CYCLICAL TAX ENFORCEMENT

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We wonder whether tax enforcement varies along the economic cycle and aim at answering that question from a positive perspective by means of survey data for the Spanish case (1994–2015). According to a fiscal capacity argument, tax enforcement might be stronger in times of crisis (counter-cyclical), but if the tax administration prioritizes taxpayers' welfare over public revenue, enforcement might be slacker (procyclical). We find tax enforcement is not immune to the state of the economy. In particular, it presents a prevailing counter-cyclical trend, but in presence of a severe economic crisis it turns out to be procyclical. (JEL D78, H12, H26, H83)

I. INTRODUCTION

The economic downturn associated with the global financial crisis caused a significant fall in tax revenues in many countries. In advanced economies, fiscal deficit increased by 2.5% of gross domestic product (GDP) in 2008 and by about 5% in 2009, provoking serious concern about the need to substantially lower their deficits to be able to control their debt-to-GDP ratios (IMF 2010). In response, between 2008 and 2013, many countries augmented the value-added tax (VAT) rates (e.g., 19 out of the 28 EU countries raised the general rate, with an average increase of 3 percentage points) and even some increased top marginal personal income tax rates (e.g., 13 out of the 28 EU, with an average increase of about 6 percentage points). But given the multidimensional nature of tax systems, enforcement is another parameter in the hands of the public sector—through its tax administration—to collect more revenues (Slemrod and Gillitzer 2014). In other words, if tax administrators act as revenue maximizers, they should increase enforcement efforts; that is, they should have played a counter-cyclical role.[1]

However, in a severe economic recession and with financial credit severely constrained, taxpayers' aggregate welfare likely will be declining. If tax administrations prioritize taxpayers' welfare over revenue collection, they

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1. Analyzing the finances of the southern European countries, *The Economist* indicated "Now that these countries are trying to get their finances in order, bringing down rates of tax evasion is a high priority" (August 12, 2010). Between 2010 and 2012, the annual Eurostat publication *Taxation Trends in the European Union* indicates that southern European countries (e.g., Greece, Italy, Portugal, Spain) but also other European governments (e.g., Belgium, Bulgaria, Norway) introduced changes in the administration of taxes in order to fight against tax evasion and raise revenues.

ABBREVIATIONS

AC: Autonomous Communities
GDP: Gross Domestic Product
FIS: Fully Interacted Specification
GVA: Gross Value Added
INE: National Institute of Statistics
OLS: Ordinary Least Squares
UR: Unemployment Risk
VAT: Value-Added Tax

should lessen enforcement and play a procyclical role. In other words, a procyclical tax agency will reduce the level of enforcement during a time when credit-constrained taxpayers may be tempted to use tax evasion as an alternative source of finance, as they may perceive the risks of tax evasion (penalties) much smaller than the potential gains of avoiding bankruptcy (see e.g., Brondolo 2009). Regarding taxpayers' behavior, in a recent paper, Alm, Liu, and Zhang (2019) analyze whether the financial constraints faced by a firm increase the extent of tax evasion and, working with a survey of firms from 27 transitional countries, find evidence that more financially constrained firms are more likely to be involved in tax evasion activities. Similarly, Richardson, Taylor, and Lanis (2015), based on a sample of 203 publicly-listed Australian firms covering the 2006–2010 period, show that firms' financial distress is significantly and positively associated with tax avoidance across several proxy measures of tax avoidance and financial distress.

This idea was first analyzed by Andreoni (1992) for individuals in a theoretical model in which the tax administration could act as a last-resort lender ("the tax agency as a loan shark"). When taxpayers face binding financial constraints, they may consider evading taxes to smooth consumption along time. They would do so even if evasion were not a fair gamble, that is, the expected return from evasion was negative. Only severely financial constrained taxpayers would act like this, something very relevant at the aggregate level in times of crisis. The role of tax evasion as a substitute for loans was also analyzed by Fishlow and Friedman (1994), in a paper where they focus on the public resort of tax evasion in developing countries. They use a theoretical model of intertemporal consumption that characterizes the behavior of taxpayers in a financially constrained economy and show that negative shocks over current income raise evasion. Agents use evasion to substitute for loans in economies where credit is not available.

The aim of this paper is to analyze tax enforcement over the economic cycle. We do so by means of ordered response models applied to Spanish data extracted from repeated surveys and other sources. In particular, we employ a measure of tax enforcement as it is perceived by individuals and try to identify what part of its variation along the economic cycle is due to the annual variation in the effort of the administration. This entails isolating potential unobserved confounders that could vary over the cycle. We identify two dimensions of the perceived enforcement by individuals that can act in this way. Namely, these are individual risk perception and normative beliefs. We propose an identification strategy to deal with these two confounders. According to our empirical results, perceived tax enforcement presents a prevailing counter-cyclical trend, but becomes procyclical in presence of severe economic downturns. This is the main contribution of this paper.

The rest of the paper is organized as follows: Section II sets the main hypotheses concerning the impact of the cycle on tax enforcement; Section III presents the empirical strategy we employ to test those hypotheses; Section IV presents the results of the empirical analysis, and Section V concludes. An online appendix reports the results of robustness analyses.

II. TAX ENFORCEMENT ALONG THE ECONOMIC CYCLE

Might tax enforcement be influenced by economic cycles and particularly by a severe economic downturn? This is the main research question we pose. To counteract the negative macroeconomic effects of a downturn, tax policy should be counter-cyclical. Nonetheless, tax revenues also vary endogenously with changes due to factors not under the control of policymakers, such as changes in income distribution or changes in agents' behavior over the economic cycle (Vegh and Vuletin 2015).

Likewise, we also know the limits of fiscal policy when the public debt-to-GDP ratio is high (Ghosh et al. 2013), while some authors simply cast doubts on the effectiveness of that policy (Ramey and Zuvairy 2018), or suggest their impact—through the estimated value of the fiscal multipliers—is contingent on the state of the economy (Auerbach and Gorodnichenko 2012). Being aware of those potential limitations, not all fiscal instruments might be equally effective at stabilizing the economy (Wren-Lewis 2010). Under this context, tax enforcement might be a peculiar instrument, which to our knowledge has never been formally considered as a potential tool for stabilization purposes.

The most common approach sees tax administration as a public agency whose aim is maximizing tax revenues given a certain budget (e.g., Shaw, Slemrod, and Whiting 2009; Slemrod and Yitzhaki 1987, 2002). But, as we said before, tax enforcement policies carried out by the tax

administration might be linked to the economic cycle. Furthermore, recent empirical studies suggest that political as well as budgetary variables play a role in determining tax administration's enforcement efforts (see, e.g., Baretti, Huber, and Lichtblau 2002; Bönke, Jochimsen, and Schröder 2017; Esteller-Moré 2005, 2011; Young, Reksulak, and Shughart II 2001).

A strand of literature underlines the institutional capacity of countries to raise revenues, which includes an administration for the collection of taxes and the monitoring of compliance (Besley and Persson 2009). From a dynamic perspective, tax administration should then play a counter-cyclical role, that is, under a negative external shock (e.g., an economic downturn), tax enforcement should be reinforced.[2] This idea seems to be confirmed in a related empirical study by Chen (2017) for China: a revenue loss (in that case, the abolition of a local tax) was largely offset by tougher tax enforcement. This evidence confirms enforcement may be used by tax authorities as an instrument to counteract revenue losses due to a negative shock. However, Chen considers an isolated shock, and the scarce empirical literature does not address the potential existence of a fiscal capacity argument in the setting of enforcement along the economic cycle. The context caused by the economic downturn associated with the global financial crisis, with individuals and companies facing very important financial constraints, offers the opportunity to analyze the role of tax administration over the economic cycle.[3]

Brondolo (2009) argues tax enforcement has attractive features at stabilizing the economy, especially where formal automatic stabilizers are weak. In particular, he cites two peculiar features: (1) it is relative quick acting through it, as no legislative action is necessary and (2) it might be targeted to those more in need, if changes in the level of tax evasion indicates changing liquidity constraints among taxpayers. In other words, tax administration could be an expeditious tool to deal with asymmetric shocks within a country. We suspect that the Spanish tax administration[4] might have employed tax enforcement to react to regional sources of heterogeneity in the economic cycle.

This author also stresses negative features: it lacks transparency, it might be unfair and distortionary, and—in a similar vein as a "tax amnesty"[5]—it might make lose credibility to the administration. That is why, Brondolo proposes a detailed practical strategy for tax administrations to contain a potential rise in noncompliance during an economic crisis.[6]

All in all, in front of an economic downturn the tax administration can react as follows:

(i) *Strengthening tax enforcement*, or tax capacity argument (Besley and Persson 2009). This would imply tax enforcement is counter-cyclical and would be raised in order to overcome the financial constraints of public finances in times of crisis.

(ii) *Weakening tax enforcement*. If the tax administration prioritizes taxpayers' welfare over the revenue, enforcement would be procyclical as to smooth taxpayers' financial shocks; or

(iii) *Tax enforcement is independent of the state of the economy*. This is the implicit assumption made by the economic literature.

In this paper, we do not pretend to normatively assess which one of the three options is the optimal one, but to infer whether tax enforcement is

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2. Kuehn (2014) provides a model for the informal economy in high-income countries and runs an interesting policy experiment with Spain and other Southern European countries: raising the enforcement standards to the Finnish level (the best governance quality observed) would reduce the informal economy in Spain close to 8 percentage points and increase tax revenues by 7%. In order to provide a notion for the benefits of the policy, Kuehn assesses that the increase in tax collection costs that would leave Spain indifferent between adopting or not adopting the policy in terms of tax revenue is 779%. Thus, the potential benefits of increasing enforcement in Spain would be large.

3. Almost 40% of the 49 revenue bodies analyzed by the OECD, reported an increase in the aggregate value of their debt inventory over the years 2007 to 2009 exceeding 20%, and for 13 revenue bodies, this increase exceeded 40% (OECD 2011). These are unpaid debts, that is, tax liabilities recognized by taxpayers but not paid. After 2009 peak, average tax debt levels decreased, but in 2011 it remained in excess of 20% of the average reported for 2007. The incidence varied enormously across countries and in eight OECD countries the level remained in 2011 over 50% their level in 2007 (OECD 2013).

4. In Spain, tax administration tasks are shared by the national tax agency (AEAT) and the tax agency of each Spanish region (the so-called autonomous communities—AC henceforth). The AEAT is responsible for the effective application of the main national taxes, such as personal income tax, value added tax and corporate income tax. Regional tax agencies are responsible for the enforcement of annual wealth tax, inheritance and gift tax and tax on wealth transfers, in addition to other minor regional taxes. Therefore, the national agency plays a much more significant role than regional agencies.

5. See, though, Andreoni (1991) where he develops a theoretical framework where a "tax amnesty" may increase both efficiency and equity of the tax system.

6. Pappa, Sajedi, and Vella (2015) analyze how fiscal consolidation is affected by the extent of evasion and corruption. That is, they relate fiscal policy to compliance, but take this latter element as given.

influenced by economic cycles. Before moving to the next section, where we will carefully explain our identification procedure, note that the cyclical characterization of enforcement might also depend on how severe the economic crisis is. That is, the relationship between economic shock and enforcement could be nonlinear. We will also take this into account in our empirical framework.

III. EMPIRICAL ANALYSIS

The conceptual framework just described presents interesting and novel hypotheses about the evolution of tax enforcement along the economic cycle that require empirical testing. Next, we present the employed methodology to test this framework, discuss our identification strategy, and finally present and comment on the main results.

A. The Empirical Framework

In order to test the hypotheses raised about the level of tax enforcement along the economic cycle, we employ enforcement as it is perceived by individuals in Spain.[7] This is our endogenous variable, which is extracted from the repeated waves of the survey "Public opinion and fiscal policy," conducted annually (1994–2015) and released by the Spanish Centre of Sociological Research (*Centro de Investigaciones Sociológicas* in Spanish, CIS henceforth). This repeated cross-section survey reports information on subjective perceptions of the fiscal policy, public provided goods and services, and other aspects of the tax system in Spain.

The relevant question used to define the endogenous variable is the following: "Do you think the tax administration is currently taking many/quite a few/a few/very few steps in its efforts to fight against tax evasion?"[8];

this question has remained unchanged over the 1994–2015 period. For any respondent i, in AC j, in survey year t, we code the answer to this question into the variable p_{ijt}, which is scaled from very low (1) to very high (4) according to the answer. Thus, by defining p_{ijt} as an ordinal dependent variable measuring the unobservable actual perceived tax enforcement of individuals, p^*_{ijt}, we can design an ordered response model (see, e.g., Wooldridge 2002, 504–9)[9]:

$$p^*_{ijt} = \beta EC_{jt} + Y_{ijt}\psi + X_{jt}\alpha + \vartheta_j + \tau_t + \epsilon_{ijt}$$

$$(1) \quad p_{ijt} = \begin{cases} 1 & \text{if } p^*_{ijt} \leq \omega_1 \\ 2 & \text{if } \omega_1 < p^*_{ijt} \leq \omega_2 \\ 3 & \text{if } \omega_2 < p^*_{ijt} \leq \omega_3 \\ 4 & \text{if } p^*_{ijt} > \omega_3 \end{cases}$$

where EC_{jt} is a proxy of the AC-specific economic cycle at time t. In particular, we alternatively employ the GDP of the AC j during year t (GDP_{jt}) or the level of unemployment in AC j during year t ($Unemployment_{jt}$). Thus, a low value of GDP_{jt} with respect to its potential long-run level—implicitly accounted for through AC fixed effects—implies an economic downturn. The symmetric reasoning holds when $Unemployment_{jt}$ is employed as a proxy for the economic cycle. Therefore, we identify a counter-cyclical perceived tax enforcement with a negative (positive) sign when EC_{jt} is proxied by GDP_{jt} ($Unemployment_{jt}$).

Since socioeconomic information about the respondents is also included in the survey, we collect this information in vector Y_{ijt} to control for personal characteristics, while X_{jt} is a vector collecting other AC-specific relevant variables. We discuss in detail all these variables

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7. What matters about the decision to evade is the perception of taxpayers (Slemrod 2019). For instance, Blank and Levin (2010) show that the U.S. Department of Justice Tax Division issues a disproportionately large number of tax enforcement press releases during the weeks immediately prior to Tax Day (when income tax returns are due) compared to the rest of the year, with the aim to influence individual taxpayers' perceptions and knowledge of the audit probability. Hence, this perception might be directly affected by the actions of the tax administration. In any case, there is vast evidence that individuals tend to overestimate the probability of their being audited even when fully informed about actual policy (see e.g., Kahneman and Tversky 1979). We will explain in the next section how we tackle this issue.

8. The original question in Spanish is "¿Cree Ud. que, en la actualidad. la Administración hace muchos, bastantes,

pocos o muy pocos esfuerzos para luchar contra el fraude fiscal?" (see e.g., question n. 21 of the survey n. 2,994 released in 2013, as the numbering of the questions might change from year to year).

9. Since the dependent variable is defined as an ordinal discrete ranking, employing an ordered response model is the most appropriate estimation strategy. Indeed, as Greene (2002) states "although the outcome is discrete, the multinomial logit or probit model would fail to account for the ordinal nature of the dependent variable. Ordinary regression analysis would err in the opposite direction, however. Take the outcome of an opinion survey. If the responses are coded 0, 1, 2, 3, or 4, then linear regression would treat the difference between a 4 and a 3 the same as that between a 3 and a 2, whereas in fact they are only a ranking." (see e.g., Greene 2002, 736). However, as a robustness check we also replicate the analysis by estimating an OLS model (see the online Appendix S1).

in Section III.B. Finally, we account for fixed effects (ϑ_j), time effects (τ_t) and ϵ_{ijt} is the error term. We estimate the coefficients as well as the cut-points in Equation (1) through an ordered probit model[10] by means of maximum likelihood technique.

By estimating (1), we can evaluate the pooled effect of the economic cycle on tax enforcement. This effect could vary depending on the severity of the economic shocks. In order to appreciate this potential change in the response of tax enforcement, we employ a linear spline approach (see e.g., Poirier and Garber 1974; Gould 1993; or Johnston and DiNardo 1997) by specifying the relationship between p^*_{ijt} and EC_{jt} as a piecewise seamless compound linear function. In other words, the relationship between p^*_{ijt} and EC_{jt} is estimated as a function composed of linear segments that meet at the knots. The following expression describes such specification:

$$p^*_{ijt} = f(EC_{jt}) + Y_{ijt}\psi + X_{jt}\alpha + \vartheta_j + \tau_t + \epsilon_{ijt}$$

$$f(EC_{jt}) = \begin{cases} \beta_1 EC_{jt} + a_1 & \text{if } EC_{jt} \leq knot_1 \\ \beta_2 EC_{jt} + a_2 & \text{if } knot_1 < EC_{jt} \leq knot_2 \\ \beta_3 EC_{jt} + a_3 & \text{if } EC_{jt} > knot_2 \end{cases}$$

$$(2) \quad p_{ijt} = \begin{cases} 1 & \text{if } p^*_{ijt} \leq \omega_1 \\ 2 & \text{if } \omega_1 < p^*_{ijt} \leq \omega_2 \\ 3 & \text{if } \omega_2 < p^*_{ijt} \leq \omega_3 \\ 4 & \text{if } p^*_{ijt} > \omega_3 \end{cases}.$$

The knots are alternatively equally spaced over the range of EC_{jt} or are placed at convenient percentiles of EC_{jt} in order to identify severe economic downturns by considering extreme values of EC_{jt}. Specifically, we set knot1 and knot2 at the first and the fifth percentiles of GDP_{jt} or at the 95th and 99th percentiles of $Unemployment_{jt}$. Alternatively, we also employ another standard approach to identify nonlinearity that consists of including quadratic and cubic terms of EC_{jt} in the regression model. This methodology is represented by:

$$p^*_{ijt} = \beta_1 EC_{jt} + \beta_2 (EC_{jt})^2 + \beta_3 (EC_{jt})^3$$
$$+ Y_{ijt}\psi + X_{jt}\alpha + \vartheta_j + \tau_t + \epsilon_{ijt}$$

$$(3) \quad p_{ijt} = \begin{cases} 1 & \text{if } p^*_{ijt} \leq \omega_1 \\ 2 & \text{if } \omega_1 < p^*_{ijt} \leq \omega_2 \\ 3 & \text{if } \omega_2 < p^*_{ijt} \leq \omega_3 \\ 4 & \text{if } p^*_{ijt} > \omega_3 \end{cases}.$$

Since nonlinear and linear terms are highly correlated and there is the risk of getting inflated standard errors, we orthogonalize the EC_{jt} polynomial variables (Sribney 1995).

In the next section, we discuss our identification strategy.

B. Identification Strategy

Figure 1 shows the answers given by citizens to the question employed to define our endogenous variable. One can observe how this variable falls since 2009, that is, at the start of the financial crisis with a lag and, then, goes up again moderately from the beginning of the economic recovery. Thus, perceived enforcement shows a cyclical pattern, in particular as a consequence of the Great Recession.

Since we aim at estimating the potential tax enforcement response to asymmetric shocks at the regional level, we plot in Figure 2 each AC-specific economic cycle[11] vis-à-vis the average evolution of our endogenous variable; we then show the correlation coefficient between the two series. These trends are obtained without controlling for any potential confounder and thus simple correlations cannot uncover a causal effect. Nevertheless, we can observe variation across regions. In particular, in half of them there is a prevailing procyclical trend, while in the rest the trend is counter-cyclical. Given this first graphical evidence, we aim at identifying the causal impact of the cycle on enforcement in a robust way as we explain next.

Our endogenous variable is not a direct description of the real efforts carried out by the tax administration.[12] Part of its variation along

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10. The difference between an ordered probit and an ordered logit model regards the distribution of ϵ_{ijt}. As main strategy, by employing an ordered probit model, we are assuming a normal distribution of the error term. We also replicate the analysis assuming a logistic distribution, that is, estimating an ordered logit model (see the Appendix S1).

11. The AC-specific trend in the economic cycle is measured as the residual part of the variation of the regional GDP measured in logs which is not explained by the variation in logs of the national GDP and an AC-specific constant.

12. There is no data on the number of audits performed by tax authorities at regional level. We have data on the total number of employees of the tax administration in both AC-specific tax agencies and regional offices of the national tax authority, but we cannot disaggregate this data by function. Thus, this data does not seem to be a good proxy for tax enforcement but rather a measure of the size of each tax agency in any AC and year. Therefore, we employ this data to

FIGURE 1

Average p_{ijt} Variability along Time by AC.
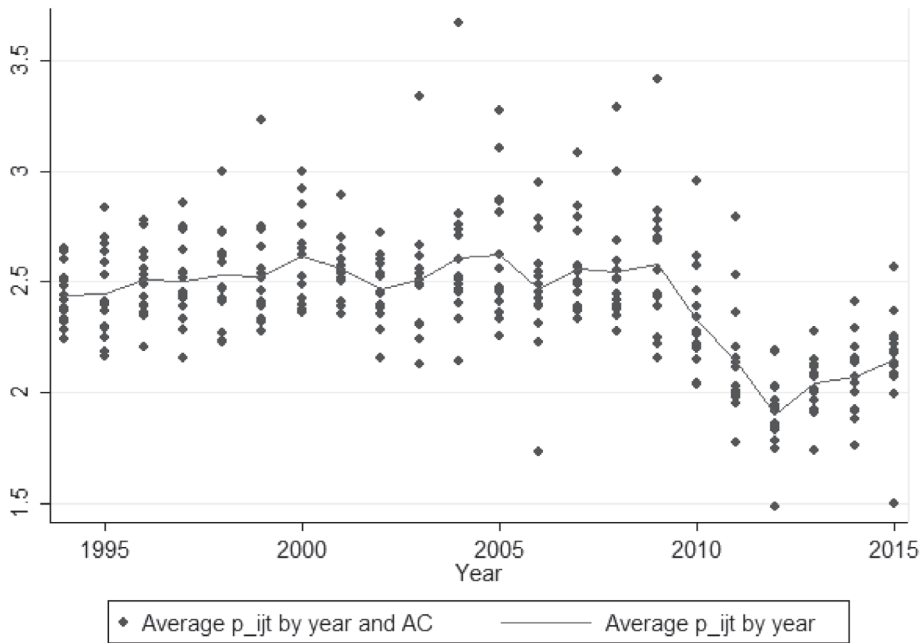
Note: y-axis represents the average score of p_{ijt}

time can certainly be explained by how the actual policy implemented by the administration varies year-to-year. However, given the survey nature of the variable, it might also vary along time due to the variation of individual risk perception even if efforts carried out by the tax administration do not change (see fn. 7); the response could also be normative, that is, what level of enforcement the interviewed thinks should hold at that particular time. These last two dimensions are the individual component of p^*_{ijt}; in the regression, we will include individual variables to control for those factors.

Nonetheless, both the actual policy dimension and the individual one might be subject to different types of fluctuations along the economic cycle. Indeed, both factors can be broken down into a structural component, a common national cyclical component and an AC-specific cyclical

define a variable controlling for the tax enforcement capacity at the regional level (see Section III.C for more details). Given this limitation, we think that individual perceptions of tax enforcement policies, once filtered by potential confounders (i.e., normative beliefs and any particular bias due to risk aversion) play the right role as endogenous variable.

one. Hence, since we want to identify the impact of the latter on the actual policy, our strategy entails first controlling for the structural and common cyclical components of both dimensions of p^*_{ijt}, and second refining β in order to identify the AC-specific cyclical component of the actual policy. Indeed, the coefficient β in Equation (1) is picking up the potential effect of the AC-specific economic cycle on both dimensions of p^*_{ijt}. The main challenge for a correct identification is being able to isolate such an effect. Below, we detail the procedure we employ to deal with this issue.

Controlling for the Actual Policy: Structural Component. In Equation (1), by employing fixed effects (ϑ_j) and AC-specific contextual variables (X_{jt}), we are already implicitly controlling for the structural component of the actual policy. Nevertheless, we strengthen this strategy by controlling for 5 years fixed effects (i.e., by interacting the AC-specific dummies with 5 years common trend time dummies) instead of pure fixed effects. In this way, we should control for potential changes in the long-term level of EC_{jt}

FIGURE 2

Trends in AC-Specific Economic Cycle Vis-À-Vis Average p_{ijt} Variability along Time by AC.
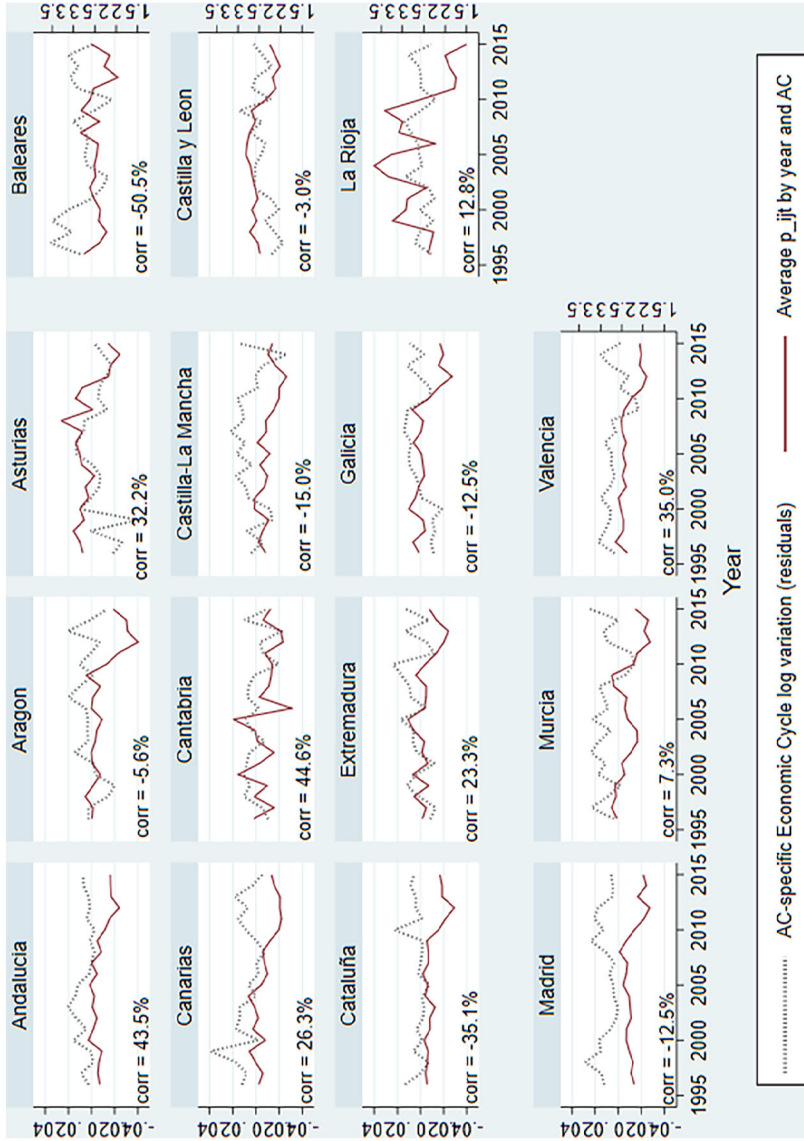
Note: left y-axis represents the log variation of the AC-specific Economic Cycle. This is measured as the residual part of the variation of the regional GDP measured in logs which is not explained by the variation in logs of the national GDP and an AC-specific constant; right y-axis represents the average score of p_{ijt}

over time.[13] In order to account for AC-specific contextual variables, vector X_{jt} includes several controls. First, we include a set of variables to identify the regional productive structure through the percentage composition of the regional gross value added (GVA).[14] Namely, the percentage of GVA represented by the secondary sector (without the construction subsector), the percentage of GVA represented by the construction subsector—which has particularly been important in Spain—and finally the percentage of GVA given by the tertiary sector.[15] We also include the regional population in order to account for the demographic dimension of any AC, and the total number of employees of the tax administration in per capita terms in order to account for the capacity of the tax authority to enforce the existing tax legislation. The regional deficit is included to synthetically account for budgetary shocks on both government expenditure and revenues and to further isolate these shocks from the business cycle. Finally, we include a dummy variable to account for the AC electoral cycle and a dummy identifying whether the AC government stands on the left of the political spectrum.

Controlling for the Individual Dimension: Structural Component. In order to account for the structural component of the individual dimension of perceived tax enforcement, we control for individual characteristics of the respondents (Y_{ijt}), which may influence the risk perception and the enforcement demand of individuals. We include dummies for female,

head of household, married individual, retired, self-employed, public employee, left-wing voter, nationalist voter,[16] as well as for the estimated low unemployment risk (UR, henceforth).[17] We also control for the municipality size,[18] age of the respondent—which are both included also in squared terms to account for nonlinearity in their effect—and the educational level attained by the respondent.

Controlling for the Common Cyclical Components (Individual Dimension and Actual Policy). By employing common time effects (τ_t), we account for the common national cyclical component of our endogenous variable. Moreover, in order to control for the sensitivity of the individual component of p^*_{ijt} on the national economic cycle, we interact the vector of individual variables (Y_{ijt}) with the common time dummies (τ_t) allowing the risk perception and demand dimension of p^*_{ijt} to sluggishly adjust along the national economic cycle. Indeed, respondents may answer differently implicitly showing a different risk perception/demand of tax enforcement efforts depending on the national economic cycle.

Controlling for the Individual Dimension: AC-Specific Cyclical Component. Despite accounting for the aforementioned effects, serial correlation might still be present. Indeed, the relationship between the AC-specific economic cycle and our endogenous variable will capture both the sensitivity of the tax administration throughout the economic cycle (i.e., the AC-specific cyclical component of the actual policy) and the evolution of individual risk perception/demand throughout the cycle (i.e., the AC-specific cyclical component of the individual dimension of p^*_{ijt}). This means that the estimated effect of the cycle on the (latent) endogenous variable—the coefficient β—could be biased.

In order to deal with this issue, we follow the approach adopted by Backus and Esteller-Moré (2017). The initial step of this strategy is to

13. Alternatively, we also employ as a robustness 3- and 10-year fixed effects. The results of this robustness analysis are reported in the Appendix S1.

14. These are introduced with 5-year lags in order to account for the long-run productive structure of any AC. The regional composition of the GVA does not vary much along the analyzed period and controlling for the GVA structure without lags does not qualitatively alter the results which are available upon request.

15. More precisely, the primary sector includes agriculture, forestry, and fishing. The secondary sector is defined to include extractive industries; manufacturing industries; energy industries (electricity, gas, steam, and air conditioning); water supply; sanitation, waste management, and decontamination. As mentioned in the text, the construction industry is considered as a subsector a part. Finally, the tertiary sector includes the following services: wholesale and retail trade; repair of motor vehicles and motorcycles; transport and storage; hospitality; information and communications; financial and insurance activities; real estate activities; professional, scientific, and technical activities; administrative activities and auxiliary services; public administration and defense; compulsory social security; education, health, and social services activities; artistic, recreational, and entertainment activities; repair of household items; and other services.

16. The dummy nationalist is defined as equal to 1 if the respondent voted for one of the nationalist parties of the historical nationalities recognized in Spain.

17. The methodology employed to estimate UR is explained below in this section.

18. The municipality size is coded as to rank from 0 to 7 in this way: 0—less or equal to 1,000 inhabitants; 1—1,001 to 2,000 inhabitants; 2—2,001 to 10,000 inhabitants; 3—10,001 to 50,000 inhabitants; 4—50,001 to 100,000 inhabitants; 5—100,001 to 400,000 inhabitants; 6—400,001 to 1,000,000 inhabitants; 7—more than 1,000,000 inhabitants.

split our sample of surveyed individuals into two groups, the first one—say group 1—composed by people whose risk perception and demand of tax enforcement should not vary along the AC-specific economic cycle and the second one constituted by the complementary cluster (group 2). To this end, coherently with Backus and Esteller-Moré (2017), we provide an estimate of each individual's UR based on their labor market characteristics.[19] This is an estimate of an individual's idiosyncratic risk of unemployment, scaled between 0 and 1, and provides us with a proxy of the impact of the economic cycle on the risk perception/demand of tax enforcement of those individuals. The rationale is that the higher the UR, the higher the individual's exposure to the economic cycle, and thus, the higher should be the potential impact of the economic cycle on her risk perception and probably demand for tax enforcement. In other words, an individual with low UR is less likely to change her perception/demand of tax enforcement along the economic cycle and thus is more likely to contribute to produce a correct estimation of β. We identify the cluster of individuals whose risk perception and demand of tax enforcement should not vary along the AC economic cycle (group 1) by defining the dummy variable "low UR" equal to 1 if the UR of a certain individual in year t is lower than the average UR of that year.[20]

The following step consists of running separate regressions for these two groups, and checking whether there is a statistically significant difference between the estimated coefficient $\widehat{\beta}$ for the two clusters (i.e., whether $\widehat{\beta}_1 \neq \widehat{\beta}_2$ is statistically significant[21]). If this is the case, and according to our identification strategy, then we should choose $\widehat{\beta}_1$ as the best approximation to the real impact of the AC economic cycle on the actual tax enforcement policy. Otherwise, we can conclude that this source of bias is not relevant.

As a final step of our identification strategy, we perform a falsification test aimed at determining the reliability of the results based on the filtering process presented above. To this end, we employ the same identification strategy to test cyclicality in tax policy. Similarly, in order to define the dependent variable, we employ another question of the CIS' repeated surveys: "Would you say that what the Spaniards pay in taxes is a lot, regular or little?"[22]; again, this question has remained unchanged over the 1994–2015 period. Analogously to what we do for p_{ijt}, we code the answers to this question into an ordered variable t_{ijt}, which is scaled from "low tax pressure" (1) to "high tax pressure" (3). This is a measure of the perceived tax pressure t^*_{ijt}. By employing the same filtering process, we then estimate a model analogous to Equation (1), but employing t_{ijt} as dependent variable. If our identification strategy is properly filtering the impact of the AC-specific economic cycle on the actual policy, we would expect results coherent with the hypothesis of acyclical tax policy. Indeed, while the individual component of t^*_{ijt} may well be either pro or counter-cyclical according to changes in the individual risk perception or demand, it is unlikely policy-makers react to the AC-specific economic cycle when it comes to statutory tax policy. This means that, after having filtered t^*_{ijt} for all the individual confounders as well as for the structural and common cyclical components, we expect a non-statistically significant impact of the AC-specific economic cycle on tax policy. This would corroborate our identification strategy.

In the next section, we present some descriptive statistics and detail the sources of the variable included in the analysis.

C. Data and Sources

Our data set comprises information about individual-level and AC-level variables for the 1994–2015 period. Our dependent variable, including the one employed for the falsification test, and all the individual-level control variables,

19. More precisely, we estimate the individual UR by employing a probit model on a subsample of individuals who are employed plus those that are currently unemployed but were employed in previous periods. Specifically, we establish the relationship $UR_{ijt} = \mathbf{w}_{ijt}\boldsymbol{\omega} + \eta_{ijt}$ where UR_{ijt} is a dummy equal to 1 if i is unemployed and 0 if i is employed, $\mathbf{w}_{ijt}$ is a vector of i's employment—or previous employment—characteristics reported in the CIS surveys. Those include occupation, industry of employment, and level of education all interacted with the sector of employment and year effects, $\boldsymbol{\omega}$ is a vector of parameters to be estimated, and η_{ijt} is the error term. The predicted probabilities $\widehat{UR}_{ijt}$, represent the estimated UR variable (for more details see Backus and Esteller-Moré 2017, 207). Additionally, we assign a value equal to zero to the UR of retired individuals.

20. Alternatively, we have also employed the median of the UR of any year to define the threshold and obtain qualitatively the same results, which are available upon request.

21. In order to perform this test, we implement a fully interacted specification (FIS) of Equation (2), by allowing any coefficient to differ depending on whether individual i belongs to group 1 or 2 (see Backus and Esteller-Moré 2017, 209 for more details).

22. The original question in Spanish is "¿Diría Ud. que lo que los/as españoles/as pagamos en impuestos es mucho, regular o poco?" (see e.g., question n. 11 of the survey n. 2994 released in 2013).

TABLE 1
Pooled Summary Statist ics

Variable	Measurement unit	Obs.	Mean	SD	Min	Max
Dependent variable						
p	Ranking	32,357	2.360	0.812	1	4
Falsification test dependent variable						
t	Ranking	35,152	2.607	0.542	1	3
Proxies of the Economic Cycle (main explanatory variables)						
GDP (CA)	Hundreds of billions of euros	36,935	1.006	0.643	0.051	2.150
Unemployment (CA)	Millions of people	36,935	0.427	0.425	0.005	2.186
AC-specific explanatory variables						
Deficit (CA)	Hundreds of billions of euros	34,345	−0.010	0.021	−0.107	0.015
FYL_%GVA_Secondary_sector	Share	36,935	0.219	0.073	0.076	0.441
FYL_%GVA_Construction_sector	Share	36,935	0.092	0.029	0.029	0.149
FYL_% GVA_Tertiary_sector	Share	36,935	0.647	0.076	0.416	0.827
Population (CA)	Millions of people	34,345	4.606	2.488	0.263	8.450
Leftist government (CA)	Dummy	36,935	0.352	0.478	0	1
Electoral cycle (CA)	Dummy	36,935	0.277	0.447	0	1
TA employees per thousands of people	Employees per thousands of people	32,522	0.725	0.225	0.343	1.615
Individual-level explanatory variables						
Dummy self-employed	Dummy	36,946	0.147	0.354	0	1
Left	Dummy	36,946	0.535	0.499	0	1
Female	Dummy	36,946	0.422	0.494	0	1
Age	Nr. of years	36,940	48.899	17.994	18	99
Age squared	Nr. of years (squared)	36,940	2,714.857	1872.325	324	9,801
Head of household	Dummy	36,946	0.609	0.488	0	1
Dummy married	Dummy	36,919	0.353	0.478	0	1
Education level	Nr. of years	36,852	4.296	3.042	0	15
Nationalist	Dummy	36,946	0.065	0.246	0	1
Municipality size	Units	36,946	3.351	2.126	0	7
Municipality size squared	Units squared	36,946	15.748	15.216	0	49
Dummy retired	Dummy	36,946	0.329	0.470	0	1
Dummy public employee	Dummy	36,946	0.171	0.376	0	1
Unemployment risk	Probability	35,369	0.109	0.144	0	0.837
Dummy low Unemployment risk (mean)	Dummy	36,946	0.621	0.485	0	1

Note: The dependent variables and all the individual-level control variables, are extracted from the repeated surveys waves of the "Public opinion and public policy" annually published by the CIS. UR, and the relative dummy for low unemployment risk have been estimated (see Section III.B). The GDP, the unemployment, the productive structure and the population of ACs is provided by the INE. To define the total number of employees of the tax administration we rely both on information provided by the Statistical Bulletins of the Central Personnel Registry and on information made available in the Report on the ceded taxes to ACs published every year jointly with the project of the general State budget. Information on the electoral cycle and on the political color of the government in office in any AC/year is available on the database of the Spanish Interior Ministry.

are extracted from the abovementioned repeated waves of the annually published survey by the CIS. The only exception is UR, and the related dummy for low unemployment risk, which were estimated using the methodology presented in Section III.B.

Contextual variables refer to the 15 Spanish "common regime" ACs and are obtained from the following statistical sources. The information about the GDP, the unemployment, the productive structure, and the population of ACs is provided by the Spanish National Institute of Statistics (INE). The variable that controls for the tax enforcement capacity—the total number of employees of the tax administration—accounts

for the number of employees employed in both AC-specific tax agencies and regional offices of the national tax authority and it is relativized per capita terms. This variable represents a measure of the size of each tax agency with respect to the population in any AC and year. In order to define this variable, we rely both on information provided by the Statistical Bulletins of the Central Personnel Registry ("Boletines Estadísticos del Registro Central de Personal" in Spanish) and on information made available in the Report on the ceded taxes to ACs ("Informe sobre la cesión de tributos a las Comunidades Autónomas" in Spanish) published every year jointly with the project of the general State budget. Information on the

TABLE 2
Summary Statistics by UR Type

Panel A: High UR

Variable	Measurement Unit	Obs.	Mean	SD	Min	Max
Dependent variable						
p	Ranking	12,593	2.308	0.813	1	4
Falsification test dependent variable						
t	Ranking	13,478	2.632	0.531	1	3
Proxies of the Economic Cycle (main explanatory variables)						
GDP (CA)	Hundreds of billions of euros	13,984	1.020	0.638	0.051	2.150
Unemployment (CA)	Millions of people	13,984	0.432	0.417	0.005	2.186
AC-specific explanatory variables						
Deficit (CA)	Hundreds of billions of euros	12,987	−0.011	0.022	−0.107	0.015
FYL_%GVA_Secondary_sector	Share	13,984	0.219	0.074	0.076	0.441
FYL_%GVA_Construction_sector	Share	13,984	0.088	0.032	0.029	0.149
FYL_% GVA_Tertiary_sector	Share	13,984	0.652	0.075	0.416	0.827
Population (CA)	Millions of people	12,987	4.691	2.492	0.263	8.450
Leftist government (CA)	Dummy	13,984	0.341	0.474	0	1
Electoral cycle (CA)	Dummy	13,984	0.321	0.467	0	1
TA employees per thousands of people	Employees per thousands of people	12,281	0.711	0.218	0.343	1.515
Individual-level explanatory variables						
Dummy self-employed	Dummy	13,990	0.111	0.314	0	1
Left	Dummy	13,990	0.570	0.495	0	1
Female	Dummy	13,990	0.425	0.494	0	1
Age	Nr. of years	13,989	39.082	13.457	18	99
Age squared	Nr. of years (squared)	13,989	1,708.481	1,188.069	324	9,801
Head of household	Dummy	13,990	0.516	0.500	0	1
Dummy married	Dummy	13,980	0.419	0.493	0	1
Education level	Nr. of years	13,971	4.495	4.951	0	99
Nationalist	Dummy	13,990	0.060	0.237	0	1
Municipality size	Units	13,990	3.381	2.018	0	7
Municipality size squared	Units squared	13,990	15.505	14.465	0	49
Dummy Retired	Dummy	13,990	0.051	0.219	0	1
Dummy public employee	Dummy	13,990	0.108	0.310	0	1
Unemployment risk	Probability	12,413	0.254	0.155	0	0.837

Panel B: Low UR

Variable	Measurement Unit	Obs.	Mean	SD	Min	Max
Dependent variable						
p	Ranking	19,764	2.393	0.809	1	4
Falsification test dependent variable						
t	Ranking	21,674	2.591	0.548	1	3
Proxies of the Economic Cycle (main explanatory variables)						
GDP (CA)	Hundreds of billions of euros	22,951	0.997	0.646	0.051	2.150
Unemployment (CA)	Millions of people	22,951	0.423	0.431	0.005	2.186
AC-specific explanatory variables						
Deficit (CA)	Hundreds of billions of euros	21,358	−0.010	0.020	−0.107	0.015
FYL_%GVA_Secondary_sector	Share	22,951	0.220	0.073	0.076	0.441
FYL_%GVA_Construction_sector	Share	22,951	0.094	0.026	0.030	0.149
FYL_% GVA_Tertiary_sector	Share	22,951	0.644	0.076	0.416	0.827
Population (CA)	Millions of people	21,358	4.555	2.485	0.263	8.450
Leftist government (CA)	Dummy	22,951	0.360	0.480	0	1
Electoral cycle (CA)	Dummy	22,951	0.250	0.433	0	1
TA employees per thousands of people	Employees per thousands of people	20,241	0.733	0.229	0.343	1.615
Individual-level explanatory variables						
Dummy self-employed	Dummy	22,956	0.169	0.375	0	1
Left	Dummy	22,956	0.514	0.500	0	1
Female	Dummy	22,956	0.421	0.494	0	1
Age	Nr. of years	22,951	54.882	17.784	18	99
Age squared	Nr. of years (squared)	22,951	3,328.259	1946.403	324	9,801
Head of household	Dummy	22,956	0.665	0.472	0	1
Dummy married	Dummy	22,939	0.312	0.463	0	1
Education level	Nr. of years	22,951	4.464	5.220	0	99
Nationalist	Dummy	22,956	0.068	0.252	0	1
Municipality size	Units	22,956	3.332	2.189	0	7
Municipality size squared	Units squared	22,956	15.896	15.654	0	49
Dummy Retired	Dummy	22,956	0.498	0.500	0	1
Dummy public employee	Dummy	22,956	0.209	0.406	0	1
Unemployment risk	Probability	22,956	0.031	0.039	0	0.170

TABLE 2
Continued

Panel C: Means Difference High UR – Low UR Variable	Mean High UR	Mean Low UR	Difference	p Value
Dependent variable				
p	2.308	2.393	−0.085	.000***
Falsification test dependent variable				
t	2.632	2.591	0.041	.000***
Proxies of the Economic Cycle (main explanatory variables)				
GDP (CA)	1.020	0.997	0.023	.001***
Unemployment (CA)	0.432	0.423	0.009	.040**
AC-specific explanatory variables				
Deficit (CA)	−0.011	−0.010	−0.001	.000***
FYL_%GVA_Secondary_sector	0.219	0.220	−0.001	.312
FYL_%GVA_Construction_sector	0.088	0.094	−0.006	.000***
FYL_% GVA_Tertiary_sector	0.652	0.644	0.008	.000***
Population (CA)	4.691	4.555	0.136	.000***
Leftist government (CA)	0.341	0.360	−0.019	.000***
Electoral cycle (CA)	0.321	0.250	0.071	.000***
TA employees per thousands of people	0.711	0.733	−0.022	.000***
Individual-level explanatory variables				
Dummy self-employed	0.111	0.169	−0.058	.000***
Left	0.570	0.514	0.056	.000***
Female	0.425	0.421	0.005	.365
Age	39.082	54.882	−15.800	.000***
Age squared	1,708.481	3,328.259	−1,619.778	.000***
Head of household	0.516	0.665	−0.150	.000***
Dummy married	2.0000	0.419	0.312	.107
Education level	4.495	4.464	0.031	.576
Nationalist	0.060	0.068	−0.008	.002***
Municipality size	3.381	3.332	0.049	.032**
Municipality size squared	15.505	15.896	−0.391	.017**
Dummy retired	0.051	0.498	−0.447	.000***
Dummy public employee	0.108	0.209	−0.101	.000***
Unemployment risk	0.254	0.031	0.223	.000***

Note: The dependent variables and all the individual-level control variables, are extracted from the repeated surveys waves of the "Public opinion and public policy" annually published by the CIS. UR, and the relative dummy for low unemployment risk have been estimated (see Section III.B). The GDP, the unemployment, the productive structure and the population of ACs is provided by the INE. To define the total number of employees of the tax administration we rely both on information provided by the Statistical Bulletins of the Central Personnel Registry and on information made available in the Report on the ceded taxes to ACs published every year jointly with the project of the general State budget. Information on the electoral cycle and on the political color of the government in office in any AC/year is available on the database of the Spanish Interior Ministry.
*p < .10; **p < .05; ***p < .01.

electoral cycle and on the political color of the government in office in any AC/year is available on the database of the Spanish Interior Ministry. Table 1 reports the pooled summary statistics of the variables employed in our empirical analysis, while Table 2 presents the descriptive statistics referred to the two subsamples defined on the basis of the dummy "low UR" (panels A and B) and a test for the equality of subsamples means (Panel C).

Next, we present the results of our empirical analysis.

IV. RESULTS

A. Main Results

Table 3 presents the results of the estimation of Equation (1). In particular, in columns 1–3, we measure the economic cycle through GDP_{jt}, while in columns 4–6, we use $Unemployment_{jt}$.

The structure of the table is coherent with the filtering process presented in our estimation strategy. More precisely, columns 1 and 4 estimate the baseline model presented in Equation (1) including fixed and time effects, columns 2 and 5 substitute standard fixed effects with 5-year fixed effects and finally in columns 3 and 6, we add the interaction between any individual variable and the time dummies. In every model, the proxy for the economic cycle is highly significant and presents a sign that is coherent with a pooled counter-cyclical perceived tax enforcement.

Regarding our filtering process, by substituting standard fixed effects with 5-year fixed effects has a significant impact on the magnitude of the coefficients of the economic cycle, while introducing the interactions between individual variables and time dummies has a negligible if not null impact. This seems to suggest that the individual component of the perception/demand of

TABLE 3

The Determinants of Perceived Tax Enforcement Along Time. Ordered-Probit, 1994–2015

	(1)	(2)	(3)	(4)	(5)	(6)
GDP (CA)	−0.409***	−0.788***	−0.770***			
	(−3.695)	(−3.861)	(−3.622)			
Unemployment (CA)				0.180***	0.202***	0.202***
				(4.361)	(3.365)	(3.126)
Deficit (CA)	1.901**	1.006	1.138	1.663**	1.270	1.387
	(2.396)	(0.814)	(0.885)	(2.171)	(1.029)	(1.080)
FYL_%GVA_Secondary_sector	1.327	−0.590	−0.707	0.200	−1.955	−1.923
	(1.469)	(−0.417)	(−0.470)	(0.226)	(−1.327)	(−1.238)
FYL_%GVA_Construction_sector	−1.292	0.983	1.372	−1.049	0.590	1.126
	(−1.163)	(0.494)	(0.661)	(−0.952)	(0.296)	(0.540)
FYL_% GVA_Tertiary_sector	2.450**	2.718*	2.668*	1.860*	2.010	2.077
	(2.452)	(1.750)	(1.653)	(1.875)	(1.271)	(1.269)
Leftist government (CA)	0.011	0.024	−0.008	0.017	0.047	0.013
	(0.448)	(0.638)	(−0.203)	(0.717)	(1.233)	(0.345)
Electoral cycle (CA)	−0.004	−0.003	−0.005	−0.003	0.003	0.001
	(−0.209)	(−0.177)	(−0.276)	(−0.159)	(0.148)	(0.076)
TA employees per thousands of people	−0.412***	−0.398***	−0.439***	−0.399***	−0.390***	−0.432***
	(−7.048)	(−6.603)	(−7.192)	(−6.813)	(−6.450)	(−7.060)
Population (CA)	0.165***	0.223	0.190	−0.011	−0.061	−0.077
	(2.659)	(1.567)	(1.272)	(−0.281)	(−0.486)	(−0.578)
Municipality size	−0.086***	−0.085***	−0.033	−0.087***	−0.085***	−0.033
	(−4.719)	(−4.607)	(−0.369)	(−4.752)	(−4.623)	(−0.368)
Municipality size squared	0.009***	0.009***	0.005	0.009***	0.009***	0.005
	(4.048)	(3.854)	(0.423)	(4.075)	(3.860)	(0.422)
Left	−0.037***	−0.035***	−0.195***	−0.037***	−0.034***	−0.195***
	(−2.772)	(−2.596)	(−2.854)	(−2.758)	(−2.583)	(−2.854)
Female	−0.008	−0.007	−0.065	−0.008	−0.007	−0.065
	(−0.562)	(−0.496)	(−0.946)	(−0.553)	(−0.497)	(−0.946)
Age	−0.005**	−0.004*	−0.018	−0.005**	−0.004*	−0.018
	(−1.965)	(−1.929)	(−1.451)	(−1.977)	(−1.920)	(−1.451)
Age squared	0.000***	0.000***	0.000	0.000***	0.000***	0.000
	(2.802)	(2.766)	(1.505)	(2.815)	(2.766)	(1.506)
Head of household	0.013	0.015	−0.009	0.013	0.015	−0.009
	(0.813)	(0.982)	(−0.123)	(0.844)	(0.984)	(−0.122)
Dummy married	−0.023	−0.024	−0.033	−0.023	−0.023	−0.032
	(−1.518)	(−1.555)	(−0.366)	(−1.497)	(−1.518)	(−0.364)
Dummy self-employed	0.044*	0.045**	0.109	0.043*	0.044*	0.109
	(1.925)	(1.961)	(0.961)	(1.894)	(1.937)	(0.962)
Dummy Retired	−0.015	−0.013	−0.223	−0.015	−0.014	−0.223
	(−0.576)	(−0.520)	(−1.617)	(−0.574)	(−0.536)	(−1.618)
Dummy public employee	−0.032*	−0.029	0.018	−0.032*	−0.029	0.018
	(−1.728)	(−1.564)	(0.193)	(−1.714)	(−1.564)	(0.194)
Dummy low Unemployment risk (mean)	0.044**	0.042**	0.136	0.044**	0.042**	0.136
	(2.341)	(2.240)	(1.443)	(2.334)	(2.243)	(1.442)
Education level	0.008***	0.008***	0.001	0.008***	0.008***	0.001
	(5.161)	(5.196)	(0.165)	(5.137)	(5.181)	(0.164)
Nationalist	0.076***	0.069**	−0.009	0.077***	0.071**	−0.009
	(2.650)	(2.404)	(−0.059)	(2.664)	(2.449)	(−0.059)
Observations	28,384	28,384	28,384	28,384	28,384	28,384
Log-likelihood	−32,875.604	−32,793.128	−32,554.447	−32,872.955	−32,795.524	−32,556.497
Fixed effects	Yes	No	No	Yes	No	No
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
FE ×5 years TE	No	Yes	Yes	No	Yes	Yes
Individual_Var.s × TE	No	No	Yes	No	No	Yes

Note: z statistics are reported in parentheses and are derived using robust standard errors. We do not employ standard errors clustered at regional level, since we have too many regressors in comparison to clusters. The theory that justifies the calculation of cluster standard errors is asymptotic in the number of clusters, and the established rule is to employ a number of clusters that at least equates the number of estimated variables. Otherwise, one needs to consider whether any of the reported standard errors means anything. However, we use Fixed Effects (or even 5 years FE) at regional level which control for most of the within-cluster correlation of the error.
*p < .10; **p < .05; ***p < .01.

tax enforcement does not vary much along the economic cycle. For these reasons, and in order to be able to more easily interpret the effect of relevant individual variables, we choose the results for 5-year fixed effects (columns 2 and 5) as our best estimates for the pooled regression. Further analyses presented in Tables 4 and 5 are based on these models.

As explained in detail in Section III.B, the control variables have been included as part of our identification strategy. Thus, the interpretation of their impact on the dependent variable is not key for the purpose of this paper. Nevertheless, it is interesting to stress some results. In particular, regions with a higher percentage of GVA generated by the tertiary sector tend to have higher perceived tax enforcement. The capacity of tax administration to enforce the existing tax legislation seems to be oversized as the coefficient of the TA employees per thousands of people variable suggests. The impact of size of the municipality in which the respondent to the survey resides is reported to be nonlinear as the impact of the age of the respondent. Leftist voters report a lower perceived level of tax enforcement suggesting a demand for a more stringent fight against fiscal fraud. On the other hand, being a voter of a regional nationalist party has the opposite effect on the individual perception/demand. Self-employed individuals report a higher level of perceived tax enforcement which is coherent with the higher probability they have to be audited. Finally, individuals employed in the public sector tend to report a lower level of perceived tax enforcement, while people with a lower estimated expected unemployment rate show the opposite effect.

Following our identification strategy, Table 4 presents the results of the estimation of separate regressions for different groups of individuals based on their UR-type. In particular, columns 1 and 2 replicate model 2 of Table 3 for low-UR type and high-UR type individuals, respectively. Similarly, columns 3 and 4 reproduce model 5 of Table 3 for the same clusters of individuals. The results show perceived counter-cyclical tax enforcement for both clusters of individuals. Testing for significantly different coefficients for these two groups lead to rejecting this hypothesis, so we maintain the results shown in model 2 and 5 of Table 3 as best approximation to the pooled effect of the economic cycle on perceived tax enforcement.

Hence, thus far, our study confirms the existence of a fiscal capacity argument in the setting

of enforcement (generally corroborating the results obtained by Chen 2017), but as a novelty it relates this result to economic cyclical shocks. Indeed, our results implicitly suggest that, on average, tax revenue losses due to the economic downturn tend to be accompanied by perceived tougher enforcement. Next, we try to disentangle whether the severity of the economic downturn affects perceived tax enforcement.

In this vein, Table 5 presents the results of the analysis of the presence of potential nonlinearity. More specifically, columns 1–4 are related to Equation (2). Columns 1 and 2 employ a linear spline methodology with equally spaced knots; columns 3 and 4 use a linear spline methodology with knots at specified extreme points (i.e., first and fifth percentiles for the GDP based model and 95th and 99th percentiles for the unemployment based model); and columns 5 and 6 present the results of the estimation of Equation (3) that employs an orthogonalized third degree polynomial to account for nonlinearity in the economic cycle.

These results seem to suggest a change in the perceived behavior of tax administration. Namely, the models that employ linear spline with equally spaced knots do not show a change in the sign of the slope, but we can at least appreciate a change in the slope magnitude. A drawback of this approach is that in order to identify the change in the economic cycle employing knots, they are equally spaced. By using linear spline models with knots at specified extreme points that identify severe financial constraints, though, we are able to appreciate a significant change in the slope of perceived tax enforcement to the economic cycle. More specifically, column 3 (4) show that for very low (high) values of GDP (unemployment) taxpayers' perception of tax enforcement policy turns out to be procyclical while remaining counter-cyclical for the rest of the economic cycle. We obtain a similar effect also for the results related to Equation (3) but just for what concerns the unemployment-based model (column 6).

In the online appendix, we present the results of our robustness analyses. In particular, Tables A1 to A6, Supporting Information, replicate Tables 3–5 by alternatively employing 3 years or 10 years fixed effects instead of 5 years fixed effects in order to account for potentially different economic cycles. Results remain qualitatively unchanged. Online Tables A7 to A12 present the results obtained by replicating the analysis presented in Tables 3–5 by estimating

TABLE 4

The Determinants of Perceived Tax Enforcement Along Time. Ordered-Probit, 1994–2015; Separate Regressions by UR Type

	(1) Low UR	(2) High UR	(3) Low UR	(4) High UR
GDP (CA)	−0.782***	−0.793**		
	(−3.038)	(−2.282)		
Unemployment (CA)			0.171**	0.241**
			(2.286)	(2.311)
Deficit (CA)	−0.752	3.409*	−0.501	3.724*
	(−0.463)	(1.755)	(−0.309)	(1.925)
FYL_%GVA_Secondary_sector	−1.131	1.618	−2.158	−0.384
	(−0.665)	(0.607)	(−1.222)	(−0.138)
FYL_%GVA_Construction_sector	−1.339	5.774	−1.691	5.338
	(−0.546)	(1.625)	(−0.687)	(1.498)
FYL_% GVA_Tertiary_sector	3.366*	2.907	2.779	1.989
	(1.775)	(1.019)	(1.437)	(0.685)
Leftist government (CA)	−0.010	0.099	0.010	0.121*
	(−0.220)	(1.568)	(0.200)	(1.930)
Electoral cycle (CA)	0.005	−0.026	0.011	−0.021
	(0.195)	(−0.799)	(0.459)	(−0.652)
TA employees per thousands of people	−0.386***	−0.433***	−0.378***	−0.423***
	(−5.042)	(−4.328)	(−4.924)	(−4.223)
Population (CA)	0.029	0.467**	−0.232	0.166
	(0.149)	(1.993)	(−1.337)	(0.790)
Municipality size	−0.087***	−0.069**	−0.087***	−0.068**
	(−3.734)	(−2.258)	(−3.757)	(−2.239)
Municipality size squared	0.009***	0.007*	0.009***	0.007*
	(3.149)	(1.850)	(3.154)	(1.834)
Left	−0.050***	−0.012	−0.050***	−0.012
	(−2.935)	(−0.561)	(−2.927)	(−0.540)
Female	−0.015	0.003	−0.015	0.003
	(−0.799)	(0.120)	(−0.791)	(0.113)
Age	−0.007**	−0.001	−0.007**	−0.001
	(−2.125)	(−0.254)	(−2.116)	(−0.234)
Age squared	0.000***	0.000	0.000***	0.000
	(3.079)	(0.391)	(3.073)	(0.376)
Head of household	0.015	0.013	0.015	0.012
	(0.771)	(0.507)	(0.770)	(0.497)
Dummy married	−0.002	−0.058**	−0.002	−0.057**
	(−0.113)	(−2.514)	(−0.105)	(−2.463)
Dummy self-employed	0.038	0.069	0.038	0.068
	(1.449)	(1.341)	(1.426)	(1.325)
Dummy retired	−0.032	0.054	−0.032	0.052
	(−1.004)	(0.773)	(−1.009)	(0.743)
Dummy public employee	−0.034	−0.005	−0.034	−0.004
	(−1.551)	(−0.141)	(−1.564)	(−0.112)
Education level	0.007***	0.008***	0.007***	0.008***
	(3.583)	(3.703)	(3.570)	(3.696)
Nationalist	0.091**	0.031	0.091**	0.033
	(2.477)	(0.641)	(2.482)	(0.689)
Observations	17,371	11,013	17,371	11,013
Log-likelihood	−20,002.242	−12,705.151	−20,004.539	−12,705.350
Fixed Effects	No	No	No	No
Time Effects	Yes	Yes	Yes	Yes
FE×5 years TE	Yes	Yes	Yes	Yes
Individual_Var.s×TE	No	No	No	No

Note: z statistics are reported in parentheses and are derived using robust standard errors.
*$p < .10$; **$p < .05$; ***$p < .01$.

TABLE 5

The Determinants of Perceived Tax Enforcement Along Time. Ordered-Probit, 1994–2015; Nonlinearity in the Response to Economic Cycle

	(1) Linear Spline with Knots Equally Spaced	(2)	(3) Linear Spline with Knots At Specified Points (first and fifth pctls)	(4) (95th and 99th pctls)	(5) Orthogonalized Third Degree Polynomial	(6)
GDP (CA)$_1$	−0.997*** (−3.099)		10.637* (1.821)			
GDP (CA)$_2$	−0.337** (−2.363)		−3.260 (−1.078)			
GDP (CA)$_2$	−0.503*** (−4.295)		−0.418*** (−4.267)			
Unemployment (CA)$_1$		−0.160 (−0.968)		0.184* (1.728)		
Unemployment (CA)$_2$		0.369*** (2.727)		0.522** (2.306)		
Unemployment (CA)$_3$		−0.011 (−0.067)		−4.958*** (−2.740)		
Orthogonalized GDP (CA)					−0.088 (−1.249)	
Orthogonalized [GDP (CA)]^2					−0.463*** (−3.297)	
Orthogonalized [GDP (CA)]^3					−0.013 (−0.487)	
Orthogonalized Unemployment (CA)						0.269** (2.487)
Orthogonalized [Unemployment (CA)]^2						0.231*** (2.697)
Orthogonalized [Unemployment (CA)]^3						−0.231** (−2.443)
Observations	28,384	28,384	28,384	28,384	28,384	28,384
Log-likelihood	−32,872.263	−32,791.689	−32,873.986	−32,791.381	−32,792.650	−32,791.272
AC-specific explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Individual-level explanatory variables	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	No	No	No	No	No	No
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
FE × 5 years TE	Yes	Yes	Yes	Yes	Yes	Yes
Individual_Var.s × TE	No	No	No	No	No	No

Note: z statistics are reported in parentheses and are derived using robust standard errors.

*p < .10; **p < .05; ***p < .01.

TABLE 6

Falsification Test—The Determinants of Perceived Tax Pressure Along Time. Ordered-Probit, 1994–2015

	(1)	(2)	(3)	(4)	(5)	(6)
GDP (CA)	0.256**	−0.050	−0.097			
	(2.084)	(−0.230)	(−0.423)			
Unemployment (CA)				−0.134***	−0.043	−0.078
				(−2.813)	(−0.634)	(−1.070)
Deficit (CA)	1.563*	1.983	1.446	1.600*	1.971	1.434
	(1.799)	(1.454)	(1.015)	(1.915)	(1.445)	(1.006)
FYL_%GVA_Secondary_sector	−0.727	−0.687	−1.808	0.005	−0.404	−1.325
	(−0.738)	(−0.446)	(−1.100)	(0.005)	(−0.253)	(−0.782)
FYL_%GVA_Construction_sector	0.754	−0.456	−2.329	0.613	−0.321	−2.040
	(0.633)	(−0.211)	(−1.024)	(0.522)	(−0.148)	(−0.892)
FYL_% GVA_Tertiary_sector	−0.706	−1.195	−2.511	−0.342	−0.950	−2.105
	(−0.642)	(−0.689)	(−1.383)	(−0.314)	(−0.538)	(−1.142)
Leftist government (CA)	−0.032	−0.019	−0.003	−0.037	−0.023	−0.009
	(−1.173)	(−0.464)	(−0.068)	(−1.362)	(−0.540)	(−0.199)
Electoral cycle (CA)	0.005	−0.003	0.006	0.005	−0.001	0.010
	(0.229)	(−0.141)	(0.280)	(0.232)	(−0.059)	(0.433)
TA employees per thousands of people	−0.154**	−0.176***	−0.172**	−0.163**	−0.180***	−0.177***
	(−2.350)	(−2.601)	(−2.496)	(−2.488)	(−2.644)	(−2.577)
Population (CA)	−0.134*	0.027	0.103	−0.024	0.014	0.083
	(−1.941)	(0.169)	(0.617)	(−0.565)	(0.101)	(0.550)
Municipality size	0.041**	0.046**	−0.017	0.042**	0.046**	−0.017
	(2.043)	(2.238)	(−0.165)	(2.072)	(2.246)	(−0.166)
Municipality size squared	−0.005**	−0.006**	−0.000	−0.005**	−0.006**	−0.000
	(−2.134)	(−2.357)	(−0.027)	(−2.166)	(−2.370)	(−0.026)
Left	−0.164***	−0.165***	−0.092	−0.164***	−0.165***	−0.092
	(−11.245)	(−11.307)	(−1.248)	(−11.258)	(−11.302)	(−1.248)
Female	0.195***	0.195***	0.131*	0.195***	0.195***	0.131*
	(11.955)	(11.974)	(1.680)	(11.962)	(11.978)	(1.680)
Age	0.006**	0.006**	−0.011	0.006**	0.006**	−0.011
	(2.171)	(2.282)	(−0.743)	(2.173)	(2.276)	(−0.743)
Age squared	−0.000***	−0.000***	0.000	−0.000***	−0.000***	0.000
	(−2.799)	(−2.916)	(0.678)	(−2.803)	(−2.910)	(0.678)
Head of household	0.010	0.010	0.017	0.010	0.010	0.017
	(0.597)	(0.595)	(0.219)	(0.593)	(0.597)	(0.219)
Dummy married	−0.017	−0.018	−0.123	−0.018	−0.018	−0.123
	(−1.024)	(−1.077)	(−1.238)	(−1.052)	(−1.081)	(−1.239)
Dummy self-employed	0.108***	0.106***	0.078	0.108***	0.107***	0.078
	(4.207)	(4.149)	(0.662)	(4.223)	(4.157)	(0.662)
Dummy retired	0.154***	0.155***	0.196	0.153***	0.154***	0.196
	(5.463)	(5.487)	(1.342)	(5.456)	(5.484)	(1.342)
Dummy public employee	−0.150***	−0.152***	−0.404***	−0.150***	−0.152***	−0.404***
	(−7.476)	(−7.557)	(−3.944)	(−7.479)	(−7.554)	(−3.945)
Dummy low Unemployment risk (mean)	−0.128***	−0.128***	−0.117	−0.128***	−0.128***	−0.117
	(−6.132)	(−6.110)	(−1.148)	(−6.128)	(−6.108)	(−1.148)
Education level	−0.017***	−0.017***	−0.020*	−0.017***	−0.017***	−0.020*
	(−8.695)	(−8.596)	(−1.647)	(−8.678)	(−8.595)	(−1.647)
Nationalist	−0.009	−0.008	−0.302*	−0.010	−0.008	−0.302*
	(−0.272)	(−0.237)	(−1.683)	(−0.280)	(−0.243)	(−1.683)
Observations	30,891	30,891	30,891	30,891	30,891	30,891
Log-likelihood	−22,641.947	−22,598.572	−22,339.425	−22,640.050	−22,598.391	−22,338.923
Fixed effects	Yes	No	No	Yes	No	No
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
FE×5 years TE	No	Yes	Yes	No	Yes	Yes
Individual_Var.s×TE	No	No	Yes	No	No	Yes

Note: z statistics are reported in parentheses and are derived using robust standard errors.
*$p < .10$; **$p < .05$; ***$p < .01$.

TABLE 7

Falsification Test — The Determinants of Perceived Tax Pressure Along Time. Ordered-Probit, 1994 – 2015; Separate Regressions by UR Type

	(1) Low UR	(2) High UR	(3) Low UR	(4) High UR
GDP (CA)	0.257	−0.528		
	(0.916)	(−1.475)		
Unemployment (CA)			−0.042	−0.071
			(−0.497)	(−0.598)
Deficit (CA)	3.680**	−0.342	3.627**	−0.174
	(2.070)	(−0.158)	(2.038)	(−0.080)
FYL_%GVA_Secondary_sector	1.103	−3.496	1.343	−2.848
	(0.590)	(−1.245)	(0.697)	(−0.963)
FYL_%GVA_Construction_sector	−0.169	−1.808	−0.112	−1.433
	(−0.063)	(−0.471)	(−0.042)	(−0.372)
FYL_% GVA_Tertiary_sector	0.722	−5.000	0.836	−4.216
	(0.340)	(−1.611)	(0.387)	(−1.332)
Leftist government (CA)	−0.072	0.078	−0.077	0.079
	(−1.392)	(1.118)	(−1.474)	(1.115)
Electoral cycle (CA)	−0.032	0.056	−0.035	0.065*
	(−1.185)	(1.532)	(−1.276)	(1.811)
TA employees per thousands of people	−0.268***	−0.019	−0.269***	−0.024
	(−3.200)	(−0.159)	(−3.204)	(−0.204)
Population (CA)	−0.028	0.205	0.057	0.051
	(−0.135)	(0.783)	(0.301)	(0.216)
Municipality size	0.077***	−0.010	0.077***	−0.009
	(3.033)	(−0.293)	(3.036)	(−0.268)
Municipality size squared	−0.009***	−0.000	−0.009***	−0.000
	(−2.937)	(−0.034)	(−2.933)	(−0.064)
Left	−0.189***	−0.127***	−0.189***	−0.127***
	(−10.221)	(−5.294)	(−10.227)	(−5.276)
Female	0.212***	0.171***	0.212***	0.170***
	(10.219)	(6.426)	(10.221)	(6.404)
Age	0.004	0.005	0.004	0.005
	(1.161)	(0.926)	(1.161)	(0.914)
Age squared	−0.000*	−0.000	−0.000*	−0.000
	(−1.771)	(−1.072)	(−1.773)	(−1.061)
Head of household	−0.005	0.037	−0.005	0.037
	(−0.230)	(1.299)	(−0.226)	(1.301)
Dummy married	0.018	−0.077***	0.018	−0.077***
	(0.804)	(−2.979)	(0.801)	(−2.988)
Dummy self-employed	0.135***	0.010	0.135***	0.010
	(4.556)	(0.182)	(4.559)	(0.174)
Dummy retired	0.161***	0.181**	0.161***	0.179**
	(4.669)	(2.261)	(4.674)	(2.232)
Dummy public employee	−0.141***	−0.176***	−0.141***	−0.176***
	(−5.945)	(−4.396)	(−5.940)	(−4.404)
Education level	−0.018***	−0.016***	−0.018***	−0.016***
	(−7.017)	(−5.100)	(−7.011)	(−5.099)
Nationalist	0.013	−0.046	0.013	−0.045
	(0.300)	(−0.828)	(0.299)	(−0.808)
Observations	19,074	11,817	19,074	11,817
Log-likelihood	−14,130.416	−8,392.347	−14,130.725	−8,393.204
Fixed effects	No	No	No	No
Time effects	Yes	Yes	Yes	Yes
FE × 5 years TE	Yes	Yes	Yes	Yes
Individual_Var.s × TE	No	No	No	No

Note: z statistics are reported in parentheses and are derived using robust standard errors.
*p < .10; **p < .05; ***p < .01.

Equations (1)–(3) by means of ordered logit and OLS models, respectively. Again, the results qualitative results do not change.

B. Falsification Test

Table 6 presents the results obtained by performing a falsification test consisting in estimating Equation (1) by substituting the perceived tax enforcement for the perceived tax pressure as dependent variable. As expected, results suggest that tax policy does not react to AC-specific economic cycle. Indeed, in the baseline models (columns 1 and 4), where the filtering process is not completely taking into account all the components of the dependent variable, the economic cycle seems to affect the tax policy as it is perceived by taxpayers in a procyclical way. This effect, though, vanishes as the filtering process is fully implemented. Table 7 furthers this falsification test by allowing the effect of the economic cycle to be different based on the individual risk type. Results fail to show a significant impact of the economic cycle on tax policy both for high- and low-risk individuals. These results validate the reliability of our identification strategy.

V. CONCLUSIONS

Despite a strand of the literature on public finance acknowledges tax enforcement is an additional parameter of an optimal fiscal system (see e.g., Slemrod and Gillitzer 2014), there is little literature checking whether this is the case. That is, there are not many positive analyses aiming at explaining how tax enforcement evolves along the economic cycle. This is the challenge of this paper.

In particular, we estimate, first, if perceived tax enforcement depends on the state of the economy, and if so, second, estimate its nature (pro or counter-cyclical). To do so, we have used survey data, as a proxy of real efforts by the tax administration and tried to filter any other potential (individual) explanation in the survey responses that might bias our dependent variable. From the analysis, we conclude that the perceived level of enforcement is cyclical with the nature of the response dependent on the severity of the crisis. These results confirm those of Chen (2017) while extending those findings to subnational regions and severity of economic crisis. It would be interesting to test this result using administrative data on tax enforcement effort as well as in other contexts, where the institutional design of the tax

administration is different from the Spanish one. Finally, we think this line of research might merit further theoretical developments.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

APPENDIX S1: ROBUSTNESS ANALYSIS