spain, we can accurately account for the legal change through measures of electoral cycle-specific variation in the estimation. The main explanatory variable of interest is municipal housing prices as they reflect profit incentives for bribing. We rely on a new data set on housing prices of new dwellings for all Spanish municipalities over 25,000 inhabitants by the Ministry of Public Works and Transport which records housing prices from 2005 on. The information pertains to property values of new housing units in euro per square meter. We use this normalization to account for any effects the size of the property may have on its price. For the reasons discussed in subsection 2.2, we expect a positive relationship between housing prices and land planning corruption.

To account for electoral outcomes, we include information obtained from the Ministry of Home Affairs. Specifically, we use an indicator variable taking the value of 1 if the municipality was governed throughout the whole period by a party enjoying absolute majority; that is, single-party governments not needing other parties' support. The level of political competition where corruption is recorded is an important environmental feature of the municipality to account for. Previous literature has highlighted that connections between political parties and the cajas in the form of direct political appointment of their chairman also led to lower profitability (Cuñat and Garicano, 2010). Costas-Pérez *et al.* (2012) find that voters react to corruption scandals by penalizing the incumbent local government in subsequent elections, albeit vote loss occurs only when the press coverage of a scandal was extensive and judicial charges against the incumbent have been levied. Moreover, Solé-Ollé and Sorribas-Navarro (2018) find a persistent negative effect of municipal corruption on governmental trust. However, Puigmulé-Solà *et al.* (2016) find that, on average, non-majority municipal governments are neither more nor less corrupt than the majority ones. At any rate, we include information on the political profile of each municipality given extensive evidence that ideological and political motives do matter in local service management in Spain (Picazo-Tadeo *et al.*, 2012). To do so, we measure political ideology based on the PP, PSOE or other party affiliation of the incumbent mayor of a given municipality (Esteban and Altuzarra, 2016). We also account for whether a majority municipal government was in place and, finally, interact the PP and PSOE party affiliation measures with the majority government variable. Given the somewhat mixed prior evidence, we have no *a priori* expectations about the sign of the coefficient of the political variables.

We also allow for other factors to influence the proclivity of politicians toward corruption informed from the within-country literature on the determinants of corruption. Three types of controls are used to adjust for the economic and spatial characteristics of each municipality to capture environmental and institutional conditions that exogenously affect corruption. Specifically, we include the unemployment rate given its strong linkage to political fragmentation which is, in turn, has been found to be a determinant of corruption in Spain as documented in Sanz *et al.* (2020). As a result, we expect a positive relationship between the unemployment rate and land planning corruption. Similarly, we add four population strata indicators (25,000–35,000, 35,000–50,000, 50,000–100,000 and >100,000 residents) to control for differences in the prevalence of corruption stemming from the relative sizes of each municipality (Sanz *et al.*, 2020). A greater incidence of corruption is expected for municipalities exceeding 100,000 residents relative to those ranging from 25,000 to 35,000 residents. We use population density obtained from the Anuario Municipal

of Caixa Bank as a watchdog measure of civilian monitoring of fraudulent land planning that may be negatively related to land planning corruption. In light of Romero *et al.* (2012), we also account for whether the municipality is coastal and expect that land planning corruption is more prevalent among coastal municipalities.

In sum, our data set comprises information about the 2003–2007 and 2007–2009 electoral cycles giving rise to a municipality-electoral cycle panel of 554 observations. Table A1 in the Appendix provides summary statistics of the variables used in the analysis.

3.3 Regression model

We estimate the IV probit regression model shown below in equation (1) via maximum likelihood and cluster standard errors at the municipal level to retain an element of local geographical variation.

$$Prob\big(Corruption_{ijkt} = 1\big) = \alpha HP_{ijkt} + X_{ijkt}\beta + 1(PopStratum_k)\delta + \mu_t + \nu_j + \varepsilon_{ijkt} \tag{1}$$

We model the probability that a land planning corruption indictment occurs (Prob (Corruption$_{ijkt}$ = 1) in municipality i of region j in population stratum k during electoral cycle t as a function of the natural logarithm of housing prices (HP_{ijkt}) and the following covariates collected in vector X_{ijkt}: unemployment rate, the natural logarithm of population density, an indicator of a coastal municipality, an indicator of PP or PSOE political affiliation of the incumbent mayor, an indicator of absolute political majority and its interaction with logged housing prices, PP or PSOE political affiliation variables. The vector $1(PopStratum_k)$ contains values for the indicator variables of the 35,000–50,000, 50,000–100,000 and >100,000 resident population strata k (25,000–35,000 resident population stratum omitted). Finally, we include time and regional fixed effects μ_t and v_j, respectively. Our baseline results are based on the regression model specifying regional fixed effects given the emphasis on the links between political parties at the regional level of governance and caja development decisions in Cardenas (2013).

The key parameter of interest is given by the coefficient of the logarithm of housing prices α. The inference is drawn from changes in the growth rates of cajas and housing market transactions per capita. As a result, the validity of our identification strategy hinges on the comparability between municipalities either in the same region or the same province which have a comparable population size and experienced expansion of cajas.

4. Results

The results of the first and second stages of our empirical analysis are provided in Table 1. Several tests have been performed to assess the relevance and validity of the instruments. First, we test whether the instruments are relevant, i.e. strongly correlated to the endogenous regressor. The Kleibergen-Paap Wald rank F statistics is greater than 10 in both columns, suggesting that the instruments are relatively strong. The overidentification tests fail to reject the null hypothesis of overidentification of the models in both columns at the conventional critical level of 5%. This suggests that the instruments are valid. Finally, the Wald tests of exogeneity of the first stage and second stage error terms fail to reject in all the cases the null hypothesis of exogeneity of uncorrelated first stage and second stage error terms. The majority of explanatory variables are strong predictors of housing prices. As expected, economic output measured by GDP per capita, population density, greater population levels and coastal geography have a positive impact on housing prices. Unsurprisingly, housing prices are negatively correlated to the unemployment rate but also in the presence of absolute

Variables	(1) 1st stage	(2) 2nd stage
Log(Housing Prices)		3.9366*** (1.488)
Instrument 1: Transactions per capita	0.7251*** (0.164)	
Instrument 2: Cajas	0.0002*** (0.000)	
Absolute Majority	−2.8202*** (0.304)	11.7282** (5.501)
Absolute Majority*Log(Housing Prices)	0.3725*** (0.039)	−1.6048** (0.718)
Major PP	−0.0152 (0.038)	−0.3005 (0.318)
Major PP*Absolute Majority	0.0257 (0.046)	0.4358 (0.469)
Major PSOE	−0.0293 (0.027)	−0.2457 (0.262)
Major PSOE*Absolute Majority	0.0196 (0.038)	0.1062 (0.450)
Log(GDP per capita)	0.0540*** (0.016)	−0.5556*** (0.138)
Unemployment Rate	−0.0274*** (0.005)	0.0999 (0.067)
Log(Population Density)	0.0556*** (0.008)	−0.2243 * (0.115)
Coastal	0.0813*** (0.017)	−0.0651 (0.233)
Population Stratum: 35k–50k	0.0239 (0.023)	0.1145 (0.243)
Population Stratum: 50k–100k	0.1160 *** (0.023)	−0.1430 (0.256)
Population Stratum: >100k	0.1777 *** (0.036)	−0.7569* (0.423)
Constant	6.8444*** (0.129)	−24.8448** (10.899)
Province FE	×	×
Region FE	✓	✓
Electoral Cycle FE	✓	✓
Kleibergen-Paap rk Wald F	15.08	15.08
Wald Test χ^2	1.381	1.381
$Pr(\chi^2 > \chi_c^2)$	0.240	0.240
Overidentification S	0.273	0.273
Pr(S > Sc)	0.601	0.601
Observations	562	562

Notes: Unit of analysis is the municipal-electoral cycle. The outcome is indictments of corrupt local land planning officials reported in media. Housing price is the key endogenous variable of interested instrumented by housing market transactions per capita and the average number of cajas in operation during the electoral cycle in a municipality. Region and time fixed effects included in specification but omitted from presentation. Robust standard errors clustered at the municipal level in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 1.

majority governments. The latter result may be suggestive of the perils of the lack of political competition for housing price capitalization.

Our second stage results confirm the positive and precisely estimated relationship between housing prices and land planning corruption. Specifically, a 1% increase in housing prices leads to a 3.9% points increase in the probability of land planning corruption. For robustness, we also specify provincial fixed effects in alternative regression models. These supplemental results are presented in Appendix Table A2 and show that our main finding is not sensitive to the choice of geographical aggregation in the fixed effect specification (a 1% increase in housing prices leads to a 5.8% points statistically significant increase in the probability of land planning corruption). The lack of sensitivity in statistical significance and the tightly bounded range of the housing price coefficient estimate using provincial fixed effects gives us confidence about the robustness of our main finding.

We recover a number of statistically significant associations between the independent variables we use and land planning corruption. The majority of government municipalities are particularly more likely to experience corruption which underscores the importance of political competition in preventing land planning corruption. Interestingly, this result is

abated, although not reversed, by rising housing prices as the negative coefficient of their interaction term with the absolute majority indicates. There are no statistically detectable differences in the probability of corruption in municipalities led by PP-affiliated or PSOE-affiliated majority local governments. Municipalities with increased economic activity per capita are exhibiting less land planning corruption. Municipalities with a greater proportion of unemployed residents are associated with more land planning corruption, although not in a statistically significant way. Less densely populated municipalities are more likely to exhibit land planning corruption as implied by the negative population density coefficient. Assuming higher rates of informal citizenry monitoring in these areas, this provides a mechanism to curb land planning corruption via an increased probability of detection (Becker, 1968). We fail to recover any statistically significant differences in corruption incidence in municipalities of different population strata other than a negative association in the population stratum of municipalities exceeding 100,000 residents. Paired with the previously estimated coefficients of the economic activity variables, these findings may be interpreted as evidence of the superior capacity of larger, wealthier municipalities to address land planning corruption. Last, and as a bit of a surprise given by Romero *et al.* (2012), we do not find the coastal geography of municipalities to be an important predictor of land planning corruption.

5. Conclusions
The understanding of the determinants of corruption and its effects on the economy is a fast-growing field of study in public and urban economics (Bahoo *et al.*, 2020). We follow emerging literature of the empirical studies of corruption that exploits exogenous shocks to corruption incentives brought about by nature or by the policy. We use the windfall of cheap mortgage credit in Spain following the adoption of the euro to examine the effect of housing price bubbles on land planning corruption. It has been suggested that the increased supply of loanable funds at cheaper rates helped expand economic activity for a decade but also postponed important structural reforms and distorted the allocative efficiency of land use (Fernández-Villaverde *et al.*, 2013).

We test this conjecture empirically by assessing the relationship between housing prices and the incidence of land planning corruption. Using municipal data of electoral-term frequency from 2003 to 2009 that cover two electoral cycles, we estimate IV probit models that support a robust, causal link between housing prices and land planning corruption. We find that the housing bubble led to increasing land planning corruption; specifically, a 1% rise in housing prices increases the probability of corruption by 3.9% points. These empirical findings confirm our expectations given theoretical predictions of a positive relationship between rents from corruption and its incidence, in general, but also for the Spanish housing market in the 2000s (Jiménez, 2009).

Three straightforward and complementary policy recommendations to curb land planning corruption arise from our empirical investigation. On the one hand, we present strong evidence that political competition curbs land planning corruption, in line with Curto-Grau *et al.* (2018) who show that electoral competition causally reduces party favoritism in the allocation of intergovernmental capital transfers from regional governments to municipalities. These findings emphasize the importance of promoting electoral competition at the local government level. In addition, increased citizenry monitoring in densely or highly populated municipalities makes engaging in corrupt practices tougher. On the other hand, policymakers should be mindful that the detrimental effects of lagging economic activity may not only affect output but also the incidence of land planning corruption.

Our empirical results suggest that wealthier municipalities are less prone to land planning corruption.

Future research may consider the generalizability of this housing price-land planning corruption link in other countries that have also experienced housing bubbles following EMU accessions such as Greece and Ireland. It may be in the general public and policymakers best interest to eliminate the opportunity for corruption by introducing checks and balances on how to land planning decisions are made rather than trying to avert all future housing bubbles, which history shows can take many shapes and forms. In addition, our study sheds light on the relationship between housing prices and the extensive margin of corruption by using a binary outcome. As a complement to our findings, it would be particularly interesting to the extent the scope of analysis to the intensive margin of corruption and examine how deep corruption was in terms of counts or financial fraud in monetary terms.

Notes

1. See (Gopinath *et al.* 2017). Other countries in the EMU experienced similar housing bubbles at the time, such as Ireland and Greece.

2. Source: Bank for International Settlements, Residential Property Price database, www.bis.org/statistics/pp.htm

3. Interestingly, Fernández-Vázquez *et al.* (2016) also show that "welfare-enhancing corrupt activities" (zoning corruption being one of them) lead to significantly lower voter losses than "welfare-decreasing ones," which can be as high as 4.2%.

4. The seminal, cross-national empirical study of the determinants of corruption by Ades and Di Tella (1999) reveals a positive relationship between rents captured by firms and the underlying level of corruption in a country. Serra (2006) conducts a cross-country global sensitivity meta-analysis and finds that income, history of democratic institutions, protestant religion, colonial heritage and political instability are all robust determinants of corruption. Mauro (1997), Beets (2005), Lederman *et al.* (2005), and Cheung and Chan (2008) report a negative association between education level and corruption; however, Frechette (2006) arrives at the opposite conclusion. Beets (2005) finds that higher levels of unemployment are associated with higher corruption and Emerson (2006) finds a negative relation between market competition and subjective measures of corruption. Lambsdorff (2006), Svensson (2005), Beets (2005), Treisman (2000), Husted (1999), Mauro (1997) and Chang (2010) find a negative association between income level and corruption. On the contrary, Braun and Di Tella (2004) and Frechette (2006) find GDP per capita to be positively correlated with corruption using panel data.

5. This statistic is preferred to the Perron-Vongels and Zivot-Andrews statistics because it can capture more than one structural break in the time series while retaining its ability to identify only one (Baum, 2001).

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Appendix

Variables	N	Mean	SD	Minimum	Maximum
Prob(Corruption Scandal = 1)	562	0.235	0.424	0	1
Log(Housing Prices)	562	7.53	0.338	6.664	8.292
Housing Market Transactions per capita	562	0.058	0.047	0	0.364
Cajas	562	48.475	125.547	3	1547
1(Absolutely Majority)	562	0.491	0.5	0	1
1(Absolutely Majority)*Log (Housing Prices)	562	3.684	3.761	0	8.210
1(PP)	562	0.352	0.478	0	1
1(Absolutely Majority)*1(PP)	562	0.276	0.447	0	1
1(PSOE)	562	0.479	0.5	0	1
1(Absolutely Majority)*1(PSOE)	562	0.178	0.383	0	1
Log(GDP per capita)	562	6.223	1.273	3.461	8.936
Unemployment Rate (in per cent)	562	7.524	2.846	1.650	17.400
Log(Population Density)	562	6.658	1.463	3.215	9.988
1(Coastal)	562	0.306	0.461	0	1
Population Stratum: 25k–35k	562	0.327	0.470	0	1
Population Stratum: 35k–50k	562	0.189	0.392	0	1
Population Stratum: 50k–100k	562	0.274	0.446	0	1
Population Stratum: >100k	562	0.21	0.408	0	1

Table A1.
Summary statistics

Variables	(1) 1st stage	(2) 2nd stage
Log(Housing Prices)		4.7541*** (1.738)
Instrument 1: Transactions per capita	0.9295*** (0.164)	
Instrument 2: Cajas	−0.0001 (0.000)	
Absolute Majority	−1.9441*** (0.311)	10.8974** (5.139)
*Absolute Majority*Log(Housing Prices)*	0.2585 *** (0.040)	−1.4921** (0.671)
Major PP	−0.0049 (0.032)	−0.4401 (0.325)
*Major PP*Absolute Majority*	−0.0136 (0.041)	0.6292 (0.480)
Major PSOE	−0.0392 (0.025)	−0.2311 (0.279)
*Major PSOE*Absolute Majority*	0.0069 (0.035)	−0.0405 (0.473)
Log(GDP per capita)	−0.0863*** (0.033)	−0.3841* (0.216)
Unemployment Rate	−0.0323*** (0.004)	0.1607 * (0.090)
Log(Population Density)	0.0550*** (0.007)	−0.2464 * (0.129)
Coastal	0.0668*** (0.017)	−0.1772 (0.243)
Population Stratum: 35k–50k	−0.0293 (0.023)	0.1321 (0.264)
Population Stratum: 50k–100k	−0.0160 (0.031)	−0.1155 (0.256)
Population Stratum: >100k	−0.0476 (0.059)	−0.5175 (0.488)
Constant	7.9957*** (0.187)	−33.1188** (13.986)
Province FE	✓	✓
Region FE	×	×
Electoral Cycle FE	✓	✓
Kleibergen-Paap rk Wald F	14.30	14.30
Wald Test χ^2	1.404	1.404
$Pr(\chi^2 > \chi_c^2)$	0.236	0.236
Overidentification S	0.130	0.130
$Pr(S > Sc)$	0.719	0.719
Observations	540	540

Notes: Unit of analysis is the municipal-electoral cycle. The outcome is indictments of corrupt local land planning officials reported in media. Housing price is the key endogenous variable of interested instrumented by housing market transactions per capita and the average number of cajas in operation during the electoral cycle in a municipality. Province and time fixed effects included in specification but omitted from presentation. However, due to multicollinearity, fixed effects for the following six provinces have been excluded from the analysis: Gerona, Catalonia; Lérida, Catalonia; Orense, Galicia; Salamanca, Castilla y León; Valladolid, Castilla y León; Teruel, Aragón. For this reason, these results are shown merely for completeness, baseline results inferred from Table 1 using the full set of regional fixed effects. Robust standard errors clustered at the municipal level in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table A2.
Supplemental results

Corresponding author
Eduardo Sanz-Arcega can be contacted at: eduardosanzarcega@gmail.com