Discussion Paper No. 17-001

Housing Booms and Busts and Local Fiscal Policy

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Abstract:

This paper examines how local governments adjust their spending, savings and taxes in response to a temporary revenue windfall generated by a housing boom and how they cope with the inevitable shortfall that appears during the bust. We focus on Spanish local governments given the intensity of the last housing boom-bust experienced there and the large share of construction-related revenues they obtain. We find, first, that just a small share of the boom windfall was saved, with revenues being used primarily to increase spending (above all, current spending) and (to a lesser extent) to cut taxes. Second, we find that the failure to save during the boom is higher in places with less informed voters and more contested elections. Third, we also examine the what happens during the bust, and find that these governments had to cut abruptly their spending (above all, capital), raise taxes, and allow deficits to grow. Finally, in places wit less informed voters and more contested elections local governments had more trouble in adjusting during the bust, and they tend to rely more on spending cuts than on tax increases.

Key words: tax volatility; forward-looking behaviour; voter information

JEL Classification: E62, H72, R5

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'The municipalities (…) see in housing construction their main and most tempting source of finance.'

El País, 10/6/2006.

'The bursting of the real estate bubble hit the local council hard and construction revenues fell by 96%, leading to bankruptcy. Services were paralyzed; payments to workers and providers were delayed. Even council members went unpaid.'

Eleconomista.es, 10/2/2011.

1. Introduction

News of unexpected increases in tax returns is generally considered good. Yet, a revenue windfall is often only temporary, turning into a shortfall with little warning. This is frequently the case when a government is overly reliant on volatile revenue sources. An obvious example is the revenues obtained from oil royalties or other natural resources that fluctuate with the commodities' international price. The current economic situation of Venezuela, for example, can be explained by the country's failure to manage its oil revenues appropriately[1]. The same problem, however, can affect the revenues from taxes on such assets as company shares and real estate. A good example is that of California and the state budget's excessive reliance on capital gains taxes, which makes the evolution of revenues overly sensitive to stock market developments[2]. Likewise, the collapse of the housing market in Spain generated similar problems for governments that had become too reliant on construction-related revenues (as the quotations introducing this article above remind us). Such situations require prudent fiscal management: windfall revenues obtained during a boom should, for the most part, be saved. The consequence of failing to save during the boom is fiscal stress during the bust when these revenues vanish, leading to abrupt cuts in spending and to deterioration in public services, and/or to tax increases.

Here, we study how local governments react to temporary revenue windfalls attributable to asset booms and how they cope with subsequent shortfalls. Earlier papers examining the ability of local governments to smooth spending faced the challenge of ensuring that actual revenue changes were not capturing the effects of permanent revenue shocks. Our main contribution in this paper, therefore, is to overcome this problem by confirming the temporary nature of the windfall revenues. To do so, we draw on data from Spanish local governments for the period 1995-2011, years in which these governments were affected by a huge, unexpected, temporary fluctuation in their revenues,

[1] See, e.g., "The Endgame in Venezuela" (*The Economist*, 7/02/2016) or "How Venezuela Fell Into Crisis, and What Could Happen Next" (*New York Times*, 27/06/2016)

[2] This is well exemplified in a comment made by the spokesman for the state Department of Finance, H.D. Palmer: "We know another downturn is coming, we just don't know when. So we don't want to commit to ongoing high levels of spending – which was the mistake we made during the dotcom boom". See "California tax windfall: spend it or roll back that 'temporary' tax hike?"(*The Christian Science Monitor*, 05/20/2015).

attributable to the housing boom and bust. The reason for this abrupt swing in resources lies in the fact that Spanish municipalities obtain a large share of their revenues from property transaction taxes, including a betterment tax, a tax on construction budgets, development and building permit fees, and land sales proceeds (see section 3.1).

Using data from local governments in Spain's largest urban areas, we perform three different analyses. First, we study the average reaction to the boom windfalls. With this purpose, we estimate first-difference equations that relate changes in spending, savings and tax revenues from the start to the peak of the boom to changes in construction-related revenues during the same period. Our preferred results come from equations estimated by two-stage least squares (2SLS), using the amount of vacant land at the beginning of the period (i.e., land classified as developable at some moment in the past but not yet developed at the start of the boom) as an instrument. The amount of vacant land to start with is a very powerful predictor of housing construction revenues. We claim that the amount of vacant land (at the start of a boom) is the result of growth forecasting errors made by local planners during the previous housing cycles and so it is close to being randomly allocated in space, after controlling for urban area fixed effects and within area accessibility. Our 2SLS results show that only a small proportion of the boom windfalls (around 25%) were saved for leaner times. Most of the extraordinary revenues were used to fund spending increases (around 65%) and tax cuts (around 15%). Current spending was the most heavily affected item (accounting for 45% of the windfall), in particular, spending on wages (30%).

Second, we seek to identify which local governments are least likely to save windfall revenues during booms. Here, there is plenty of evidence suggesting that the quality of institutions matters considerably. Although formal legal and political institutions are the same across the Spanish geography, elements such as voter information (e.g., press readership) and electoral competition (e.g., margin of victory at local elections) do show considerable spatial variation. There are some papers showing that better-informed voters are less tolerant of fiscal profligacy (Brender, 2005; Arvate *et al*., 2009) and that the workings of local governments improve with voter information (Repetto, 2016; Ponzetto and Troiano, 2014). Some papers also provide evidence that contested elections introduce a short-term bias into public finance decisions (Pérignon *et al*., 2013; Bagchi, 2016). Thus, our second analysis will consist of examining the effects of indicators of voter information and electoral competition on the failure to save during booms.

What we find is striking. Local governments in municipalities with highly informed voters (one standard deviation above the mean in press circulation) save nearly all the windfall, whereas those in places with poorly informed voters (one standard deviation below the mean) squander the entire windfall (mostly through spending increases, but also through tax cuts). Electoral competition also has an effect on the ability to smooth spending and taxes over time: municipalities with low margins of victory at local elections tend to save a lower share of the windfall during booms and experience sharper adjustments during busts. These results are consistent with a model of policy myopia, in

which incumbents pander to the interests of voters in order to be re-elected. In the paper we perform several additional exercises in order to discard that the results are generated by some alternative mechanism. We show, for example, that accounting for liquidity constraints (i.e., higher prior debt burdens) does not affect our findings on voter information and electoral competition. We are also able to discard that irrational bubble expectations (i.e., high degree of revenue persistence during the boom) are the explanation of our results.

Third, we also examine how local governments cope with the loss of construction revenues during the bust. We find that construction revenue shortfalls were followed by abrupt cuts in spending (around 70%), tax rises (14%) and deficits (16%). The spending adjustment mostly affected capital expenditures and had no effect at all on spending on wages. Moreover, we also show that voter information and electoral competition also have some effects on the reaction during the bust. Fiscal adjustment is slower in places with less informed voters and more contested elections; these governments also enact larger spending cuts but are incapable of raising enough taxes.

The paper can be related to five different strands in the literature. First, there are the papers that study whether local governments are forward-looking agents (see e.g., Holtz-Eakin *et al*., 1994; Dalhberg and Lindström, 1998; Børge and Tovmo, 2009; Persson, 2015). These papers use dynamic panel data methods to estimate the effect of changes in revenues on changes in public consumption. We enhance this approach by better isolating the temporary shock, by using a new identification strategy, and by digging deeper into the mechanisms that can account for the results. Second, the paper can also be related to the literature on pro-cyclical budgeting (e.g., Gavin and Perotti, 1997). This strand has identified cyclical fluctuations in tax bases (e.g., Talvi and Vegh, 2005) and institutional quality (e.g., Lane and Tornell, 1996; Tornell and Lane, 1999; Alesina *et al*., 2008) as sources of pro-cyclical behaviour. However, no studies to date have examined this issue with local data. Third, this paper is also related to recent studies examining the effects of electoral competition on policy myopia. See Bonfiglioni and Gancia (2013) and Herrera *et al*. (2014) on the incentives to delay reforms; Matsen *et al*. (2016) on the over-exploitation of natural resources; Ponzetto and Troiano (2015) on underinvestment in education; Glaeser and Ponzetto (2015) and Bagchi (2016) on pension under-funding; and Pérignon *et al*. (2013) on government loan choices that conceal the long-run cost of debt. Some of these studies explicitly consider the role of voter information (e.g., Glaeser and Ponzetto, 2015, and Ponzetto and Troiano, 2014).[3]

Fourth, we contribute to a broader literature that studies how local governments respond to windfalls in external revenues. For example, the 'flypaper effect' literature focuses on the relative share of spending vs. taxes in the reaction to increases in grants (see Hines and Thaler, 1995, for a survey). Our focus here is different inasmuch as we

[8]These papers are also related to a much broader strand in the literature studying the effects of media access on accountability (e.g., Besley and Burgess, 2002; Snyder and Strömberg, 2010). Several studies also focus on education (e.g., Glaeser *et al*., 2007; Botero *et al*., 2013).

examine the effects of (temporary) revenue increases on savings. However, in common with various studies in this literature, we seek to improve methods of identification (see, e.g., Knight, 2002; Gordon, 2004; Dalhberg *et al*., 2008). Similarly, the 'resource curse' literature focuses on the effect of windfalls on levels of corruption and efficiency (see Caselli and Michaels, 2013; Ferraz and Monteiro, 2010; Brollo *et al*., 2013; Børge *et al*., 2015). Here, we analyse a different type of political failure: the inability to smooth spending and taxes over time. The effect of revenue volatility and the tendency to over-exploit natural resources are subjects that have lately spawned various theoretical studies (see Robinson *et al*., 2015; Matsen *et al*., 2015). However, although the effects generated by asset booms are quite similar to those generated by natural resource booms, there are virtually no papers studying them (see, however, Vamvakidis, 2007, and Fernández-Villaverde *et al*., 2013).

Finally, we contribute to a recent strand of the literature that examines the effect on local budgets of the housing boom (Vlaicu and Whalley, 2011) and bust (Alm *et al*., 2011; Lutz *et al*., 2011; Ihlanfeldt and Doerner, 2011; Ihlanfeldt and Mayock, 2015). All these papers study the U.S. case and find mild effects, due to the stability of the property tax. As discussed, taxes based on property transactions are much more volatile. The taxation of construction activity might not be a particularly relevant issue in the U.S., but the problem is not confined to Spain. In Europe, Ireland is the most similar case, although the housing boom-bust affected the national government's revenues (see, e.g., Keane, 2015). The European Commission and other institutions are concerned about the effects of asset booms windfalls on fiscal surveillance (see Morris & Schukrecht, 2007). Outside Europe, China has recently had to face similar problems[4].

The rest of the paper is organized as follows. Section 2 presents a theoretical framework that helps us interpret the findings of our empirical analysis. Section 3 sets out the empirical analysis: we provide some institutional background on Spain, describe the identification strategy, and present the data. Section 4 presents the results. The last section of the paper discusses policy implications and concludes.

2. Theoretical framework

We present a theoretical framework designed to help organize the different 'stories' that might explain the responses, in terms of spending, savings and taxes, to a temporary windfall of revenues. We begin by examining the response of an informed politician who is concerned solely with welfare. We then analyse the case of an informed but office-seeking politician. Finally, we discuss the case of an uninformed politician that might not be aware about the temporary nature of the windfall.

[4] In a recent report, the World Bank warned about the effects on budget sustainability of the over-reliance of Chinese local governments on revenues from land conversion (World Bank, 2014) and some studies conclude that windfalls are bad for local governance (e.g., Kung and Chen, 2014). Another World Bank report extends these concerns to other countries (Peterson, 2008).

2.1. Benevolent politician

Let's assume for the time being that the local incumbent cares solely about voter welfare and is fully aware of the temporary nature of the construction-revenue windfall. To keep the problem simple, we assume that the welfare of a representative voter can be expressed as:

$$W = \mathrm{E}(\ln(y_1) + \ln(y_2)) \tag{1}$$

where $y_1 = \eta_1 e_1$ and $y_2 = \eta_2 e_2$ are the quality of local public services in periods 1 and 2, e_1 and e_2 are local government spending in periods 1 and 2, and η_1 and η_2 denote the quality of the politicians. Let's also assume for the time being that all politicians are of average quality, so $\eta_1 = \eta_2 = 1$. The budget constraint of the local government in periods 1 and 2 is $e_1 = r_1 - s$ and $e_2 = r_2 + s$, where r_1 and r_2 are exogenous flows of revenues, and s are savings. The inter-temporal budget constraint can be written as:

$$e_1 + e_2 = r_1 + r_2 = r \tag{2}$$

Revenues are ordinary revenues t (i.e., that do not fluctuate) and the totally temporary windfall of construction revenues c, so that $r_1 = t + c$ and $r_2 = t$.

Finding $e_2 = r - e_1$, substituting this in (1) and maximizing w.r.t. e_1 we obtain:

$$e_1^* = e_2^* = t + \frac{1}{2}c \tag{3}$$

which indicates that spending should be constant over time and in each period equal to the permanent revenues t plus ½ of the temporary windfall. So, in this case the marginal propensity to spend/save out of the temporary windfall is:

$$\frac{\partial e_1^*}{\partial c} = \frac{1}{2} \qquad \text{and} \qquad \frac{\partial s^*}{\partial c} = \frac{1}{2} \tag{4}$$

This simply says that a substantial party of a temporary windfall should be saved[5]. This is a well-known result in consumption theory (Hall, 1978, and Japelli & Pistaferri, 2013). Of course, the prediction will change if we relax the assumptions implicit in the framework. The propensity to spend could be higher with legal debt limits (Børge and Tovmo, 2009), with liquidity constraints (Zeldes, 1989, and Persson, 2015), prudent but impatient politicians (see Craig *et al*., 2016), local multiplier effects (Suárez-Serrato and Wingender, 2016), or if the city infrastructure has to be upgraded as population size increases. Some of these influences can be ruled out in our setting; for the others we will show they do not alter the interpretation of the results. First, debt limits were not an issue in Spain during the period studied (see section 3.1 for a more detailed discussion). Second, liquidity constraints and governments limiting the size of the debt stock to avoid incurring excessive risk might be an issue given the low size and fiscal capacity of some governments, and we will account for that in the empirical analysis. Third, local multipliers are clearly not a problem given the small geographical scope of local gov-

[5] In our two-period model the windfall is equally split between the two periods; with ∞ periods the marginal propensity to consume in the present would be zero.

ernments and the low share of local taxes in personal income[6]. Fourth, infrastructure needs are really an issue and we deal with that by controlling for population growth and by showing the effects for capital and current spending separately.

Note also that it is straightforward to introduce taxes in the model. The tax-smoothing model also predicts that a (benevolent) government would not change tax rates in response to a temporary shock (see e.g., Barro, 1979). We can show that introducing taxes as a decision variable in our model has no effect at all on the response of savings to the temporary windfall; the prior reaction of spending would be split between spending increases and tax cuts, depending on the intensity of the preferences for public vs. private goods (results available upon request).

2.2. Office-seeking politician

Here we assume that the politician cares about residents' welfare but also about their own re-election. Uninformed voters observe the quality of public services but are ignorant of spending and savings decisions. Therefore, they tend to re-elect profligate politicians. This provides incentives to the incumbent to spend in the first period in order to ensure re-election. Below, we present a simple accountability model that captures this intuition. The model is a dynamic career concerns model similar to those in Holmström (1999) and Bonfiglioni and Gancia (2013)[7].

Let's now assume that politicians have different qualities, and that it is the function of elections to select the politician with the greatest quality. Voters do not observe politicians' quality but know η is distributed $U[1-1/2\phi, 1+1/2\phi]$, with $\mathbb{E}(\eta)=1$ and density ϕ. They also know that quality persists over time and that an opponent of average quality will always substitute an incumbent losing the election.

The objective function of the incumbent is:

$$U = W + R + pR \tag{5}$$

where W is (expected) voter's utility, R are the exogenous office rents in each period, and p is the (expected) probability of re-election.

There are two types of voter: uninformed and informed. Before the elections, both types observe c and y_1, but only informed voters are able to observe s and e_1[8]. Thus, an

[6] In an extension of the model we show that the local multiplier should be really high for this to be an issue. We allow permanent revenues to depend on local spending; with a multiplier of local spending equal to 2 (the highest value estimated by Suárez-Serrato and Windgender, 2016, with US county data) and the actual income share of local revenues we get a marginal propensity to consume equal to 0.52 (instead of 0.5). Results are available upon request.

[7] Similar models have been used in the political budget cycle literature (e.g., Rogoff, 1990; Shi and Svensson, 2005; and Alt and Lassen, 2006).

[8] We assume that uninformed voters know the local housing market is booming and that as a result of on-going projects the government will obtain a revenue windfall. However, they are unable to ascertain before the elections how much of the windfall the local government has spent. This assumption is justified on the grounds that the incumbent employs accounting tricks to conceal the real amount of her spending commitments.

uninformed voter is uncertain as to whether the high quality of public services is the result of profligacy (i.e., under-saving) or of the incumbent's quality. Thus, the uninformed voter has to infer the incumbent's quality as:

$$\tilde{\eta}_1 = \frac{y_1}{r_1 - \tilde{s}_1} \tag{6}$$

The uninformed voter will re-elect the incumbent if she expects her quality to be greater than that of an opponent of average quality, so if $\tilde{\eta}_1 \geq 1$, that is if:

$$\eta \geq \frac{r_1 - s}{r_1 - \tilde{s}} \tag{7}$$

So, the probability of an uninformed voter voting for the incumbent is:

$$p^u = \frac{1}{2} + \phi \left[1 - \frac{r_1 - s}{r_1 - \tilde{s}}\right] = \frac{1}{2} + \phi \left[1 - \frac{\tilde{e}_1}{e_1}\right] \tag{8}$$

The situation differs in the case of informed voters. As they are aware of whether the incumbent is saving or not, they are able to judge her quality. They vote for the incumbent if $\eta \geq 1$ so the probability is $p^i = 1/2$. If π is the probability that the representative voter is informed (which can also be interpreted as the proportion of informed voters), the re-election probability is $p = \pi\, p^i + (1 - \pi)\, p^u$, or:

$$p = \frac{1}{2} + (1 - \pi)\phi \left[1 - \frac{\tilde{e}_1}{e_1}\right] \tag{9}$$

And the effect of e_1 (and s) on the probability of re-election is:

$$\frac{\partial p}{\partial e_1} = -\frac{\partial p}{\partial s} = (1 - \pi)\frac{\phi}{e_1} \tag{10}$$

where we use the fact that, in equilibrium with rational expectations, voters are able to perfectly infer e_1 (and s): $\tilde{e}_1 = e_1$ and $\tilde{s} = s$ (see Holmström, 1999).

The incumbent maximizes U with respect to e_1 taking into account (1), (2) and (10). The F.O.C. is:

$$\frac{\partial W}{\partial e_1} + \frac{\partial p}{\partial e_1} R = \frac{1}{e_1^*} - \frac{1}{r - e_1^*} + (1 - \pi)\frac{\phi R}{e_1^*} = 0 \tag{11}$$

Similarly, we can obtain the expression for e_1^*:

$$e_1^* = \frac{(1 + (1 - \pi)\phi R)}{(2 + (1 - \pi)\phi R)} r \tag{12}$$

The responses of spending and savings to a construction-revenue windfall are:

$$\frac{\partial e_1^*}{\partial c} = \frac{(1 + (1 - \pi)\phi R)}{(2 + (1 - \pi)\phi R)} \quad \text{and} \quad \frac{\partial s^*}{\partial c} = \frac{1}{(2 + (1 - \pi)\phi R)} \tag{13}$$

An office-seeking politician has a marginal propensity to spend (save) out of a temporary windfall greater than that of a benevolent politician. Note that the propensity to spend/save now extends from ½ (in both cases) to one (zero). Note that the propen-

sity to spend (save) decreases (increases) the better informed the voters are (i.e., so the lower π) and the less competitive the elections are, represented by the ϕ parameter, which measures the sensitivity of votes to policy:

$$\frac{\partial^2 e_1^*}{\partial c \partial \pi} = -\frac{\partial^2 s^*}{\partial c \partial \pi} = \frac{-\phi R}{(2 + (1-\pi)\phi R)} \leq 0 \quad (14a)$$

$$\frac{\partial^2 e_1^*}{\partial c \partial \phi} = -\frac{\partial^2 s^*}{\partial c \partial \phi} = \frac{\pi R}{(2 + (1-\pi)\phi R)} \geq 0 \quad (14b)$$

The model's main predictions are robust to a couple of changes. First, we could allow the incumbent to choose the amount of political rents. Including two types of spending can do this: wasteful (i.e., valued only by politicians) and useful (i.e., valued also by voters). The reaction of spending (useful + wasteful) to the temporary windfall would be greater than without wasteful spending[9]. Intuitively, this is because as the incumbent obtains more rent the probability of re-election falls and this has to be offset by a further increase in useful expenditures. However, the predictions regarding the level of voter information and political competition remain. Second, if we include taxes in the model with rents the results remain unchanged (the reaction of savings does not alter and the remaining is split between spending and taxes). In this variation, rent seeking could affect the split between spending increases and tax cuts[10], but not the overall reaction of savings (full results available upon request).

2.3. Myopic politician

Another possibility is that the politician is also uninformed or myopic. For instance, she might have imagined the shock to be more persistent than it was in reality. Note that a housing boom of an unprecedented magnitude characterized the period we are studying. The possibility of agents developing irrational beliefs in this context quickly comes to mind (e.g., Glaeser and Nathanson, 2015). Various studies demonstrate that people do not readily forecast mean reversion processes of variables that grow sustainably over quite a long period (Fuster *et al*., 2010), which is what occurred in our case.

It is easy to see that this would modify the predicted reaction to the windfall. Assume, for example, that revenues in period 2 are $r_2 = t + \rho c$ where $\rho \in [0,1]$ is the persistence of the construction windfall 'as perceived by the politician'. If the politician is benevolent her propensity to spend will be $(1+\rho)/2$ and if she is office-seeking the term $(1+\rho)$ will multiply the expression in (13). So, in order to obtain some evidence concerning the role played by irrationality, we should look at whether the reaction to the windfall is mediated by a proxy of perceived persistence ρ.

[9] See Alesina *et al.* (2010) and Matsen *et al*. (2016) for alternative electoral agency models where elections with rent-seeking politicians also induce a short-term bias in budget decisions.
[10] Note that we do not study the intensity of the split between spending and taxes (the so-called 'flypaper effect'). This split might also be affected by institutional constraints faced by Spanish local governments (as e.g., limited tax autonomy, see section 3.1).

3. Empirical analysis

3.1. Institutional context

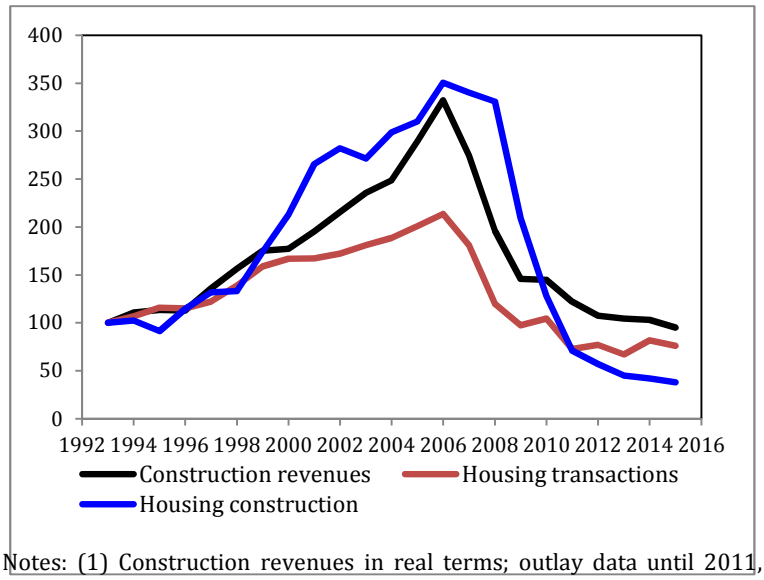
Spain's local public finances. Spain has more than 8,000 municipalities, although most are quite small. The municipalities constitute multi-purpose governments, and their main spending categories coincide with responsibilities that elsewhere are typically assigned to local governments (i.e., environmental services, planning, urban infrastructure, transportation, welfare, etc.) with the exception of education, a responsibility assigned to Spain's regional or autonomous governments. Local spending amounts to around 15% of public spending. Own revenues account for more than two thirds of current revenues, the remaining third being met by grants (mostly unconditional). Two thirds of the municipalities' own revenues come from taxes with the remaining third originating from user charges. The main taxes are the *Property tax*, the *Local vehicle tax* and the *Local business tax*, which account for 50, 25, and 10% of tax revenues, respectively. Local governments have the autonomy to fix their own tax rates, albeit within certain limits. Maximum tax rates are generally non-binding, although minimum tax rates might be binding for municipalities with high fiscal capacity. This means that municipalities that receive a huge windfall and which react by cutting taxes might hit the minimum and so, in practice, they may be constrained in their reaction.

Construction revenues. Spain's municipalities also generate extraordinary revenues, related in the main to housing construction. Chief among these is the *Betterment tax,* which is a capital gains tax on the land portion of a real estate transaction. The tax base is estimated using the current assessed value of land and the number of years since acquisition. Second, there is the *Construction tax*, which is paid by the owner of a construction project (i.e., either the developer or the homeowner). The tax base is the construction budget. Both taxes have a single *ad valorem* tax rate, set by municipalities between certain limits. Most municipalities fix the maximum tax rate as allowed by law. Third, there are *Developer's fees*, including *Building permits* and payments in exchange for development duties. Developers have the duty to contribute a share of developed land (that part required for streets plus 10% of the developed land), or to provide the equivalent value in money (see Riera *et al*., 1991, for a detailed explanation). Fourth, there are revenues from *Sales of land plots* contributed by the developers.

Figure 1 –which tracks the evolution of housing construction and of transactions- shows how these revenues fluctuated over the housing cycle. Note that construction revenues more than doubled during the boom (1995-2007) but then virtually disappeared in the bust (2008-2011). This behaviour was particular of this type of revenue instruments; ordinary taxes (e.g., property tax) were no affected at all by these fluctuations (see Figure A.1 in the Appendix). The oscillation was not only abrupt; it had a big impact on local budgets. Table 1 below shows that the share of these items in the revenue budget jumped from 12% in 1995 to 21% in 2007, before falling again to 9% in

2011. In some municipalities, the reliance on construction revenues was even larger (see Figure A.3 in the Appendix), reaching more than half of the budget at some point[11].

Figure 1: *Construction revenues and the Housing boom & bust*



Notes: (1) Construction revenues in real terms; outlay data until 2011, budget forecasts for the remaining years. (2) All variables expressed as an index (1993=100). (3) Sources: Housing construction and Transactions form Ministerio de Fomento (http://www.fomento. gob.es). Construction revenues: Ministerio de Hacienda y Administraciones Publicas (http://www.minhap. gob.es) and own elaboration.

Table 1: *Share of construction revenues in the budget in %*

	1995	2007	2011
Ordinary revenues	80.82	70.37	83.10
Ordinary taxes and fees	46.82	40.05	49.59
Transfers (*current*)	33.98	30.32	40.42
Extraordinary revenues	19.18	28.94	16.12
Construction revenues	**11.76**	**21.27**	**9.02**
Construction taxes	5.39	9.05	5.13
Construction fees	4.15	5.62	2.68
Sales of land plots	2.22	6.60	1.51
Transfers (*capital*)	7.42	7.67	7.10
	100.00	100.00	100.00

Notes: (1) Share of construction revenues measured over non-financial revenues; (2) Outlay data; (3) See Table A.1 for definitions and data sources. Source: Ministerio de Economía y Hacienda (www.minhac.es), "Base de datos de liquidaciones de los presupuestos de las Entidades Locales".

Some comments on the nature of these revenues are in order. First, some of these items are in fact intended to finance infrastructure, which means, in theory, the amount raised should be used to offset the building cost (Slack, 2002). If this were the case, however, no windfall would arise. In practice, this is of limited application, first, because

[11] Good examples are the cities of Madrid and Valencia, where construction revenues represented a 50% and a 60% of the revenue budget in 2006.

developers' duties also include the direct provision of the main infrastructure (including, street paving, lighting, and sewage), meaning that revenues tend to exceed by several factors the needs created by the urbanization process; second, because developers also provide lump-sum contributions (in land or in money) so that the community can obtain a share of urbanization profits[12] (these contributions are not designed to match urbanization costs and thus constitute a windfall); and, third, because the regulations that should keep these revenues out of the current budget are either non-existent (in the case of taxes) or often circumvented (in the case of land sales).

Debt limits. Spanish municipalities also have the autonomy to use debt to cover their capital spending. Capital projects are funded from current account savings, with earmarked capital transfers, extraordinary revenues (see above) and with debt. During the period under study, legally binding debt limits were in place. The debt burden and debt stock could not exceed 25% and 115% of current revenues, respectively. Reaching these thresholds does in theory trigger the imposition of a local adjustment plan that forces the accumulation of savings during a period of years. However, very few municipalities had reached this limit by the start of the boom. Despite this, many governments entered the boom period with a sizeable amount of debt inherited from the previous crisis. It is unclear as to whether this hindered access to finance in a period of plentiful credit, but it might have had some impact on low fiscal capacity municipalities, prompting a different reaction to the boom windfalls. The situation changed radically during the bust: although formal debt limits were not tightened until 2011 (Lago and Solé-Ollé, 2016), credit to local governments totally dried up during the financial crisis (Jensen and Bentolila, 2016), affecting governments with high and low debt prior debt levels alike.

3.2. Identification

3.2.1. First-differences

In order to study the reaction of local budgets to construction windfalls during the boom we estimate equations that relate changes in the average value of budget variables between a pre-boom period and a period corresponding to the peak of the boom to changes in construction-related revenues per capita during the same period (see section 3.3 for more details). Averaging over many years helps coping with the year-to-year volatility of construction revenues while using long-differences avoid having to model the short-run dynamics of fiscal decisions. It allows us also to study the response to the boom windfalls during the boom and during the bust in a quite intuitive manner.[13]

A first estimation approach consists of using OLS on equations like:

$$\Delta e_{ijk}^{boom} = \alpha^{x,boom} * \Delta c_{ijk}^{boom} + \beta^{x,boom} * x_{ijk}^{0} + \gamma^{x,boom} * \Delta y_{ijk}^{boom} + \lambda_j + \lambda_k + \varepsilon_{ijk}^{x} \quad (15)$$

[12] See Peterson (2008) for a review of 'land value capture' policies. Several of the construction-related sources used in Spain follow the logic of sharing urbanization profits with citizens.

[13] See Charles *et al.* (2015), for a paper using a similar approach to study the effects of the US housing boom and bust on college enrolment.

With e we denote spending per capita and with c are construction revenues (also per capita). Δ is the first-differences operator and the super index *boom* indicates that the difference the variable has been computed between the pre-boom and the peak of the boom. The sub index i indicates municipality, j indicates urban area (i.e., j=1…62) and k indicates distance-to-central city interval (i.e., k=1…4, i.e., less than 5km, 5 to 10km, 10 to 15km, and more than 15km). Similar equations are estimated for savings (s) and tax revenues (t)[14].

Note that by taking first differences we are getting rid of permanent differences across municipalities in the levels of budgetary variables and of construction revenues. In addition to that, the equation in (15) controls for base period municipality characteristics that might be correlated with trends in the evolution of construction revenues (x_{ijk}^0). A similar role is played by λ_j and λ_k, which represent a set of urban area dummies and a set of distance-to-central-city interval dummies. These fixed effects aim at capturing trends common to all municipalities in an urban area (or with the same level of within area accessibility) that might at the same time correlated with developments in the housing market. The equation also controls for changes during the boom period in variables (Δy) that might be alternative channels of influence of housing construction on the budget. Two variables that stand out in this group is the change over the period in tax capacity from ordinary taxes and in population growth. Note, for instance, that housing construction might also have an effect on the growth of property tax revenues if new houses are larger, more expensive or assessed at higher values. Controlling for shocks in ordinary revenues (which tend to be much more persistent) is also important to correctly interpret the shocks in construction revenues as truly temporary. Also population growth may be related to additional infrastructural needs related to urbanization. Other variables we consider, are changes in personal income, building density (new construction might be more land intensive), changes in the share of immigrants and of old and young residents (which might influence the demand for local services).

Similar equations are also estimated for the bust period:

$$\Delta x_{ijk}^{bust} = \alpha^{x,bust} * \Delta c_{ijk}^{boom} + \beta^{x,bust} * x_{ijk}^0 + \gamma^{x,bust} * \Delta y_{ijk}^{boom} + \mu_j^x + \mu_k^x + \epsilon_{ijk}^x \qquad (16)$$

Note that in this case we look at the effects of boom windfalls (i.e., changes in construction revenues from the base period to the peak of the boom) on the reaction of budget variables during the bust (i.e., changes in spending, savings or tax revenues from the peak of the boom to the bust period). Since the shocks to construction revenues during the boom are completely mean reverting (i.e., $\Delta c_i^{bust} \approx -\Delta c_i^{boom}$, see section 3.3.2) the estimated coefficient in (16) will indicate whether the budget variables that where shown to react during the boom in a given way (e.g., spending increases or tax cuts) are

[14]From the budget identity ($e \approx s+c+t$) it follows that the effects on spending, savings and tax revenues should at to one. This abstracts from the possible effects on intergovernmental grants. However, our results will show that construction revenues did not have any impact on grants.

also adjusted during the bust back towards its pre-boom levels or instead stay at the levels reached at the peak of the boom.

3.2.2. Instrumental variables

The main threat to the estimation of the above equation by OLS is the possible endogeneity of construction revenues. Note that in Spain local governments are responsible for zoning regulations. Municipalities are in charge of drafting the Master Plan, which specifies the areas under municipal jurisdiction where building is permitted, as well as the many regulations related to type of activity, building densities, and so on (see Solé-Ollé and Viladecans, 2012 and 2013). Local governments determine the amount of new land to be converted from rural to urban uses and this affects the amount of new construction in the coming years (see García *et al*., 2015, for evidence) and, thus, the amount of construction-related revenues. This suggests causality might actually run from spending (or from the other budget variables analysed) to construction revenues: municipalities might decide to allow for more construction in order to obtain funds to expand their budget or in order to fund tax cuts. This would bias the OLS coefficient of the spending and tax revenues equations upwards (in absolute value) and that of the savings equation downwards. In addition to this a problem of omitted variables might remain if we are not able to fully account for influences correlated with differential trends across municipalities in construction revenues.

The difficulty in dealing with these issues within an OLS framework justifies the use of a different identification approach. We estimate the equations in (15) or (16) by 2SLS, using as the instrument the amount of vacant land at the start of the boom, that is the amount of land already zoned for development in the past but not yet developed at the start of the boom. The first-stage equation looks like:

$$\Delta c_{ijk}^{boom} = \rho * v_{ijk}^{0} + \mu^{x} * x_{ijk}^{0} + \delta^{x} * \Delta y_{ijk}^{boom} + \zeta_{j} \ + \zeta_{k} \ + \omega_{ijk} \qquad (17)$$

Three main assumptions have to be fulfilled for v_i^0 to be a valid instrument (see Angrist *et al*., 1996). First, vacant land should be able to predict the increase in construction revenues (i.e., $\rho \neq 0$). Moreover, we know that in order to avoid biased inferences the explanatory power of the instrument has to be substantial, that is the instrument has to be 'strong' (see Staiger and Stock, 1997). Second, vacant land should be assigned in a quasi-random way, which means that municipalities with high and low amounts of vacant land should not differ systematically from one another (this is the so-called 'ignorability' assumption). Third, the effect of vacant land on spending (and other budget items) should be channeled exclusively through construction revenues (this is the so-called 'exclusion restriction' assumption). In the paper we defend that vacant land fulfills the second and third assumptions conditional on controlling for the two sets of fixed effects mentioned above. Other controls also considered prove to be of no practical relevance. Below we explain the logic behind the instrument and discuss in detail why we think it fulfills the three assumptions.

Instruments' logic. For vacant land to explain the change in construction revenues these revenues should be sensitive to housing construction and the same time there should be more housing construction where there is more vacant land to start with. We think the first part of the statement is plausible given that most tax bases are computed with information on quantities (i.e., housing units build, transactions)[15].

The second part of the statement depends on some peculiarities of land use regulations in Spain. First, the Master Plan specifies the amount of vacant land to accommodate the growth needs of the municipality for a given period of time (i.e., between fifteen and twenty years)[16]. The amount of vacant land some years after the approval of the plan is equal to vacant land at the time of approval less the new construction during this period. This suggests that the vacant land some years after the approval of the plan can be considered as a forecast error (i.e., the difference between forecasted and real construction). So, a given municipality might start a housing boom with a larger amount of vacant land because politicians were overly optimistic in their forecasts of housing demand in previous housing cycles. Note that whether a local development project materializes or not is a highly uncertain event, and there is plenty of anecdotal evidence of unfulfilled expectations in this respect[17]. Therefore, it is quite possible that real housing construction falls short of expectations some years after the plan is implemented.

Second, the Master Plan is a legally binding document that creates rights for the landowners. This means that the development status of a land plot cannot be reverted to its previous use without properly compensating its owner (see Riera *et al*., 1991), something that Spanish local governments are generally not able to do. So, past planning forecast errors are virtually impossible to rectify. Third, the process of amending the plan is very complex and lengthy and the subsequent process of land assembly is also very slow[18]. During this process housing construction tends to slow down, either because of legal provisions (i.e., permitting stops while the plan is discussed), or because when the local government starts the process the plan already suffers from obsoles-

[15] Prices also play some role in the computation of the tax base but in most cases they are based on the assessed value of the property and are outdated due to property value reassessment lags. Also, municipalities building more need not necessarily face lower prices, since these are determined at the level of the whole urban area. It might even be that larger quantities mean higher prices; this might happen because the share of social housing (which price is lower than the market price) in new construction tends to be lower in municipalities that build more.

[16] The Spanish system is highly interventionist and rigid (see Riera *et al.,* 1991). Most town planning responsibilities are in the hands of local governments. Municipalities draw up a Master Plan that classifies land as *developed* (already build-up), *vacant* (developable land though not yet build-up), and *non-developable* (see Figure A.4 in the Appendix for an illustration). Only a portion of this last category is actually protected; most of it is not developable under the current plan but its status could change if a new plan decides so. The plan also specifies other regulations as zoning uses (e.g., residential, retail, industrial) and building densities (see Riera, 1991).

[17] There are plenty of anecdotes from Spain on failed attempts to attract big plants and on its consequences for the amount of vacant industrial and retail land (see "The industrial Estate bubble explodes", *ElEconomista* 22/10/2012).

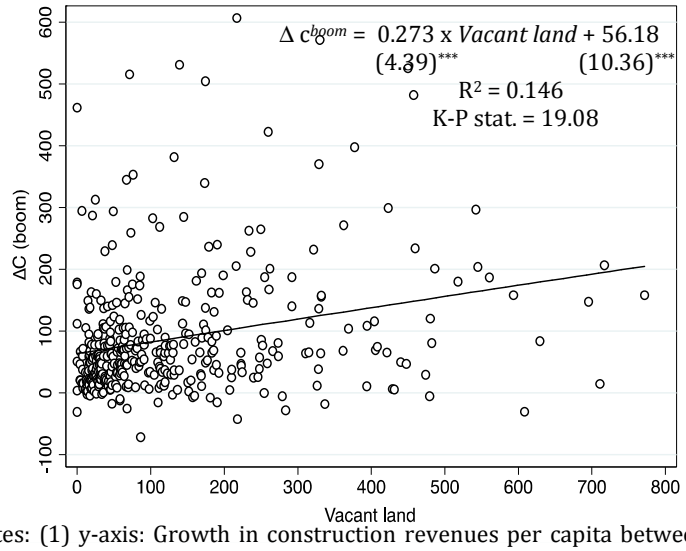
[18] See Brooks and Lutz (2015) on how land use regulations affect land assembly for the US.

cence, which means that the amount (and type) or vacant land remaining is not enough to sustain the current rate of construction (Martínez-Mora and Sáez-Fernández, 2009).

These three facts combined suggest that municipalities with higher stock vacant land at the beginning of a housing boom will experience more housing construction during the following years. The municipalities with a lower stock of vacant land (those where the forecast was more accurate) will at some point start the process of amending the plan. However, it will take some time to do so and in the meanwhile (for the reasons commented above) housing construction will slow down. In contrast, municipalities with a large initial stock of vacant land (due to past forecast errors that could not be later fixed) will continue building at the same pace during the whole boom period[19].

***Strength*.** The amount of vacant land has a significant impact on windfall revenues during the boom, as verified by Figure 2. The upward slope is clear and the F-statistic is equal to 32.18. This holds despite the addition of urban area and distance-to-central-city interval fixed effects and of different types of control variables (see section 4.1).

Figure 2: *Growth in Construction revenues v. Vacant land.*



Notes: (1) y-axis: Growth in construction revenues per capita between base period (1993-1995) and peak of the boom (2004-2007); x-axis= vacant land per capita in 1995. (2) t-values in parentheses, ***: significant at the 1% level; standard errors clustered by province. (4) K-P is Kleiberger-Paap Wald rk F statistic; the value of the Stock and Yogo weak identification test critical values at 10% maximal IV bias are is 16.38.

Ignorability. As explained above, the stock of vacant land at the start of the boom is to some extent the result of the accumulation of past forecast errors in the demand for housing construction. These forecast errors might be quasi-random as far as some local governments do not err systematically more than others. There are some reasons this might not be the case in practice. For example, forecast errors might not be random if some urban areas systematically experience larger housing demand shocks than others. In these areas local governments might fear more the risk of falling short of land (which

[19] See A.6 in the Appendix for a graphical representation of this story.

mean that very profitable projects might flight to another location) that about the possibility of supplying too much land (which means that the land might be in the long run occupied by not so desirable projects). This suggests that the local planners of these places (taking into consideration these issues) will plausibly convert more land than in places that are not expected to grow that much. The way we deal with this issue is by including urban area and distance-to-central-city interval dummies in the estimation. By looking at within area differences (and holding constant accessibility) we are controlling for housing demand shocks that are common to all municipalities in the area and also for the overall stock of vacant land available in the area. We expect that after controlling for urban area and distance-to-central-city interval dummies, differences in vacant land across municipalities will not be systematic. We think this is the case because it is less true that different locations inside an urban area (compared to different urban areas) grow systematically more than others; land supply is more constrained locally than across areas and, as some places are filled up, development moves to places that still have vacant land. Also, many locations inside a given urban area are close substitutes, especially if they are adjacent or located at the same distance from the central city.

We perform several exercises in order to check the validity of this approach. First, we study the determinants of vacant land in 1995 (so before the start of the housing boom). We are able to show (see Table A.2 in the Appendix) that construction in previous housing cycles do have some ability to explain differences in vacant land at the start of the boom. However, their effect vanishes after including urban area and distance-to-central-city interval dummies. Second, we explore the possibility that differences in preferences for or against development and or in the fiscal situation of the local government are correlated with the amount of vacant land[20]. We find that these variables have a low explanatory power and that none of them is statistically significant (see also Table A.2). At the end, it seems that there are no systematic differences in the stock of vacant land, at least after controlling for urban area and accessibility to the city centre. Third, as we will show in section 4.1, the introduction of any of these sets of variables in the equation (besides the fixed effects) has no effect on the estimation.

Fourth, there might still be other determinants of vacant land that we are not taking into account, and that are correlated with trends in budget variables. To deal with this issue we run regressions using changes in the budget variables in a period prior to the housing boom (i.e., between 1993 and 1995) as dependent variable and vacant land

[20] We control for political variables such as the vote margin and the vote share of left-wing parties (at prior local elections), variables measuring voter preferences (i.e., income per capita in 1995, % college education, % renters and % commuters, measured with 1991 census data), and budgetary variables (i.e., debt burden, spending, and assessed property value in 1995). Some of these variables have been shown to influence the amount of land converted from rural to urban uses and so on the amount of vacant land (see Solé-Ollé and Viladecans, 2012 and 2013). However, they have also been shown to predict the amount of new construction in the years that follows the amendment of the plan; it is therefore unclear whether they should have any influence on the amount of vacant land remaining years after that.

at the start of the boom (in 1995) as an explanatory variable. The results indicate that vacant land is not correlated with changes in budget variables during this period, suggesting budget variables do not have different pre-trends municipalities with high v. low stocks of vacant land (Table A.3 in the Appendix).

Exclusion restriction. We accept that vacant land, by fuelling housing construction, may also have some effect on property tax revenues. In addition to this, housing construction might also have an effect on employment, which could, in turn, have an effect on vehicle and business tax bases. We, therefore, need to recognise the possibility that the estimated effect of temporary windfalls impacts other (perhaps more permanent) sources of revenues. Construction activity might also impact personal incomes and building densities, thus affecting the demand for and/or the costs of providing local services. We believe, however, that these effects might also be attenuated by the inclusion of urban area and distance-to-central-city interval dummies. Note, for instance, that the effect of vacant land on the property tax base depends on the response of housing prices, which is determined at the urban area level, and of the frequency of property reassessments, which are performed close in time for municipalities in the same housing market. The same can be said of the effects on employment or income, which spill over to other localities in the area.

We examine the seriousness of this issue by running different regressions using vacant land as the explanatory variable and changes in ordinary revenues (i.e., ordinary taxes plus grants), population growth, personal income, building density, share of immigrants, and share of old and young residents. In all these regressions we control for urban area and distance-to-central-city dummies. We show (see Table A.4 in Appendix) that vacant land at the start of the boom does have a statistically significant effect on changes over the boom period in ordinary revenues (at the 5% level) and in population growth (at the 10% level), but not on changes in the other outcomes. However, the effect on the growth of ordinary revenues and on population growth is quite small, which means that the exclusion of these variables from the equation could hardly affect our estimates. In fact, after including the fixed effects, neither the first-stage coefficient nor the second-stage results depend on controlling for these two variables (see section 4.1).

3.3. Data

3.3.1. Sample and period

We focus on municipalities located in the largest Spanish urban areas[21]. There are several reasons for this choice. First, these are the municipalities where the demand for housing was most intense and also where the notion of land regulation constraints

[21] We had to exclude the urban areas of the Canary and Balearic Islands, because of difficulty in obtaining data on land uses, and the urban areas of the Basque Country and Navarra due to difficulties in obtaining access to budgetary data for the whole period.

makes greatest sense[22]. Second, it is in urban areas that it makes also greatest sense to consider the different locations as substitutes, which is an important trait of our identification strategy. The urban area delimitations are provided by AUDES (http://alarcos.esi.uclmes/ per/fruiz/audes/) and are based on commuting patterns and the physical continuity of the build-out area. Major urban areas are defined as having a central city of at least 50,000 residents and a sizeable conurbation. This gives us here a total of 62 urban areas. We also restrict our attention to the municipalities inside these areas that have direct access to the road network, defined as having an expressway ramp or a direct connection to a major two-lane road as of 1995. The road data comes from García *et al*. (2015). This excludes a number of municipalities that can be considered far from the central city in terms of travel time, and ensures that the municipalities inside an urban area are close substitutes.

Reasons of data availability mean we have to focus on municipalities with a population greater than 1,000 residents in all the years. This gives us a total of 456 municipalities. We have been able to assemble the required budget data for the whole period of analysis (1993-2011) for 311 of these. These data are drawn from a survey that covers all the largest municipalities (i.e., above 5,000 residents) and a sample of the smaller ones, and was undertaken by the Spanish Ministry of Finance. The selection of the small municipalities into the survey was in theory random so our final sample should be representative. This intuition is confirmed after comparing the restricted sample to one that included all municipalities; the averages of the variables for which we have information in both cases are very similar.

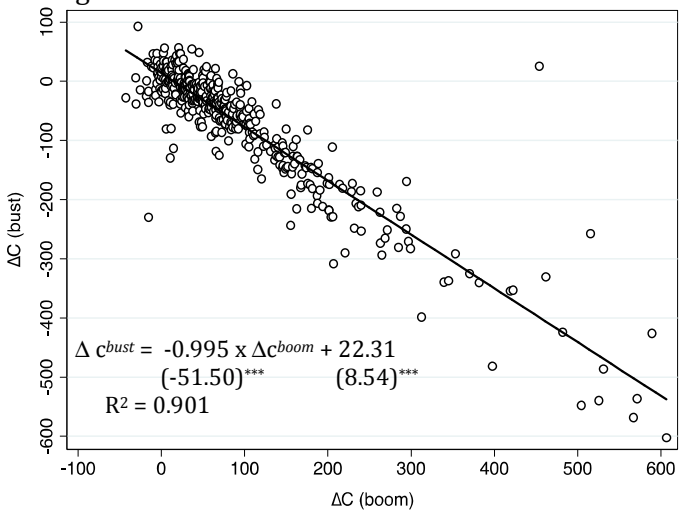
3.3.2. Data sources

Construction revenues. These are revenues derived from the *Betterment tax* and the *Construction tax* and from *Developer's fees* and *Sales of land* (see section 3.1). These revenues (as all the budget data) have been computed from outlay data and have been deflated using a provincial price index provided by the National Institute of Statistics (www.ine.es)[23]. Windfalls are increases in per capita revenues from these taxes between a base pre-boom period (1993-95) and a period covering the years at the peak of the boom (2004-07). Shortfalls are defined as decreases in revenues per capita from these taxes between the peak of the boom (2004-07) and the bust (2008-11)[24,25]. Figure 3

[22] Note for instance that many municipalities in rural areas do not have Master Plans and use simplified land planning mechanisms (see (Martínez-Mora and Sáez-Fernández, 2009).
[23] Table A.1 in the Appendix reports the descriptive statistics and data sources for all variables.
[24] The start of the boom occurs not earlier than 1997 and it is not perceptible in most urban areas before of 1999. Nevertheless, we fix the pre-boom period in 1993-95 as to ensure that we measure both pre-boom budget variables and vacant land in a moment in time were there no expectations of housing construction growing again.
[25] The results are robust to changing the definitions of the boom and bust periods; they do not change qualitatively if we define the periods using just a two-year average (i.e., the peak of the boom as the years 2006 and 2007 and the valley of the bust as 2010 and 2011) or if we use one

shows that windfalls and shortfalls are perfectly negatively correlated: the extra revenues obtained during the boom disappeared in the bust.

Figure 3: *Mean reversion in Construction Revenues*



Notes: (1) y-axis: Growth in construction revenues per capita during the boom; x-axis= Growth in construction revenues per capita during the bust. (2) t-values in parentheses, ***: significant at the 1% level; standard errors clustered by province.

Budget data. Changes in all the budgetary variables studied are defined in the same way as for construction revenues: differences in real average outlays per capita between terms. Spending is total non-financial spending, Revenues are total non-financial revenues (tax revenues – construction revenues + grants), and Savings are Revenues – Spending. In addition, we also analyse the breakdown of spending into Current and Capital spending, and the breakdown of current spending into Wages, Purchases and Transfers. Ordinary revenues are tax revenues + grants. These data have been used to compute Net Savings (Current revenues – Current Spending – Debt principal), a variable used in the interaction analysis.

Land use data. The amount of vacant land has been obtained from a database provided by the National Property Assessment Office (the so-called *Catastro*), which assesses property values across Spain. A by-product of the work undertaken to update its property register is a complete database on the status of all land plots in Spain. This database can be accessed online (http://www.catastro.meh.es/esp/estadisticas.asp) and provides information of the amount of land classified, since 1995, as developed, developable (not yet developed but legally developable), and not developable. The amount of developable land is what we refer to here as vacant land; the value of this variable in 1995, in per capita terms, is what we use as our instrument[26].

year (i.e., 2007 and 2011). The results are also similar if we look at the increase between the pre-boom period and an earlier phase of the boom (e.g., the period 1999-2003).

[26] See Figure A.4 in the Appendix for a graphical illustration of the concept of vacant land and Figure A.5 for an example of the delineation of vacant land in a real Master Plan.

Control variables. We use a variety of control variables from a number of sources, the most important being the Housing Census for 2001 and 1991. This data source provides us with annual housing construction statistics, insofar as it records the year of construction of all housing in the country. This and the 1991 Population Census furnishes information on the socio-demographic variables used here as controls (including, % renters and % commuters) and/or in the interaction analysis (including, % unemployed and % college education). Proxies for employment and income per capita are described in Table A.1 in the Appendix. Building density has been computed as the build-out area (according to the Cadastre database) and resident population.

4. Results

4.1. First stage

In Table 2 we present the results obtained when estimating the first-stage equation, including the different types of controls. In column (1), we do not include any controls; in column (2), we include urban area and distance-to-central-city interval fixed effects; in column (3), we also control for housing demand (i.e., past housing growth and population size); in column (4), we include variables that proxy for fiscal stress (spending, debt burden, and property tax base) and political (voting margin and left-wing voting) and citizen preferences (personal income, % renters, % commuters, and % college educated); and, finally, in column (5), we control for changes over the boom period in variables that might constitute alternative channels of influence of housing construction on local budgets (i.e., ordinary revenues and population growth).

Table 2: *First stage results*

	Windfall revenues p.c. (Δc^{boom})				
	(1)	(2)	(3)	(4)	(5)
Vacant land p.c. (v^0)	0.273 (4.39)***	0.234 (4.21)***	0.225 (4.13)***	0.210 (4.71)***	0.219 (4.01)***
R^2 (adj.)	0.145	0.406	0.423	0.425	0.483
K-P Statistic	19.08	18.33	18.80	19.02	17.21
	[16.38 / 8.96 / 6.66]				
Urban area fixed effects	NO	YES	YES	YES	YES
Distance-to-central city fixed effects	NO	YES	YES	YES	YES
Housing demand	NO	NO	YES	NO	NO
Preferences and fiscal stress	NO	NO	NO	YES	NO
Alternative channels	NO	NO	NO	NO	YES

Notes: (1) Dependent variable is windfall revenues per capita (i.e., increase in construction revenues per capita during the boom period); (2) Sample: municipalities in larger Spanish urban areas larger than 1,000 inhabitants and with access to the main road network (N=311); (3) t-statistic in parenthesis; ***. ** & *=statistically significant at the 1%, 5% and 10% levels; standard error clustered by province; (4) K-P statistic: Kleiberger-Paap Wald rk F-statistic; in brackets Stock-Yogo weak identification test critical values at 10%/15% and 20% maximal IV bias.

Table 2 highlights the stability of the coefficient. Only after including the fixed effects does the first-stage coefficient fall slightly. The introduction of the other controls does not change the outcomes at all. The instrument appears to be strong in all cases, given that the Kleibergen-Papp Wald rk statistic is always higher than the Stock-Yogo weak ID test critical value at a 10% maximal IV bias.

4.2. The boom

In Table 3 we present the 2SLS results for spending, savings, and tax revenues, sequentially adding the different sets of controls as in Table 2. In the case of spending, the coefficient falls from around 0.9 when no controls are included to around 0.65 when we add the fixed effects. This coefficient is statistically significant at the 1% level; neither the value of the coefficient nor its statistical significance changes when other controls are included. The coefficients of savings and tax revenues also remain stable after adding the fixed effects. In the case of savings, the coefficient rises from zero to around 0.25, but the estimation of this effect is very imprecise. The effect on tax revenues is around -0.1, and becomes statistically significant at the 10% level after the inclusion of the fixed effects. The results suggest that for every 100 euros of windfall, around 25 were saved and around two thirds were used to fund spending increases. This latter result is statistically different from zero at the 1% level, so we can conclude that Spanish local governments do not smooth their spending over time and seem to overreact to temporary windfalls in construction revenues.

Table 3: *Average effect on main budget items. Boom period*. 2SLS *results.*

	(1)	(2)	(3)	(4)	(5)
	(a) *Spending p.c.* (Δe^{boom})				
Construction revenues p.c. (Δc^{boom})	0.891 (4.25)***	0.652 (2.41)***	0.647 (2.48)***	0.630 (2.44)**	0.651 (2.19)**
	(b) *Savings p.c.* (Δs^{boom})				
Construction revenues p.c. (Δc^{boom})	0.009 (0.04)	0.251 (1.52)	0.264 (1.40)	0.251 (1.55)	0.243 (1.41)
	(c) *Tax revenues p.c.* (Δt^{boom})				
Construction revenues p.c. (Δc^{boom})	-0.100 (-1.29)	-0.115 (-1.84)*	-0.120 (-1.88)*	-0.113 (-1.92)*	-0.125 (-1.73)*
Urban area fixed effects	NO	YES	YES	YES	YES
Distance-to-central-city fixed effects	NO	YES	YES	YES	YES
Housing demand	NO	NO	YES	NO	NO
Preferences and fiscal stress	NO	NO	NO	YES	NO
Alternative channels	NO	NO	NO	NO	YES

Notes: See Table 2.

The OLS results (see Table A.5 in the Appendix) suggest an even higher degree of over-spending (under-savings), since the spending coefficient is around one and the savings and taxes coefficients are zero, and do not change very much when fixed effects and the control variables are included. A Hausman test verifies that the 2SLS and the OLS are statistically different. The difference between the 2SLS and the OLS coefficients suggests that the OLS results are upwardly biased for spending and taxes (in absolute value) and downward biased for savings. This might be due, among many possibilities, to the fact that the municipalities that expand their spending budgets or that cut taxes most are also the ones that convert more land and obtain larger windfalls.

Table 4: *Average effect on detailed budget items. Boom period.* 2SLS *results*.

	Spending				*Revenues*		
	Capital	*Current*			*Tax Revenues*		*Grants*
		Total	*Wage*	*Transfers*	*Property*	*Other*	
Construction revenues p.c (Δc^{boom})	0.209 (1.97)**	0.448 (3.56)***	0.281 (3.45)***	0.167 (1.67)*	-0.100 (-2.57)***	-0.015 (-0.31)	0.051 (0.20)

Notes: (1) All equations include urban area and distance-to-central-city interval fixed effects. See Tables 2 & 3. (2) See Table A.1 for definitions of the different budget items analysed.

Table 4 presents the 2SLS results for a detailed breakdown of the budget categories[27]. First, we show that the spending response is allocated as follows: two thirds goes to current spending (45 out of each 100 euros of windfalls) and one third to capital spending (19 euros). Even if we consider the capital spending response difficult to interpret (since this spending might either bring future benefits and/or is influenced by liquidity constraints), the effect on current spending is still quite large. Note also that the spending response is dedicated mainly to wages (29 euros or two thirds of the spending response). Due to the lack of a more detailed breakdown for this spending type, we are unable to say whether this spending is made up of salary raises, new permanent hires or just temporary jobs. Note, however, that since both cutting salaries and laying off workers are politically costly or even impossible in Spain (for permanent public servants), assuming this type of commitment out of a temporary windfall might entail certain financial risks.

4.3. Heterogeneous effects

In this section we investigate whether the failure to smooth spending and taxes over time is a generalized problem of all Spanish municipalities or, instead, there are differences among them. The model presented in section two suggests that the propensity to spend out of the construction revenue windfall will be larger in places with poorly informed voters and contested elections. So, first, we estimate equations that include interactions between the increase in construction revenues and proxies of voter infor-

[27] Here we report results controlling for just for fixed effects but the results when including the different sets of controls (available upon request) are similar.

mation and electoral competition. After that we look at whether the results regarding these interactions are robust to the inclusion of additional interactions that account for alternative explanations: liquidity constraints and irrational expectations. For example, in the case of spending, we will estimate the following equation:

$$\Delta e_{ijk}^{boom} = \left[\alpha + \delta * w_{ijk}^{0} + \sigma * z_{ijk}^{0}\right] * \Delta c_{i}^{boom} + \theta * w_{ijk}^{0} + \vartheta * z_{ijk}^{0} + \psi_{j} + \psi_{k} + \xi_{i} \quad (18)$$

where w_{ijk}^{0} represents a variable measuring either for voter information or electoral competition and z_{ijk}^{0} represent potential confounders, that is, variables that might be correlated with voter information and which could also plausibly have an effect on the reaction to the windfall, according to some alternative story. The variables in w_{ijk}^{0} and z_{ijk}^{0} are demeaned. This means, for example, that the parameter α tell us about the effect of a voter information variable at the mean while δ measures the effect at different levels above or below the mean.

The variables included in w_{ijk}^{0} are the following. First, we use a proxy of press circulation at the start of the boom (i.e., number of newspapers sold per capita). This variable has been selected because it fits our theory well and because they have been used previously in the literature (e.g., Besley and Burgess, 2002). Second, we use a proxy of political competition, measured as the difference between the voting shares of the two most voted parties at local elections prior to the period of analysis. Similar variables have also been used in the literature (e.g., Besley *et al*., 2010). Our variable is measured prior to the period of analysis in order to avoid picking up any impact from windfalls on electoral competition. Third, we also present some results with alternative variables, namely, the share of residents with college education, the tenure in office of the main party in the local government (i.e., the number of terms this party held the mayoralty since 1979), and the number of civic associations per capita. The first variable can be is also a proxy of voter information and has also been used in the literature (Arvate *et al*., 2009). The second one is an alternative measure of electoral competition. The third one is a measure of social capital; some authors suggest that social capital, in addition to voter information, might also enhance accountability (Ponzetto and Troiano, 2014).

The variables included in z_{ijk}^{0} are the following. First, we add interactions with proxies for the strength of the liquidity constraints. The main variable we use is net savings per capita at the start of the boom, where net savings are defined as current savings (current revenues – current spending including interest payments) less debt principal. Net savings are low when the debt burden is large and/or revenues low and it is therefore an indicator of the capacity to repay the debt. This indicator is used by higher layers of government in charge to oversee the financial situation of municipalities and also by lenders. Additionally, to see whether the results are robust to the choice of any particular proxy for the financial situation of the municipality, we will repeat the analysis using other variables: debt burden per capita, ordinary revenues per capita, and net savings and debt burden as a share of ordinary revenues.

Third, we also add interactions with variables that aim to measure whether local politicians hold irrational expectations with respect to the possible future evolution of construction revenues. As we already explained in section two, if the 'perceived' level of persistence of construction revenues is larger than zero, the temporary windfall might end up being considered as permanent. The long housing boom period coupled with the tendency to extrapolate the evolution of revenues based on recent information might explain this behaviour (see e.g., Fuster *et al*., 2012). The main variable we use to proxy for these influences is an estimate of the persistence parameter ρ; we assume that at the peak of the boom local politicians were forecasting future construction revenues as $\hat{\rho}c$ and that $\hat{\rho}$ was obtained after observing how construction revenues evolved during the different phases of the boom. More concretely, what we do is to use municipal level data to run regression between construction revenues per capita averaged for the period 2004-2007 and construction revenues per capita during 1999-2003. We run the regression separately for each Spanish province and the estimated coefficient is our proxy for the perceived perception of construction revenues. The logic of this procedure is that in places where construction revenues during the peak of the boom remained as high as in the first phase of the boom we could expect that local politicians may have been confused about the true nature of the windfall. In addition to this variable, we will repeat the analysis including interactions with the average annual growth rate of housing prices during the boom and also with the average annual rate of housing construction. The idea here is that places with higher price appreciation and/or more construction during the period we focus on could have developed more irrational expectations.

The sources for these variables are as follows. Press circulation is computed at the provincial level (there are 50 provinces in Spain) as the number of daily newspapers sold per capita in 1995. This is the best statistic we can obtain for the mid-1990s[28]. The electoral competition variable has been computed as the difference between the first and second most voted parties at the two local elections immediately prior to our period of analysis (i.e., those held between 1979 and 1995). The Ministry of the Interior provides these data. The data on Civic associations also comes from the Ministry of the Interior and is also measured at the provincial level. Housing price data are provided by the Spanish Ministry of Public Works and are measured at the provincial level. Housing construction data comes from the census.

Fiscal myopia. In Table 5 we examine the effect of the level of voter information and electoral competition on the reactions in local government spending (columns 1 to 3) , savings (columns 4 to 6) and taxes (columns 7 to 9) during the boom. In columns 1, 4 and 7 we present the results when including in the equation an interaction with the level of press circulation. Columns 2, 5 and 8 present the results with an interaction with

[28] The information comes from the Spanish media association (AIMC, www.aimc.es). For more recent periods, press circulation survey data could also be used (see www.cis.es). The two variables are, however, very highly correlated (results upon request).

the vote margin. In columns 3, 6 and 9 we introduce the two interactions at the same time. In the case of spending, the coefficients of the interacted variables are always negative, indicating that places with less informed voters and with more contested elections overspend more. Similar results are obtained for savings. In the case of tax revenues the interaction coefficient is positive (suggesting that in places with more informed voters taxes are cut less when there is a windfall) but they are very small and the standard errors are quite large.

Table 5: *Fiscal myopia. Boom period*. 2SLS *results.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(a) *Spending p.c.* (Δe^{boom})			(b) *Savings p.c.* (Δs^{boom})			(c) *Tax revenues p.c.* (Δt^{boom})		
Construction revenues p.c (Δc^{boom})	0.673 (3.59)***	0.682 (2.77)***	0.628 (2.96)***	0.223 (1.42)	0.184 (1.56)	0.182 (1.63)	-0.100 (-1.95)*	-0.116 (-2.02)**	-0.123 (-2.23)**
× *Press circulation p.c.*	-0.016 (-2.53)**	--.--	-0.015 (-2.23)**	0.019 (3.04)***	--.--	0.015 (2.19)**	0.002 (1.08)	--.--	0.002 (1.14)
× *% Vote margin*	--.--	-0.022 (-1.47)	-0.008 (-1.56)	--.--	0.028 (2.30)**	0.018 (1.32)	--.--	0.009 (1.48)	0.009 (1.28)
K-P statistic	9.64 [7.03 / 4.58 / 3.95]	8.935	6.95	9.64 [7.03 / 4.58 / 3.95]	8.935	6.95	9.64 [7.03 / 4.58 / 3.95]	8.935	6.95

Notes: (1) All equations include urban area and distance-to-central-city interval fixed effects. See Tables 2 & 3. (2) See Table A.1 for definitions of the different budget items analysed. (3) K-P statistic: Kleiberger-Paap Wald rk F-statistic; in brackets Stock-Yogo weak identification test critical values at 10%/15% and 20% maximal IV bias.

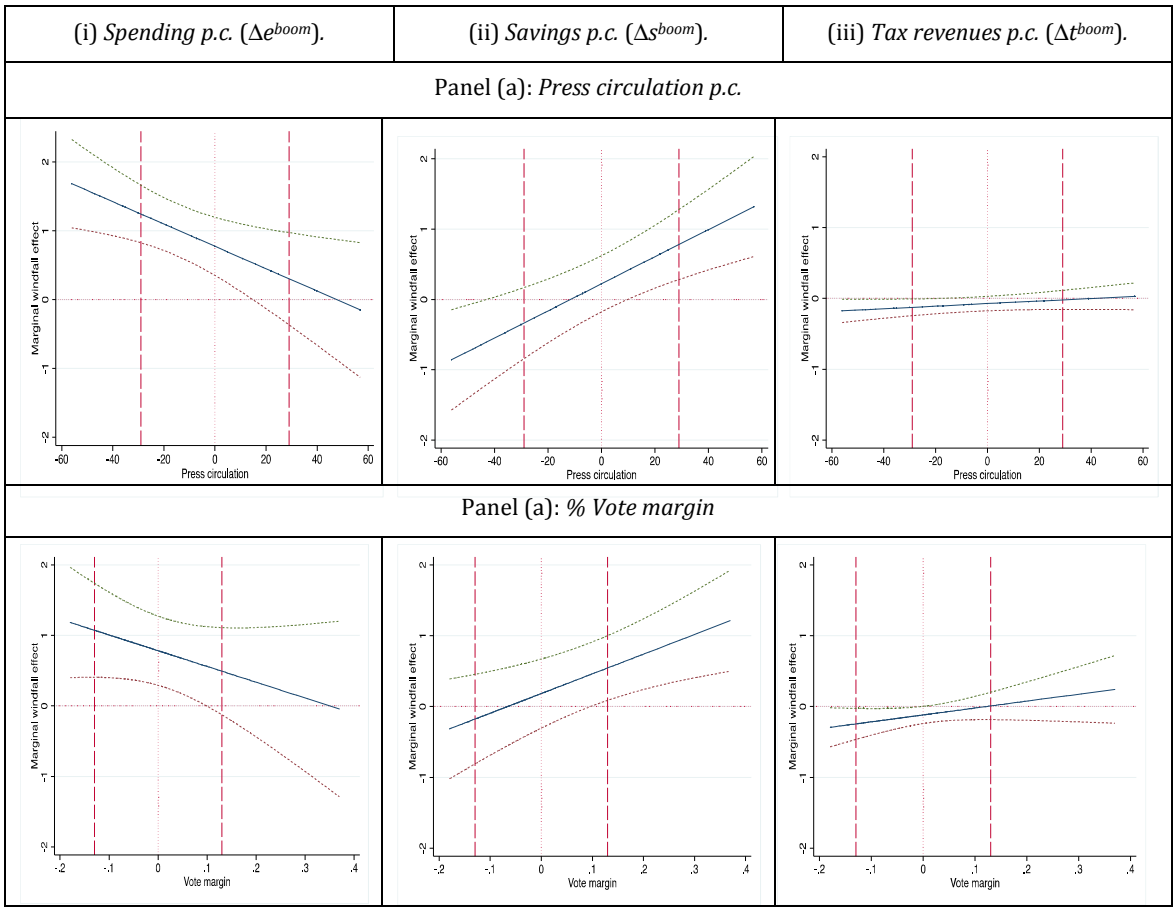
To gauge the quantitative relevance of these findings it is better to consider the marginal effects, which are reported in Figure 4. Panel (a) shows that the level of voter information has a sizable impact on the response recorded by spending and savings to temporary windfalls. Notice that if we take into consideration one standard deviation in press circulation below/above the average (indicated by the long-dashed vertical lines), the marginal propensity to spend moves from one to zero. The graph confirms that in the case of tax revenues the marginal effect is growing with the vote margin but remains small and it is not statistically different from zero for the whole range of values of the interacted variable.

Panel (b) displays the marginal effects for the vote margin variable. Note from the graph that the range of variation of the marginal propensity to spend out of the windfall is lower that it was in the case of press circulation. At one standard deviation below the average the marginal propensity to spend is again 1 but at one standard deviation above the average it is just 0.5. Note that in any case, however, due to the fact that the interacted coefficient is less precisely estimated, we cannot reject the null that these two values are one and zero, respectively. The effects on savings are similar: at one standard deviation below (above) the average the marginal propensity to save is zero (one half). We cannot reject the null that the marginal propensity to spend is zero in the first case, but we can reject the null that it is one in the second. Finally, the marginal effects are quite

flat in the case of tax revenues. Here the slope of the graph also suggests that higher vote margins mean lower tax cuts in response to the windfalls, but the effect is very small.

To see whether these results are due to the use of some specific variables, we repeated the analysis using other measures of voter information and electoral competition. We used the share of college-educated residents as an alternative measure of political competition and the tenure in office in the local government (i.e., the number of terms of office since 1979 during which the main party held the mayoralty). We also introduced an interaction with the number of civic associations per capita, which is a common measure of social capital. These results are presented in Table A.6 in the Appendix. The results regarding the first two variables are quite similar to the ones presented above: the interactions with the share of college residents and with turnover are statistically significant in the case of spending and savings and the size of the effect is quite big. The marginal effects graphs (available upon request) are very similar to the ones presented above for press circulation and vote margin. Finally, the results are not affected at all by the number of civic associations (whose coefficient is positive but very small and not statistically significant).

Figure 4: *Fiscal myopia. Boom period. Marginal effects.*



Notes: (1) Effect of an increase in construction revenues during the boom at different levels of Press circulation and % Vote margin. (2) Marginal effects computed using results from column (3) of Table 6.

Alternative stories. In Tables 6 and 7 we examine two other possible sources of heterogeneity in the response of the budget variables to construction windfalls. Table 6 explore the role of liquidity constraints. With this purpose we add to the equation an interaction between windfall revenues and net savings per capita. Columns (1), (4) and (7) include this interaction alone; columns (2), (5) and (8) also add the interaction with press circulation, and columns (3), (6) and (9) the interaction with vote margin. The results reported in the table show that the coefficient of the interaction with net savings is negative in the case of the spending and the tax revenues equations and null in the case of savings. This suggests that municipalities with a small amount of savings use the windfall to a larger extent to increase spending and less to cut taxes, with no overall effect on savings. Note that this behaviour is not consistent with a liquidity constraint. In any case, the quantitative effect of this variable is very small irrespective of the level of net savings, as it is revealed by a flat profile of the marginal effect graph (which is available upon request). It seems that Spanish municipalities don't seem to be liquidity constrained during the boom period. The results also reveal that the coefficients of the interaction with press circulation and vote margin are not affected by the inclusion of the interaction with net savings.

To discard that these results are due to the particular variable used to proxy for liquidity constraints, we repeated the analysis using other variables: debt burden per capita, ordinary revenues per capita, and net savings and debt burden as a percentage of ordinary revenues. None of these variables seem to have any influence on the reaction of budget variables to construction revenue windfalls (results are available upon request).

Table 6: *Liquidity constraints. Boom period*. 2SLS *results.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(a) *Spending p.c.* (Δe^{boom})			(b) *Savings p.c.* (Δs^{boom})			(c) *Tax revenues p.c.* (Δt^{boom})		
Construction revenues p.c (Δc^{boom})	0.634 (2.80)***	0.633 (2.07)***	0.667 (2.19)***	0.189 (1.42)	0.210 (1.60)	0.236 (2.01)**	-0.100 (-1.95)*	-0.091 (-1.67)*	-0.088 (-1.81)*
× *Net savings p.c.*	-0.004 (-1.11)	-0.001 (-0.42)	-0.001 (-0.33)	0.000 (0.02)	0.000 (0.01)	0.000 (0.03)	-0.001 (-0.86)	-0.001 (-1.01)	-0.001 (-1.14)
× *Press circulation p.c.*	--.--	-0.018 (-2.24)**	--.--	--.--	0.017 (2.13)**	--.--	--.--	-0.001 (-0.55)	--.--
× *% Vote margin*	--.--	--.--	-0.020 (-1.44)	--.--	--.--	0.025 (1.43)	--.--	--.--	0.001 (0.25)
K-P statistic	9.83 [7.03 / 4.58 / 3.95]	8.40	7.59	9.83 [7.03 / 4.58 / 3.95]	8.40	7.59	9.83 [7.03 / 4.58 / 3.95]	8.40	7.59

Notes: (1) All equations include urban area and distance-to-central-city interval fixed effects. See Tables 2 & 3. (2) See Table A.1 for definitions of the different budget items analysed. (3) K-P statistic: Kleiberger-Paap Wald rk F-statistic; in brackets Stock-Yogo weak identification test critical values at 10%/15% and 20% maximal IV bias.

Table 7 inquires into the role of irrational expectations. We include in the equations an interaction between the windfall variable and a proxy for the degree of persistence of construction revenues during the boom. The proxy of revenue persistence is

computed as the coefficient of a regression between construction revenues per capita at the peak of the boom (2004-2007) and construction revenues during the period 1999-2003. We use municipal level data to estimate a different value for each province. The average value of the estimated value is 1, indicating a high degree of persistence across the different phases of the boom. The value of this indicator is however quite heterogeneous, going from 0.5 to 1.5, with a standard deviation of 0.2. The results obtained when introducing this interaction alone are reported in columns (1), (4) and (7) of Table 7 for spending, savings and tax revenues, respectively. The interaction coefficient is not statistically significant, but a look at the marginal effects (available upon request) would reveal that the reaction to windfalls changes with the degree of revenue persistence. This effect, however, vanishes once we introduce again the interactions with press circulation and vote margin. Note that now the coefficient of the interaction with revenue persistence drops to a very low value and the standard errors grew also a lot. Note also that the coefficients on the interactions with the fiscal myopia proxies are very similar to the ones reported in Table 5.

Table 7: *Irrational expectations. Boom period*. 2SLS *results.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(a) *Spending p.c.* (Δe^{boom})			(b) *Savings p.c.* (Δs^{boom})			(c) *Tax revenues p.c.* (Δt^{boom})		
Construction revenues p.c (Δc^{boom})	0.638 (2.82)***	0.647 (2.12)**	0.630 (2.32)***	0.189 (1.42)	0.234 (1.68)*	0.242 (1.83)*	-0.100 (-1.94)*	-0.120 (-2.00)**	-0.121 (-2.18)**
× *Revenue persistence*	0.567 (1.21)	0.002 (0.032)	0.032 (0.210)	0.123 (1.02)	0.001 (0.021)	0.024 (0.165)	-0.092 (-1.17)	-0.000 (-0.06)	-0.005 (-0.33)
× *Press circulation p.c.*	--.--	-0.020 (-2.04)**	--.--	--.--	0.021 (2.45)***	--.--	--.--	0.003 (0.63)	--.--
× *% Vote margin*	--.--	--.--	-0.020 (-1.54)	--.--	--.--	0.014 (1.60)	--.--	--.--	0.001 (0.42)
K-P statistic	10.23 [7.03 / 4.58 / 3.95]	8.44	7.55	10.23 [7.03 / 4.58 / 3.95]	8.44	7.55	10.23 [7.03 / 4.58 / 3.95]	8.44	7.55

Notes: (1) All equations include urban area and distance-to-central-city interval fixed effects. See Tables 2 & 3. (2) See Table A.1 for definitions of the different budget items analysed. (3) K-P statistic: Kleiberger-Paap Wald rk F-statistic; in brackets Stock-Yogo weak identification test critical values at 10%/15% and 20% maximal IV bias.

Again, to discard that these results are due to the use of a particular variable, we repeat the results using other proxies of the intensity of the housing boom: average annual growth rate of housing prices during the boom and average annual rate of housing construction. The results are very similar to those of Table 7: the interaction coefficient is very small and not statistically significant and the results regarding voter information and electoral competition remain. The results also remain when we use other variables (i.e., % of college educated or tenure in office) to run the horserace the fiscal myopia and the irrational expectations stories. Summing up, the results presented in this section suggest that the municipalities with less informed voters and more contested elections reacted to the windfall with larger spending increases and tax cuts. Municipalities expe-

riencing more financial trouble or in the midst of a more intense housing boom do not seem to have a lower propensity to save the windfall revenues during the boom.

4.4. The bust

In this section we present the results of the estimation of the effect of the construction revenue windfall obtained during the boom on the evolution of the different fiscal outcomes during the bust. We first describe the average results and then look again into the heterogeneous responses.

Average results. The methodology used to estimate the effect of boom windfalls on the reactions during the bust is the same than the one used for the boom. Also, being the treatment variable and the instrument the same in the two cases, we are going to use also the same 2SLS specification than before. Therefore, for reasons of space, we only present the average results for the detailed spending and revenue categories shown in the Table 4 above for the boom period. The results of the bust are presented in Table 8 below. Several results are worth highlighting. First, for each 100 euros of construction windfalls during the boom, spending is cut by 71 euros during the subsequent bust. Second, around 70% of this cut corresponds to capital spending (51 euros) and just 30% corresponds to current spending (20 euros). Recall that the increase in total spending during the boom was of a similar dimension (65 euros), but was allocated mainly to current rather than to capital spending (45 vs. 19 euros). Notice also that wage spending is not adjusted at all during the bust, while it absorbed a considerable proportion of the windfall during the boom (28 euros or around 40% of the spending increase). Thus, it would appear that increases in some spending categories are very tempting during boom periods and yet very difficult to reverse during busts. Third, the rest of the adjustment during the bust corresponds to a decrease in savings of around 16 euros and a tax increase of 14 euros. The savings coefficient is somewhat smaller than the one corresponding to the boom, and the one of taxes is larger than the one estimated for the boom period. This might be indicative of the pressure to adjust the budget felt by municipalities during the bust.

Table 8: *Average effect during the Bust.* 2SLS *results*.

	Spending					
	Total	*Capital*	*Current*	*Wage*	*Purchases*	*Transfers*
Construction rev. p.c (Δc^{boom})	-0.713 (-3.06)**	-0.511 (-2.68)***	-0.202 (-2.44)**	0.020 (0.33)	-0.129 (-2.73)***	-0.076 (-2.71)***

		Tax Revenues			*Grants*
	Savings	*Total*	*Property*	*Other*	
Construction rev. p.c (Δc^{boom})	-0.160 (-1.67)*	0.140 (1.89)*	0.100 (1.72)*	0.039 (0.32)	0.020 (0.21)

Notes: (1) The table reports 2SLS estimates of the effects of the increase in construction revenues p.c. during the boom (1995-2007) on several budget items during the bust (2007-2011). (2) The instrument used is the amount of vacant land p.c. in 1995; in the estimation we control for urban area and distance-to-central-city interval fixed effects. (3) See Tables 2 and 3.

Finally, note that intergovernmental grants play no role in the adjustment. There is therefore no evidence that governments that spend the windfall during the boom ended up with a bailout when these revenues vanished during the bust. This suggest that reason that governments over-spent during the bust was not that they though that someone would help them if these revenues end up disappearing later on.

Heterogeneous effects. In this section we study whether there are differences among municipalities in the speed and type of adjustment to the loss of construction revenues experienced during the bust. We inquire into whether municipalities with secular low levels of voter information and high levels of electoral competition also behaved differently during the bust. In Table 9 we present the results for the interactions with press circulation and vote margin. The results for the other proxies of fiscal myopia are very similar to these ones and are available upon request. The results reported in the table suggest that municipalities with higher press circulation and larger voter margins enact smaller spending cuts when the windfall disappears during the bust period. Note, however, that these municipalities actually enact larger tax increases and, as a result they end up suffering from lower deficits. Note also that (with the exception of tax revenues) the coefficients for spending and savings are much smaller than the ones corresponding to the boom period and that the standard errors are larger (compare with Table 5).

Table 9: *Fiscal myopia. Bust period*. 2SLS *results.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(a) *Spending p.c.* (Δe^{boom})			(b) *Savings p.c.* (Δs^{boom})			(c) *Tax revenues p.c.* (Δt^{boom})		
Construction revenues p.c (Δc^{boom})	-0.726 (-4.15)***	-0.713 (-3.04)***	-0.722 (-2.66)**	-0.160 (1.66)*	-0.170 (-1.73)*	-0.161 (1.59)	0.137 (1.89)*	0.145 (2.32)**	0.143 (2.18)**
× *Press circulation p.c.*	0.001 (1.18)	--.--	0.001 (1.23)	0.003 (1.41)	--.--	0.002 (1.34)	0.009 (2.15)**	--.--	0.009 (2.04)**
× *% Vote margin*	--.--	0.001 (1.11)	0.001 (1.04)	--.--	0.009 (0.93)	0.093 (1.23)	--.--	0.011 (1.30)	0.011 (1.28)
K-P statistic	9.56	9.11	7.30	9.556	9.11	7.30	9.556	9.11	7.30
	[7.03 / 4.58 / 3.95]			[7.03 / 4.58 / 3.95]			[7.03 / 4.58 / 3.95]		

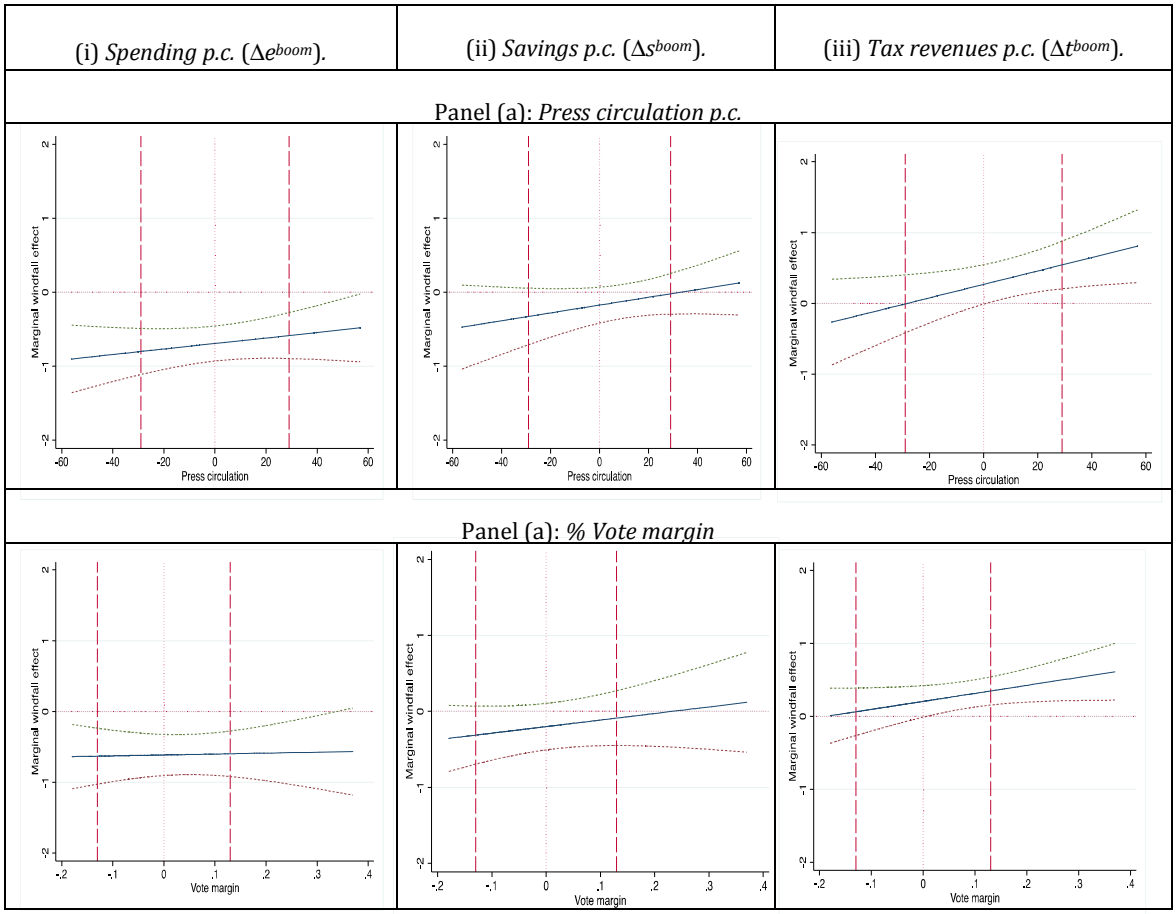
Notes: (1) All equations include urban area and distance-to-central-city interval fixed effects. See Tables 2 & 3. (2) See Table A.1 for definitions of the different budget items analysed. (3) K-P statistic: Kleiberger-Paap Wald rk F-statistic; in brackets Stock-Yogo weak identification test critical values at 10%,15% and 20% maximal IV bias.

Figure 6 displays the marginal effects corresponding to press circulation and vote margin for the three fiscal outcomes analysed. Note how spending cuts are smaller in the municipalities with lower levels of press circulation (at one standard deviation below the mean we can not discard that the value is one). In contrast, municipalities with high press circulation also enact much higher tax increases (at one standard deviation below the mean there are no tax increases while at one standard deviation above the mean we can reject the null that tax increases are zero). As a result the impact on savings also grows with press circulation. The point estimate is zero at one standard deviation above the mean while is a deficit of around -0.3 arises at one standard deviation be-

low the mean. In any case, we cannot reject that the marginal effects are zero at 5% level, irrespective of the level of press circulation. The effect is similar in the case of electoral competition. The main difference is that in this case the reaction of spending does not depend at all on the voter margin. The vote margin does matter however for the reaction of taxes. Municipalities with high vote margins are able to raise taxes much more and thanks to that they did not run a deficit. Again, the result on the deficit is a little fragile, since we are also not able to reject the null that the effect is also zero at one deviation below the mean.

The conclusion of this section is that the influence of voter information and electoral competition is different during booms than during busts. During booms, local governments in places with uninformed voters and contested elections end up spending too much and taxing too little and, as a result, do not save enough (or incur in deficits larger than what should be). During busts, these municipalities have problems in raising taxes and have to cut spending more than other municipalities, and end up generating deficits.

Figure 5: *Fiscal myopia. Bust period. Marginal effects.*



Notes: (1) Effect of an increase in construction revenues during the boom at different levels of Press circulation and % Vote margin. (2) Marginal effects computed using results from column (3) of Table A.6.

The asymmetries between boom and bust might be partly due to the fact that credit constraints –that were irrelevant during the boom- become extremely binding during the recession (see, e.g., Bentolila *et al*., 2016). This forced fast adjustments in local budg-

ets. The fact that the adjustment was complete in municipalities with informed voters and low competition –the ones that saved most during the boom- can be explained by the fact that they were not able to accumulate liquid assets during the boom. Instead of that they probably just reduced their debt stock during the boom; in normal times, this would have been sufficient to obtain the required credit during the bust, but in the absence of liquidity they might also have had to cut spending/raise taxes.

5. Conclusions

In this paper we have studied the effect of a large, temporary revenue windfall on local budgets, using as our case study the Spanish housing boom-bust of 1995-2011. As we have shown, Spanish local governments are overly reliant on taxes and other revenue sources associated with the construction sector. Revenues from these sources are, moreover, highly unstable, rising steeply during booms but virtually disappearing during busts. We have documented that, in addition to their temporary nature, these windfalls had a massive impact on local budgets both during the boom and the bust. Further, our results suggest that, on average, local governments saved only a very small proportion of these windfalls for leaner times, preferring to fund spending increases and to cut taxes, with a marked impact on current spending and, especially, wage spending. During the bust, when the windfall was converted into a shortfall, capital spending was cut abruptly while current spending proved resistant to cuts. Likewise, during the bust, deficits appeared and taxes were raised more than the corresponding cuts made during the boom.

We also document that local government behaviour during the boom differed greatly depending on the level of voter information and electoral competition. In municipalities with high press circulation and less competitive elections, the boom windfalls were largely saved, while in municipalities with low levels of voter information and contested elections, these extraordinary revenues were mostly spent and (to lesser extent) used to reduce taxes. These results remained unchanged after considering alternative stories, as liquidity constraints or irrational expectations. These characteristics also matter for the response during the bust: places with less informed voters had to apply stronger spending adjustments, and these places and also those with more competitive elections were unable to raise taxes during the bust, so they ended up generating some deficits. The fact that places with more informed voters and less competitive elections choose to adjust the budget through tax increases (and not by generating deficits) might be due to the general scarcity of credit that afflicted local governments during the Great Recession.

Given the findings, the question arises as to whether policy actions should be implemented to address this problem. Note, however, that Spanish local governments have been able to adjust fully to the impact of the construction-revenue crisis in a relatively short period. Yet, despite this adjustment, the excessive cyclical volatility of revenues and spending may constitute a real problem. For instance, abrupt cuts to infrastructure spending during a bust might be detrimental while an excessive amount of wage spending might also constitute a burden for the future. So, what solutions are available? First,

the problem derives from the excessive volatility of revenues, which implies that actions should be taken to ensure that revenues related to land use are not a source of windfall gains. One suggestion that has already been forwarded is the creation of a 'rainy-day' or stabilization fund, to be managed by the central government (see de la Fuente, 2014; Lago and Solé-Ollé, 2016). Second, it is of paramount importance that greater transparency in the management of these revenues (i.e., ensuring citizens are aware of how they are put to use), and of finances in general, is achieved. The disclosure of information by Spanish municipalities has improved since the financial crisis (thanks both to the increase in central government requirements and to a more aware citizenship), but more has to be done.

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Appendix. Additional tables and figures

Table A1: *Variable definitions and data sources*

	Definition	*Sources*
	(a) *Budget variables*	
Construction revenues	Betterment tax ('Impuesto sobre Incremento del Valor de los Terrenos de Naturaleza Urbana') + Construction tax ('Impuesto sobre Construcciones Instalaciones y Obras) + Developers fees ('Licencia de obras' y 'Cuotas de promotor') + Land sales ('Enajenación de terrenos)	Ministerio de Hacienda y Administraciones Públicas: "Estadísticas sobre liquidaciones de los presupuestos de las Entidades Locales", http://www.minhafp.gob.es/, several years
Spending	Total spending (current + capital)	
Current spending	Spending on Wages, Purchases and Current transfers	
Capital spending	Public investment + Capital transfers	
Tax revenues	Total revenues (Taxes + Fees + Current + Capital grants) – Construction revenues	
Ordinary revenues	Revenues from Taxes + Fees – Construction taxes and Fees	
Grants	Current + Capital grants	
Debt burden	Interest + Debt principal	
Net savings	Current revenues – Current spending – Debt principal	
Revenue persistence	Estimated coefficient of a regression between construction revenues per capita in 2004-07 and construction revenues per capita in 1999-2003	
	(b) *Housing variables*	
Vacant land p.c. (v^0)	Amount of land (hectares) qualified as developable in the Master Plan but not yet developed at the start of the boom (in 1995)	DCG, Dirección General del Catastro: "Estadísticas sobre ordenanzas fiscales del Impuesto sobre Bienes Inmuebles", http://www.catastro.meh.es /, several years
Building density	Amount of developed land per capita	INE, Instituto Nacional de Estadística: "Censo de Población y Viviendas", several years
Property value p.c.	Assessed value of all housed in the municipality	
Housing price growth	Average growth rate of housing prices (per m^2) in the urban area during 1995-2007	TINSA, Tasaciones Inmobiliarias https://www.tinsa.es
Housing construction rate	New housing units build in the municipality during the period 1995-2007 as a % of the housing stock in 1995	INE, Instituto Nacional de Estadística: "Censo de Población y Viviendas" http://www.ine.es/, several year
Past housing construction rate	Idem than housing construction rate but for the periods 1960-1986 and 1987-1995)	

Table A1 (continued)

	Definition	*Sources*
	(c) *Socio-economic variables*	
Press readership p.c.	Number of daily newspapers (excluding the sports ones) sold in the province/Population in the province	Spanish media association (AIMC, www.aimc.es)
# Civic associations	Number of associations in the province	Spanish Ministry of the Interior, Registro Nacional de Asociaciones, http://www.interior.gob.es/
% Vote margin	(vote share first party – vote share second party), using data from the 1979, 1983, 1987 and 1991 local elections.	Ministerio del Interior, *Base Histórica de Resultados Electorales*, http://www. elecciones.mir.es/MIR/jsp /resultados index.htm, several years
% Left vote	Vote share left wing parties, using data from the 1979, 1983, 1987 and 1991 local elections.	
Tenure in office	Maximum # of Terms of office held by the same party since 1979	
Income p.c.	Personal income / Resident population	La Caixa: 'Anuario Económico de España', several years
Population size	Resident population	INE, Instituto Nacional de Estadística: "Censo de Población y Viviendas 1961, 1971, 1981, 1991, 2001 and 2011" http://www.ine.es/
% Old	Resident population older than 65 / Population	
% College education	Resident population with a college degree / Population	
% Immigrants	Resident population born outside the EU/Population	
% Unemployed	Resident population unemployed/population	
%Renters	Rental housing units / housing units	
%Commuters	Resident population working outside the municipality / population	

Table A.2: *Determinants of Vacant land*

Dependent variable:	*Vacant land p.c.* (v^0)			
Explanatory variables:	(1)	(2)	(3)	(4)
	a) *Housing demand*			
Past housing growth (1987-1995)	10.211	11.045	4.032	3.045
	(5.92)***	(6.36)***	(0.85)	(0.72)
Past housing growth (1960-1986)	-2.281	-1.622	-0.431	-0.522
	(-1.94)***	(-1.31)	(-00.56)	(-0.47)
Population	-0.009	-0.009	-0.002	-0.002
	(-1.77)*	(-2.52)**	(-1.10)	(-1.12)
	b) *Preferences and fiscal stress*			
% Vote margin	--.--	0.089	--.--	0.043
		(0.840)		(0.540)
% Left vote	--.--	-0.770	--.--	-0.520
		(-0.842)		(-1.442)
Income p.c.	--.--	-0.009	--.--	-0.005
		(0.752)		(0.833)
% Tertiary education	--.--	-0.261	--.--	-0.202
		(-1.278)		(-0.442)
%Renters	--.--	0.029	--.--	0.021
		(0.198)		(0.110)
%Commuters	--.--	-0.006	--.--	-0.004
		(-0.617)		(-0.341)
Debt burden p.c.	--.--	0.125	--.--	0.132
		(1.331)		(0.340)
Spending p.c.	--.--	0.087	--.--	0.101
		(0.882)		(0.103)
Property value p.c.	--.--	0.217	--.--	0.245
		(0.954)		(0.420)
R^2 (adj.)	0.256	0.251	0.356	0.351
F-stat (*a*)	23.94	20.99	3.21	1.87
	(0.000)	(0.000)	(0.122)	(0.130)
F-stat (*b*)	--.--	0.72	--.--	0.38
		(0.587)		(0.687)
F-stat (f_j & f_k)	--.--	--.--	35.22	33.71
			(0.000)	(0.000)
Urban area fixed effects (f_j)	NO	YES	NO	YES
Distance-to-central city fixed effects (f_k)	NO	YES	NO	YES

Notes: (1) Dependent variable is Vacant land per capita (in 1995); (2) Sample: municipalities larger than 1,000 inhabitants and with access to the main road network in larger Spanish urban areas (N=495); (2) t-statistic in parenthesis; ***. *** & *= statistically significant at the 1%, 5% and 10% levels; standard errors clustered by province; (2) *F-stat* (*a*), *F-stat* (*b*) & *F-stat* (f_j & f_k) are the F-statistic used for the test of joint significance of *Housing demand* variables, the *Preferences* and *Fiscal stress* variables, and the urban area and distance-to-central-city interval fixed effects, respectively; values in parenthesis are standard errors. (3) Dependent variable is *Vacant land p.c.*, measured as the amount zoned for development in 1995 but not yet developed, divided by resident population in 1995. See Table A.1 for definitions and sources of the variables.

Table A.3: *Effect of Vacant land on alternative channels*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Δ *over the boom period in:*					
	Construction revenues	*Ordinary revenues*	*Population growth*	*Income per capita*	*Building density*	*% Immi-grants*	*% Young*
Vacant land p.c. (v^0)	0.234 (4.21)***	0.042 (2.23)**	0.004 (1.77)*	0.001 (0.34)	-0.021 (-0.23)	-0.001 (0.11)	0.002 (0.121)
R^2 (adj.)	0.406	0.302	0.256	0.220	0.110	0.162	0.154

Notes: (1) Effects on changes in different outcomes from the period prior to the boom (1993-95) to the peak of the boom (2004-2007); (2) See Table A.1 for definitions of the variables; (3) All equations include urban area and distance-to-central-city interval fixed effects; (4) Sample: municipalities larger than 1,000 inhabitants and with access to the main road network in larger Spanish urban areas (N=495); (5) t-statistic in parenthesis; ***. *** & *= statistically significant at the 1%, 5% and 10% levels; standard errors clustered by province.

Table A.4: *Effect of Vacant land boom and pre-boom budget changes*

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ *over the boom period in:*			Δ *over the pre-boom period in:*		
	Spending p.c. (Δe^{boom})	*Savings p.c.* (Δs^{boom})	*Tax revenues p.c.* (Δt^{boom})	*Spending p.c.* (Δe^{0})	*Savings p.c.* (Δs^{0})	*Tax revenues p.c.* (Δt^{0})
Vacant land p.c. (v^0)	0.156 (2.77)***	0.059 (1.76)*	-0.027 (-1.95)*	0.004 (0.21)	0.002 (0.33)	0.001 (0.57)
R^2 (adj.)	0.362	0.281	0.299	0.112	0.098	0.075

Notes: (1) Effects on changes in different budget variables during the boom (i.e., from the period 1993-1995 to the period 2004-2007) and during the period previous to the boom (i.e., from 1993-95 to 1996-97); (2) All equations include urban area and distance-to-central-city interval fixed effects; (3) Sample: municipalities larger than 1,000 inhabitants and with access to the main road network in larger Spanish urban areas (N=495); (4) t-statistic in parenthesis; ***. *** & *= statistically significant at the 1%, 5% and 10% levels; standard errors clustered by province.

Table A.5: *Average effect on main budget items*. OLS *results.*

	(1)	(2)	(3)	(4)	(5)
	(a) *Spending p.c.* (Δe^{boom})				
Construction revenues p.c. (Δc^{boom})	1.061 (11.43)***	0.945 (9.06)***	0.947 (8.08)***	1.082 (9.54)***	0.981 (8.44)***
R^2	0.433	0.585	0.595	0.589	0.619
	(b) *Savings p.c.* (Δs^{boom})				
Construction revenues p.c. (Δc^{boom})	-0.033 (-0.044)	0.051 (0.170)	0.061 (0.151)	-0.056 (-0.618)	0.044 (0.363)
R^2	0.107	0.371	0.393	0.401	0.428
	(c) *Tax revenues p.c.* (Δt^{boom})				
Construction revenues p.c. (Δc^{boom})	0.011 (0.211)	-0.012 (-0.343)	-0.015 (-0.763)	-0.015 (-0.191)	-0.020 (-0.77)
R^2	0.047	0.293	0.331	0.342	0.354
Urban area fixed effects	NO	YES	YES	YES	YES
Distance-to-central-city fixed effects	NO	YES	YES	YES	YES
Housing demand shocks	NO	NO	YES	NO	NO
Preferences and fiscal stress	NO	NO	NO	YES	NO
Alternative channels	NO	NO	NO	NO	YES

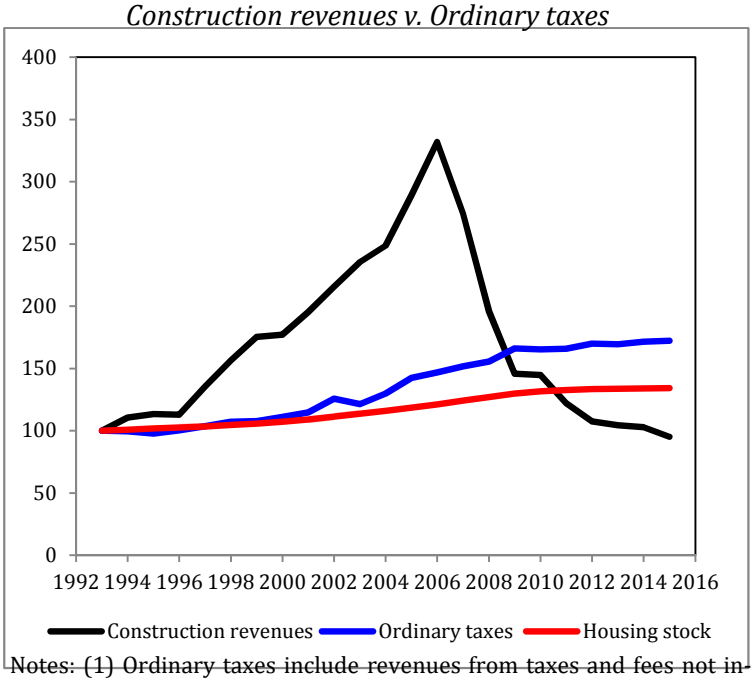
Notes: See Table 2.

Table A.6: *Fiscal myopia. Additional measures. Boom period*. 2SLS *results.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	(a) *Spending p.c.* (Δe^{boom})			(b) *Savings p.c.* (Δs^{boom})			(c) *Tax revenues p.c.* (Δt^{boom})		
Construction revenues p.c (Δc^{boom})	0.638 (2.82)***	0.634 (2.77)***	0.634 (2.77)***	0.189 (1.42)	0.225 (2.01)**	0.236 (2.01)**	-0.100 (-1.95)*	-0.116 (-2.02)**	-0.123 (-2.23)**
× *% College education*	-0.017 (-2.29)**	--.--	--.--	0.021 (2.74)***	--.--	--.--	0.003 (0.67)	--.--	--.--
× *Tenure in office*	--.--	-0.010 (-1.62)	--.--	--.--	0.015 (1.53)	--.--	--.--	0.001 (0.32)	--.--
× *# Civic associations*	--.--	--.--	0.002 (0.08)	--.--	--.--	0.001 (0.13)	--.--	--.--	0.000 (0.28)
K-P statistic	9.91	9.44	8.67	9.91	9.44	8.67	9.91	9.44	8.67
	[7.03 / 4.58 / 3.95]			[7.03 / 4.58 / 3.95]			[7.03 / 4.58 / 3.95]		

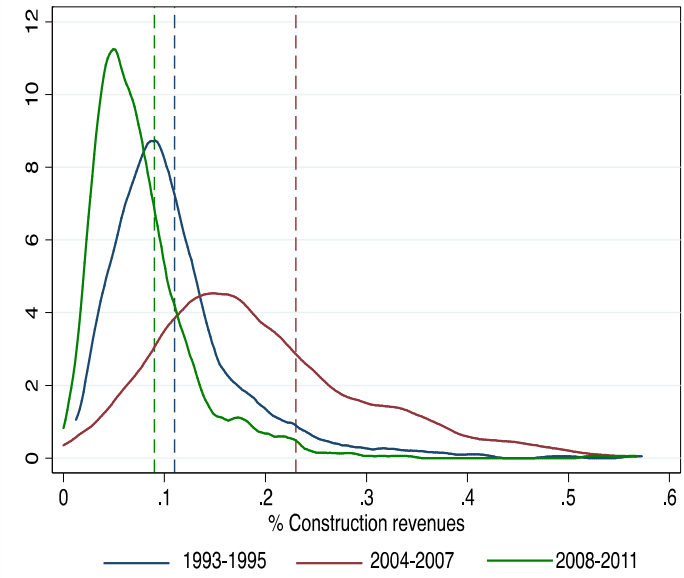
Notes: (1) All equations include urban area and distance-to-central-city interval fixed effects. See Tables 2 & 3. (2) See Table A.1 for definitions of the different budget items analysed. (3) K-P statistic: Kleiberger-Paap Wald rk F-statistic; in brackets Stock-Yogo weak identification test critical values at 10%,15% and 20% maximal IV bias.

Figure A.1:
Construction revenues v. Ordinary taxes



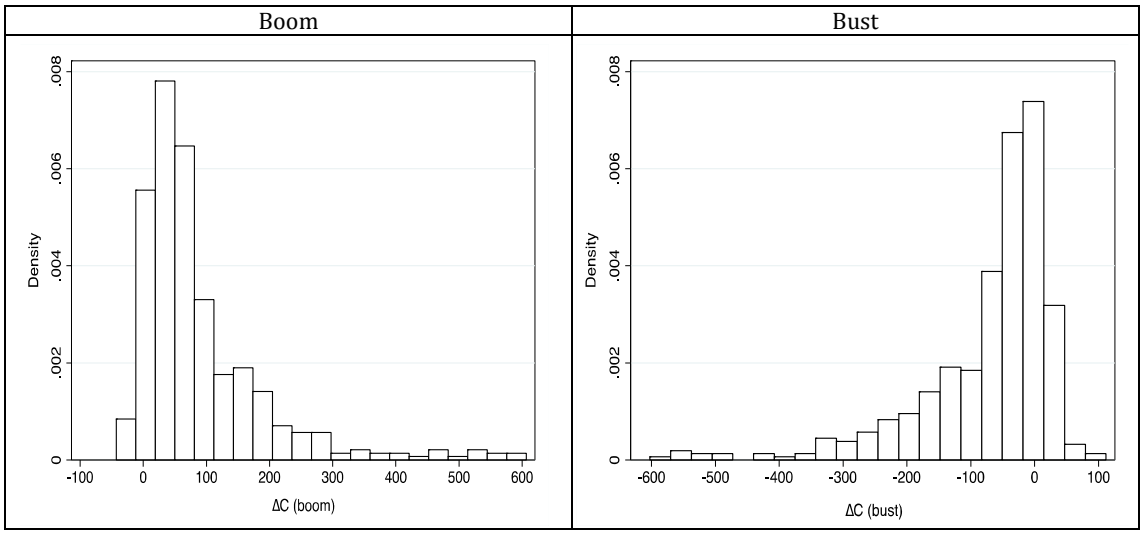
Notes: (1) Ordinary taxes include revenues from taxes and fees not included in Construction revenues: (2) Revenues from ordinary taxes computed with constant nominal tax rates and in real terms; (3) See Figure 1.

Figure A.2:
Share of construction revenues in the budget in %



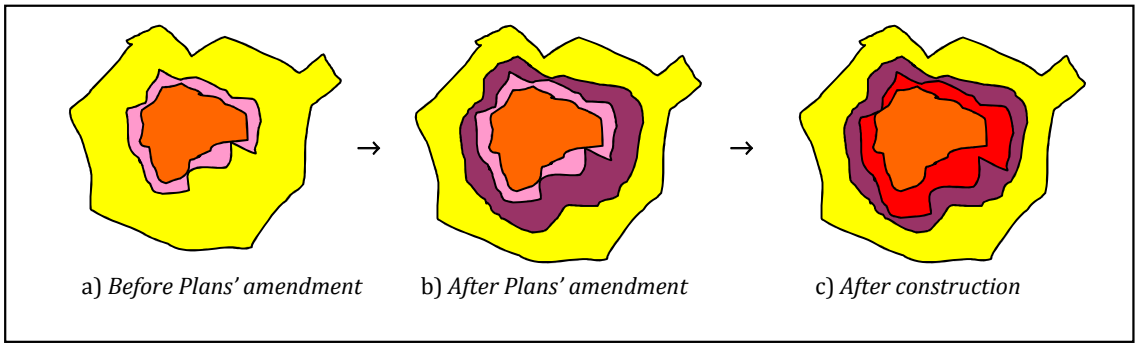
Notes: (1) Share of construction revenues measured over non-financial revenues; (2) Soid line is a Kernel epachenikov fit; dashed line is the mean of the respective period; (3) Outlay data; (4) See Table A.1 for definitions and data sources.
Source: Ministerio de Economía y Hacienda (www.minhac.es), "Base de datos de liquidaciones de los presupuestos de las Entidades Locales".

Figure A.3:
Growth of construction revenues. Boom & Bust.



Notes: Growth in construction revenues per capita. Boom: revenues in period 2004-2007 minus revenues in period 1993-1995; Bust: revenues in period 2008-11 minus revenues in period 2004-2007.

Figure A.4:
Land use categories in Spain

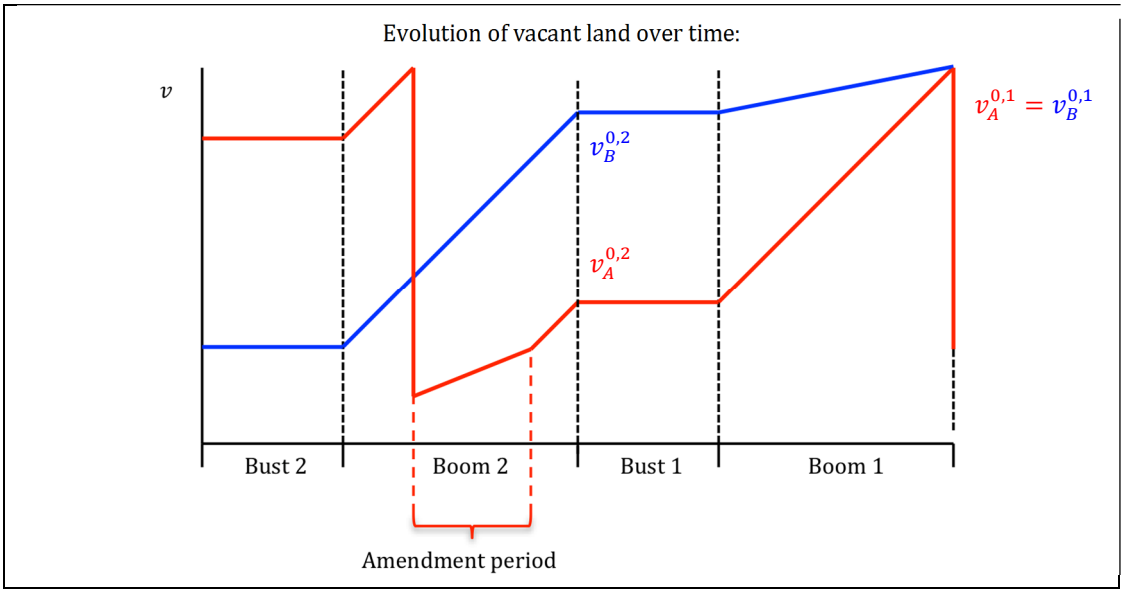


Notes: (1) *Yellow*: 'Non-developable' land (i.e., rural uses or protected); *Orange*: 'Developed' land before the amendment of the Master Plan (and before the construction that follows the implementation of the new plan); *Pink*: 'Developable' land before the amendment of the Master Plan (and also after); *Purple:* Developable land after the amendment of the plan but not before (i.e., amount of land converted from rural to urban uses between as a result of the amendment): Red: 'Developed' land with the new plan (i.e., construction that takes places once the new plan has been implemented). (2) The amount of vacant land at different moments is denoted with different colours: in graph (a) vacant land is denoted with *Pink*, in Panel (b) is *Pink* + *Purple*, and in Panel (c) is only *Purple*.

Figure A.5:
Example of land delimitation in a Master Plan

Notes: (1) Master Land Use Plan (POUM) of Granollers (60,000 residents, 15 miles from Barcelona): *Orange* and *Blue*: Developed land (Residential and Industrial, respectively), *Pink* and *Purple* (Developable, Residential and Industrial, respectively), *Yellow*: Non developable; *White*: out of the city's jurisdiction (but regulated by neighbouring cities). Black line: jurisdictional border. Border between *Yellow* and any other colour is the Development border.

Figure A.6: *Instrument's logic*



Notes: (1) The figure depicts the evolution of vacant land (v) of two hypothetical municipalities (A and B) across two housing cycles (1 and 2), each with a Boom and a Bust period; the sub-index A or B indicates municipality, the super index 1 and 2 indicates housing cycle, and the super index 0 indicates that vacant land is measured at the start of the housing boom. (2) The story begins with the implementation of a new Master Plan that supplies the same amount of vacant land for the two municipalities ($v_A^{0,1} = v_B^{0,1}$); during Boom 1, however, the rate of housing construction in municipality B is (unexpectedly) lower than in A, meaning that vacant land depleted at a lower rate too; during Bust 1 construction stops and vacant land remains constant; during Boom 2 the housing construction rate is the same in the two municipalities until municipality B begins the process of amending the Master Plan, which slows housing construction.