Norms, Enforcement, and Tax Evasion*

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Abstract

This paper studies the persistence of social norms in explaining tax evasion. We build a simple dynamic model of tax evasion that incorporates standard incentives to comply with taxes due to punishment and fines, intrinsic motivation, and social norms based on the desire to be perceived as pro-social. The latter underpins the role of norms and is the source of the dynamics that we study. Our empirical analysis exploits the adoption of a poll tax to fund local government in the UK in 1990 which led to widespread evasion. We also exploit a series of natural experiments due to narrow election outcomes which induce shifts into single-majority local governments and lead to more vigorous enforcement of local taxes. The econometric results are consistent with the model's main predictions on the dynamics of evasion.

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1 Introduction

The high levels of fiscal capacity needed to fund the spending ambitions of governments in advanced economies are supported not only by structures that detect and punish tax non-compliance, but also by intrinsic motivation which curbs the desire to cheat the government. Individuals may also care about how their decision to comply with taxes is perceived by others, creating a role for social interaction which shapes compliance norms. Even though this idea has been widely discussed in the context of tax compliance, it remains poorly understood from a theoretical and empirical point of view. One issue concerns the robustness of tax-compliance norms: can they be eroded by shocks and to what extent do the norms persist over time? The other concerns the interaction between the desire to follow a norm and other motives to comply with taxes: do these motives weaken or reinforce each other? This paper attempts to make progress on both sets of issues.

Our first contribution is theoretical. Specifically, we provide a model where agents can avoid taxes, and where the incentives depend on the tax enforcement process (detection and fines), intrinsic motivation, and a desire to acquire a pro-social reputation. The latter creates social interactions yielding a micro-foundation for the importance of social norms in this context. We use this model to study the equilibrium dynamics of norms and tax evasion. Specifically, derive the equilibrium responses of tax compliance to a temporary shocks to intrinsic motivation, as well as a permanent shock to tax enforcement. While the model may be interesting in its own right, its main role in the paper is to set the stage for the empirical analysis.

Our second contribution is empirical. Specifically, we exploit two kinds of natural experiments in the United Kingdom. The first derives from a reform by Margaret Thatcher's government in the early 1990s, when the long-standing system of property taxation for local governments (councils) based on property values (a system called *rates*) was replaced by a *poll tax* levied on an equal basis for all citizens of voting age. The new tax was deemed unfair, triggered mass evasion, and lead to a U-turn which restored a property-based tax (the *council tax*) only three years later. The breakdown in compliance was heterogeneous across councils and can be thought of as an array of council-specific temporary shocks to the intrinsic motivation to comply with taxes, similar to those in our model. The second set of natural experiments exploits narrow election victories in non-synchronous council elections in the period following the poll tax. Because shifts in and out of single-party majority are systematically associated with higher tax enforcement and lower tax evasion, they correspond to council-specific permanent shocks to tax enforcement in the model.

Section 2 of the paper formulates our model. We build on insights from several pieces of literature. The traditional economic approach literature is embodied in Allingham and Sandmo (1972), who examine the gamble that citizens take if they choose not to comply with their taxes. The primary focus is on the formal legal sanctions that shape the probability of detection and the size of penalties (see e.g., Cowell 1990 and Slemrod and Yitzhaki 2002 for surveys). Our model incorporates such standard compliance motives.

It is frequently observed that intrinsic motivation may also be important for compliance. Many different labels have been used to describe this in the literature. Gordon (1989) refers to "individual morality", Cowell (1990) to "stigma", Erard and Feinstein (1994) to feelings of "guilt and shame", and Torgler (2007) to "tax morale". Such intrinsic motivations may depend on social interactions, which create a role for norms in tax compliance.[1] The importance of norms is highlighted, for example, in Posner (2000) when he notes that:

> "A widespread view among tax scholars holds that law enforcement does not explain why people pay taxes. The penalty for ordinary tax convictions is small; the probability of detection is trivial; so the expected sanction is small. Yet large numbers of Americans pay their taxes. This pattern contradicts the standard economic model of law enforcement, which holds that people violate a law if the benefit exceeds the expected sanction. Some scholars therefore conclude that the explanation for the tendency to pay taxes must be that people are obeying a norm – presumably a norm of tax payment or a more general norm of law-abiding behavior." Posner (2000, page 1782)

Although concrete applications to studying tax compliance are few, social scientists have adopted a number of different approaches to studying social norms. One obvious way to model norms is to put a desire to conform with others directly into preferences. An earlier literature in social psychology, such as the experiments reported in Asch (1955) and subsequent work, suggest such an interpretation. Economists have used different forms of "non-standard" preferences to capture norms, e.g., Akerlof and Yellen (1990) in their study of efficiency wages as a reciprocal norm of fair effort for a fair wage. Another approach to micro-founding the norm, as in Kotlikoff, Persson and Svensson (1988) or Kandori (1992), is to embed behavior in a repeated game where the threat of dynamic punishments for norm-violation play a key role.

Another widely-used approach sees obeying norms as a way for individuals to signal their type to others, so as to maintain a social reputation for good behavior. This is the route taken in Benabou and Tirole (2011) and also followed here.[2] This route has the advantage of facilitating comparative statics and of leaving open the question whether social norms crowd in (complement) or crowd out (substitute) standard incentives, rather than building this in by assumption. Our model in Section 2 extends Benabou and Tirole's model to a

[1] See, for example, Myles and Naylor (1996).

[2] A somewhat different signalling approach is taken in Posner (2000).

dynamic setting to study the interplay between extrinsic and intrinsic motives with norms for tax evasion. We study the comparative statics and comparative dynamics in response to temporary shocks to the intrinsic motives to pay taxes, and in response to permanent shocks to tax enforcement.[3]

Section 3 of the paper describes the empirical context and our panel data on tax evasion, political majorities, and enforcement over thirty years (1980-2009) in the 342 councils of England and Wales. Since we do not have individual data, it is natural to focus on the patterns of average (aggregate) compliance at the council level.[4] We first discuss how to measure tax evasion consistently across three tax regimes – the (property-based) domestic-rates system from 1980 to 1989, the (person-based) poll-tax system from 1990 to 1992, and the (property-based) council-tax system from 1993 and onwards. Figure 1 illustrates the pattern of tax evasion averaged across all councils for each year in our sample. It shows that tax evasion before the poll tax averages was around 3% and was on a declining trend. There is an abrupt upward shift following the adoption of the poll-tax period with average evasion reaching between 10 and 15%. After the return to property-based local taxation in 1993, evasion returns only gradually towards the levels seen in the pre-poll-tax period. Clearly, this is in line with the idea that shocks to the intrinsic motives to pay taxes might lead to quite persistent effects, due to the dynamics of social norms.[5]

Figure 1 about here

Since elections are staggered across councils and years, we get a number of close election outcomes in every calendar year. We exploit the fact that these close elections trigger shifts into or out of single-party majority that are as good as random. Moreover, single-party majorities are systematically associated with less tax evasion. Figure 2 shows a version of the common Regression Discontinuity Design (RDD) diagram, where each dot represents half a percent of the sample and where the horizontal axis shows the difference between the seat share of the largest political party and the cutoff at 50%. The quadratic control functions on the two sides of the cutoff suggest that a narrow shift into a single-party majority decreases tax evasion by 1-2 percentage points. While this is a reduced-form relation, we will consider how discretionary tax enforcement by councils varies with majority shifts and show that the drop in tax evasion most likely reflects the fact that single-party council majorities enforce

[3]The dynamic model we formulate has some similarities with Lindbeck, Nyberg and Weibull's (2009) model of individual incentives and social norms in unemployment insurance.

[4]Del Carpio (2013) uses household level data to study the determinants of evasion on the property tax in Peru. She conducts an RCT at the municipality level, where the treatment is information disclosure about average compliance, enforcement or both. She finds a positive impact for all three treatments but no statistical significance for any pairwise difference in estimated effects.

[5]This persistence is consistent with the evidence presented in Helliwell, Wang and Xu (2013).

taxes more vigorously.

Figure 2 about here

Section 4 of the paper presents our empirical analysis. We begin by looking at tax-evasion changes in the 1990-92 poll-tax regime. We find that these are quite heterogeneous across councils, which can be attributed to different demographic, economic and political composition of the areas governed by any particular council. Then, we estimate the ensuing dynamics of tax evasion non-parametrically and find clear evidence that tax evasion falls more slowly in the councils that had high tax evasion during the poll-tax period – a result that confirms the impulse-response functions predicted by the theory of Section 2. Moreover, we demonstrate that this result does not reflect any pre-trends and is robust to alternative empirical specifications, to replacing gross tax evasion with residual tax evasion, and to different definitions of high evasion in the poll tax period.

Our second task is to analyze the effects of narrow shifts into single-party majorities in the period after 1993. Using an RDD approach, we show that these political shifts are associated with higher enforcement effort by councils and with lower tax evasion. This finding holds up as an immediate "impact effect", as well as over time, suggesting that we are right to interpret a narrow political shift as a permanent enforcement shock. We show that the results survive in a number of alternative RDD specifications and that the underlying identifying assumptions are fulfilled.

Finally, we study whether the politically induced enforcement shocks have different effects depending on the initial value of tax evasion. Exploiting the earlier findings on persistence, we look for heterogenous effects in the council-tax period, conditional on the level of poll-tax evasion. We find that an enforcement shock has a smaller effect on tax evasion in these councils that had a high level of tax evasion in the poll-tax period – a result that confirms the theoretically predicted interaction effect between standard enforcement incentives and the dynamics of social norms based on signalling.[6] As with the results on persistence, these findings are robust to different measurement of poll-tax evasion as well as to different definitions of high poll-tax evasion.

Section 5 concludes the paper. Some auxiliary empirical findings which do not appear in the main text are available in an Online Appendix.

[6] The existing empirical literature on norms and tax compliance has mostly relied on attitudinal data from surveys (see, for example, Wenzel, 2004). Such data has allowed researchers to investigate a wide variety of factors which support the willingness to comply with taxes (see, Hoffman et al, 2008, for a review). Among these, perceptions of fairness is frequently invoked as a crucial factor together with knowledge of the tax system.

2 Theory

2.1 The model

Basic Structure Our theoretical framework is based on Benabou and Tirole's (2011) model of social norms, but augments that model to include some adaptive dynamics. Time is measured in discrete periods, indexed by t, that correspond to years in the data. There are N councils, indexed by c, each of which is populated by a continuum of agents of size one. Agents in council c at date t have the same exogenous constant income y and tax liability $x_{c,t}$ and must decide whether or not to comply: $e \in \{0, 1\}$ where $e = 1$ denotes evasion. As in the classic Allingham-Sandmo framework, the standard incentive to pay taxes $m_{c,t}$, is given by the expected cost of getting caught (probability times punishment), which is determined by the council.

Agents may also be intrinsically motivated to pay their taxes. The mean level of such motivation, denoted $i_{c,t}$, may vary between councils and over time. However, agents also vary in their intrinsic motivation. We let higher values of ν denote a greater proclivity to pay taxes – i.e., a higher intrinsic motivation. We assume that v has a symmetric distribution with a single mode (median and mean) at zero, which is the same in all councils and time periods. The p.d.f and c.d.f. of this distribution are denoted by $g(v)$ and $G(v)$, respectively.

In addition to intrinsic motivation ν, agents care about their reputation with a desire to be perceived as more intrinsically motivated. Following Benabou and Tirole (2011), this component of their utility comes through the signal that compliance sends and, in our setting, becomes a source of social interaction within a council.

Summarizing this discussion, the preferences of a type v agent are given by:

$$y - x_{c,t}(1-e) - (m_{c,t} + i_{c,t} + v)e + \mu E(v \mid e) \ . \tag{1}$$

The final term in (1) is the signalling term, which represents the influence on the agent of his/her reputation (or self image) – i.e., how society views her (or how she views herself) given her evasion decision, e. It depends on the average value of the intrinsic motivation parameter ν in the parts of the population that either evades or pays their taxes faithfully. The agents who pay their taxes will be among those with a high value of v. The key assumption is that people in society are highly regarded when they are good citizens, in this case tax-payers, and hence appear to have a high value of ν. Parameter μ is the weight that agents place on their social reputation relative to their individual well-being.

The Evasion Decision The agent chooses e to maximize (1). The resulting decision rule is is characterized by a cutoff value, $v^*_{c,t}$ for each council which is defined by

$$m_{c,t} - x_{c,t} + i_{c,t} + v^*_{c,t} - \mu\left[E(v|e=1) - E(v|e=0)\right] = 0 \ . \tag{2}$$

Everybody with $v < v^*_{c,t}$ chooses to evade. Hence, the fraction of agents that evade their taxes in council c in year t is given by $G(v^*_{c,t})$.

There are three parts to (2). The term $m_{c,t} - x_{c,t}$ represents the material cost/benefit from compliance while $i_{c,t} + v^*_{c,t}$ is the critical level of intrinsic motivation. The third term, $\mu \left[E\left(v|e=1\right) - E\left(v|e=0\right)\right]$, represents the reputational cost of choosing to evade, which depends on how such acts are perceived. The latter represents social norms in this framework and this is where social interactions and dynamics enter the picture.

We assume that the reputation cost of evasion is updated only with a one-period lag. This is justified by the reasonable conjecture that individuals can observe evasion behavior only in the previous year. Then, the reputational cost depends on the lagged cutoff $v^*_{c,t-1}$ which determines the fraction of evaders in period $t-1$. This will allow us to study the dynamic paths of evasion with state dependence.

Dynamics Formally, we have

$$\begin{aligned} -\mu \left[E\left(v|e=1\right) - E\left(v|e=0\right)\right] &= \mu[E(v \mid v > v^*_{c,t-1}) - E(v \mid v < v^*_{c,t-1})] \\ &\equiv \mu\Delta\left(v^*_{c,t-1}\right) \ . \end{aligned} \tag{3}$$

By definition of the truncated means, the value of $\Delta\left(v^*_{c,t-1}\right)$ is always positive, i.e., there is a positive gain in reputation from paying taxes faithfully.[7] All of the model dynamics, as well as the social interaction that shapes how the norm varies over time, is embodied in (3).

Substituting (3) into (2), yields a non-linear first-order difference equation:

$$v^*_{c,t} = x_{c,t} - m_{c,t} - i_{c,t} - \mu\Delta(v^*_{c,t-1}) \ . \tag{4}$$

Standard arguments show that the equilibrium dynamics are determined by the derivative Δ_v, which is (minus) the root of the difference equation. We will assume throughout that $-1 < -\Delta_v < 1$ which implies that if x, m, and i are constant, then tax evasion will converge to a steady state implicitly defined by

$$\hat{v}(x,m,i) = x - m - i - \mu\Delta(\hat{v}(x,m,i)) \ .$$

If $\Delta_v < 0$, convergence is monotonic, while if $\Delta_v > 0$ it is oscillatory. The derivative Δ_v thus determines both the slope and steepness of the "impulse-response function"of tax evasion. This will give us a way to interpret some of the dynamics in the data.

[7]However, for the council population as a whole, social reputation is a "zero-sum game". Specifically, summing the reputational terms across all individuals in equilibrium, we obtain:

$$\int^{v^*} E(v \mid v < v^*_{c,t-1})dv + \int_{v^*} E(v \mid v > v^*_{c,t-1})dv = 0$$

To understand the sign of Δ_v, suppose that $v^*_{c,t-1}$ goes up so that more people evade in year $t-1$. Then, the two truncated means that enter into (3) both go up, so the effect on the reputational term $\Delta(\cdot)$ is ambiguous in sign. Since the density is single peaked, the results in Jewitt (2004) imply that Δ has a unique interior minimum, which is located at zero (due to the symmetry of the distribution). Hence $\Delta_v < 0$ for low values of $v^*_{c,t-1}$, a case where few people are evaders, and $\Delta_v > 0$ for high values of $v^*_{c,t-1}$, the case of high evasion.[8]

Using (4), we see that, when $\Delta_v < 0$, then individual evasion decisions across years are strategic complements – i.e., if more people evade in council c in year $t-1$ ($v^*_{c,t-1}$ goes up) then this leads to even more people in this council evading in the subsequent year t (so that $v^*_{c,t}$ goes up as well). This is the case that most earlier models of tax evasion focused on by assumption. However, it is quite possible that $\Delta_v > 0$ in which case tax-evasion decisions are strategic substitutes. This implies that higher evasion in year $t-1$ leads to lower evasion at t.

When it comes to empirical estimation, the model property that the effects of social norms on individual behavior in the current period are related to behavior within the group in the previous period means that we do not have to deal with the reflection problem uncovered and discussed by Manski (1993).

2.2 Comparative Dynamics

To illustrate the model's comparative dynamics, we now consider the adjustment path to two different shocks: (i) a permanent change in enforcement, $m_{c,t}$ and (ii) a temporary shock to the intrinsic motivation within a council district, $i_{c,t}$.

A Permanent Shock to Enforcement Suppose we begin from a steady state $\hat{v}_c$ and then $m_{c,t}$ increases permanently from some year T onwards, i.e.,

$$m_{c,t} = \begin{cases} \hat{m}_c & \text{for } t < T \\ m'_c > \hat{m}_c & \text{for } t \geq T \end{cases} .$$

In the data, this experiment will correspond to a positive enforcement shock, which is triggered by a shift towards a one-party majority due to a narrow majority for the largest party. With $\mu = 0$, so that there is no role for norms, the model would predict an immediate adjustment to a new steady state level of compliance. However, with $\mu > 0$, this adjustment will be more gradual.

To simplify the analysis, we assume that the enforcement shock is small enough that we stay in the same region where evasion activities are either strategic complements ($\Delta_v < 0$)

[8] Benabou and Tirole (2011) refer to paying taxes as a "respectable act" in the first case, and an "honorable act" in the latter case. In between it is a "modal act".

or strategic substitutes ($\Delta_v > 0$) throughout the adjustment towards the new steady state. Then, we have the following result:

Proposition 1 *The effect over time – the impulse-response function – of permanently stricter tax enforcement depends on the sign of Δ_v. If $\Delta_v < 0$, the proportion of tax evaders declines monotonically from $G(\hat{v}_c)$ to a new value $G(\hat{v}_c^-)$* with $\hat{v}_c^- < \hat{v}_c$. *If $\Delta_v > 0$, the proportion of tax evaders, undershoots its new steady-state value and displays oscillating fluctuations towards its new steady state value, which is lower than initially but higher than the one with $\Delta_v < 0$, i.e., $G(\hat{v}_c) > G(\hat{v}_c^+) > G(\hat{v}_c^-)$.*

Proof. Repeated iteration on the difference equation (4) gives the following first-order approximation for the impulse-response function – i.e., the year-on-year change in the cutoff value

$$v^*_{c,t} - v^*_{c,t-1} = -(-\mu)^{t-1-T}[\Pi_{s=T}^{s=t-2}\Delta_v(v^*_{c,s})](m'_c - \hat{m}_c) \ . \tag{5}$$

If $\Delta_v(v^*_{c,t}) < 0$ for all t, it follows that $v^*_{c,t} - v^*_{c,t-1}$ is always negative with $| v^*_{c,t} - v^*_{c,t-1} |$ declining in t. If $\Delta_v(v^*_{c,t}) > 0$ for all s, the sign of $v^*_{c,t} - v^*_{c,t-1}$ takes positive values for even $t - T$ and negative values for odd $t - T$.

Since $m'_c - \hat{m}_c$ is small, we get the following first-order approximation to the difference in steady-state cutoffs:

$$-\frac{1}{1+\mu\Delta_v(\hat{v}_c)}(m'_c - \hat{m}_c) \ . \tag{6}$$

Because the social multiplier in (6) is larger or smaller than 1 depending on the sign of $\Delta_v(\hat{v}_c)$, we get $\hat{v}_c^+ > v_c^-$. The undershooting result (for $v^*_{c,t}$) in the strategic-substitutes case is obtained by evaluating (5) $t = T+1$ and $t = T+2$ and comparing the results to (6). The results for the share of tax evaders follow trivially, because c.d.f. G is increasing in $v^*_{c,t}$ ■

This proposition characterizes the adjustment from a given initial condition, depending on the sign of Δ_v. We now consider what can be said about the adjustment in different councils that start out with different levels of tax evasion. Under the (relatively) weak assumption that $\Delta_{vv} > 0$,[9] we obtain a simple corollary:

Corollary 1 *Suppose we compare two councils with different initial share of tax evaders $G(\hat{v}_c^{low}) < G(\hat{v}_c^{high})$.* If $\Delta_{vv} > 0$, *the same permanent enforcement shock has an ambiguous/a larger effect on the incidence of tax evasion in the council with the lower share of evaders if both $\hat{v}_c^{low}$ and $\hat{v}_c^{high}$ are low/high.*

[9] This basically rules out initial values of $\hat{v}_c$ in the very tails of the distribution for v – see Figure 1b in Benabou and Tirole (2011).

To see this, note that the enforcement effect on the share of tax avoiders is given by

$$-g(\hat{v}_c)\frac{1}{1+\mu\Delta_v(\hat{v}_c)}(m'_c - \hat{m}_c) \ .$$

A lower share of tax evaders is associated with a lower initial cutoff value $v^*_{c,t}$ which, in turn, makes Δ_v lower and the 'social multiplier' for the cutoff value $\frac{1}{1+\mu\Delta_v(\hat{v}_c)}$ correspondingly higher. But the enforcement effect also depends on the fraction of agents who find themselves around the shifts in cutoffs $\hat{v}^{low}_c$ and $\hat{v}^{high}_c$, as measured by the respective densities $g(\hat{v}_c)$. If the share of tax evaders in both councils is large – so both cutoffs are higher than the minimum where $\Delta_v = 0$ – a lower share of tax avoiders is associated with a higher density.[10] This reinforces the effect of the larger social multiplier.

However, in the empirically more relevant case when the initial share of tax evaders is small (lower than one half), a lower share of tax avoiders is associated with a lower density, which makes the overall effect ambiguous. However, if we find a larger effect – or even the same effect – on tax evasion at $\hat{v}^{low}_c$ compared to $\hat{v}^{high}_c$ in the data, then this provides compelling evidence for a varying social multiplier.

To evaluate empirically the effect of different social multipliers on the adjustment to an enforcement shock, we will exploit different initial conditions for social norms in the period following the abolition of the poll tax.

A Temporary Shock to Intrinsic Motivation We now investigate the response to a temporary fall in the in the average level of intrinsic motivation $i_{c,t}$. In the data, we will argue that this corresponds to council-specific shifts in evasion norms that were triggered by the Thatcher government's introduction of a poll tax and associated with reduced tax compliance. Many taxpayers perceived the poll tax to be unfair because there was no link between the tax liability and the ability to pay.[11] This lead to a reduction in the intrinsic motivation to pay taxes, but the underlying shock was temporary: the poll tax was abolished in 1993 and replaced by essentially the same property-value based system as the one that had prevailed before 1990.

To capture the poll-tax episode, we consider the following path for mean intrinsic motivation:

$$i_{c,t} = \begin{cases} \hat{\imath}_c & \text{for } t < \underline{T} \text{ and } t > \overline{T} \\ i'_c < \hat{\imath}_c & \text{for } \overline{T} \geq t \geq \underline{T} \ . \end{cases}$$

[10] Because the underlying distribution of v is unimodal and symmetric around zero, the minimum value of Δ_v occurs at $v = 0$. Thus the density $g(\hat{v}_c)$ is declining (increasing) in $\hat{v}_c$ for cutoffs above (below) zero.

[11] This is consistent with the ideas in Cummings et al (2009) who show that there is link between willingness to pay taxes and perceptions of the quality of government. The evidence discussed in Hoffman et al. (2008) supports the idea that perceptions of fairness of the tax system shape attitudes towards tax compliance.

Note that if $\mu = 0$, so that social norms were not important, there would be discrete jump down during the period when motivation falls followed by a return to the previous level of compliance. However, since $\mu > 0$, there is a dynamic path with persistence which we now study.

As before, denote the initial steady-state value cutoff by $\hat{v}_c$. Moreover, define an interim value

$$\widetilde{v}_c = \hat{v}_c + \frac{1}{1 + \mu\Delta_v(\hat{v}_c)}(i'_c - \hat{\imath}_c) > \hat{v}_c \ ,$$

which is the hypothetical new steady-state cutoff, had the shock to $i_{c,t}$ been permanent. Then, we have the following result:

Proposition 2 *The dynamic effect on tax evasion – the impulse-response function – of a temporary decline in intrinsic motivation depends on the sign of Δ_v. If $\Delta_v < 0$, the proportion of tax evaders increases monotonically from $G(\hat{v}_c)$ and stays in the range between $G(\hat{v}_c + \hat{\imath}_c - i'_c)$ and $G(\widetilde{v}_c^-)$ as long as $\overline{T} \geq t \geq \underline{T}$. Then, the proportion of tax evaders starts to fall monotonically back to $G(\hat{v}_c)$. If $\Delta_v > 0$, the proportion of tax evaders, rises to $G(\hat{v}_c + \hat{\imath}_c - i'_c)$ in $t = \underline{T} + 1$, and then oscillates in a range from $G(\hat{v}_c + \hat{\imath}_c - i'_c) < G(\widetilde{v}_c^-)$ to $G(\widetilde{v}_c^+) < G(\hat{v}_c + \hat{\imath}_c - i'_c)$ as long as $\overline{T} \geq t \geq \underline{T}$. Then, the proportion of tax evaders starts to oscillate back towards $G(\hat{v}_c)$.*

Proof. These results follow from the fact that the model can be solved recursively. Thus, as long as $\overline{T} \geq t \geq \underline{T}$ – i.e., the lower value of i_c is in place – the dynamics are the same as they would have been if the shock to i had been permanent. The impulse-response function $v^*_{c,t} - v^*_{c,t-1} = -(-\mu)^{t-1-T}[\Pi_{s=T}^{s=t-2}\Delta_v(v^*_{c,s})](i'_c - \hat{\imath}_c)$ over these years is thus analogous to that in (5) When i returns to its former value, $v^*_{c,t}$ returns back to $\hat{v}_c$ in a monotonic (oscillating) way, when $\Delta_v < 0$ ($\Delta_v > 0$). The results for $G(v^*_{c,t})$ again follow from the monotonicity of G. ■

This provides a useful guide for the empirical analysis below. Since the variation in tax evasion prior to the introduction of the poll tax experiment was small, we hypothesize there being a common starting value for tax evasion. However, we postulate that councils experienced heterogeneous shocks $i'_c - \hat{\imath}_c$, reflecting the different socioeconomic makeup of the relevant population. Proposition 2 then predicts that councils with larger increases in evasion in the poll-tax years 1990-1992 should return more slowly to pre-poll tax levels of evasion. Moreover, their evasion rate should stay above that in councils with smaller poll-tax shocks to evasion throughout the adjustment towards the new steady state.

Endogenous Enforcement So far, tax enforcement has been exogenous. We now sketch an extension where enforcement is set according to a simple adaptive rule. To motivate this, observe that the revenue raised by council c in year t is given by

$$r_{c,t} = (1 - G(v^*_{c,t}))x_{c,t} \ . \tag{7}$$

Suppose that the council has a target level of revenue $\overline{r}_{c,t}$ with a quadratic cost of deviating from this target. Stronger enforcement at a quadratic cost indexed by $\theta_{c,t}$ can increase revenues. One can think about the changes in political control that we exploit empirically as affecting these parameters, which govern the priority the council attaches to tax evasion. Specifically, a shift into single-party majority control can be interpreted as a (permanently) higher value of $\bar{r}_{c,t}$ (or a lower value of $\theta_{c,t}$).

The council government sets $m_{c,t}$ to minimize total costs in period t,[12] taking the social norm in the previous period as given. Thus, we obtain

$$m^*_{c,t} = \text{argmin}_m \left\{ \frac{1}{2}[(r_{c,t} - \overline{r}_{c,t})^2 + \theta_{c,t} m^2] \right\} = \frac{(\overline{r}_{c,t} - r_{c,t}) g(v^*_{c,t}) x_{c,t}}{\theta_{c,t}} \ . \tag{8}$$

Thus, if $r_{c,t} < \overline{r}_{c,t}$, the council responds to the gap between its revenue and the target. The response is more aggressive if the tax liability ($x_{c,t}$) is higher, if the response of the tax base (represented by $g(v^*_{c,t})$) is more elastic, or if the marginal enforcement cost $\theta_{c,t}$ is lower.

Using this simple policy rule, we can show that the contemporaneous response, as well as the dynamic response, of the cutoff $v^*_{c,t}$ have the same signs but smaller magnitudes than in the absence of enforcement.[13] Therefore, the qualitative predictions in Propositions 1 and 2 and in Corollary 1 remain valid.

[12] This is a purely static objective – a more ambitious model would also take into acount the dynamic effects, via changing future social norms, of today's policy.

[13] Consider a shift in $i_{c,t}$.Using (7), (8), and (4), the contemporaneous response of the cutoff to this shift is given by:

$$\begin{aligned} \frac{dv^*_{c,t}}{di_{c,t}} &= \frac{\partial v^*_{c,t}}{\partial i_{c,t}} + \frac{\partial v^*_{c,t}}{\partial m^*_{c,t}} \cdot \frac{\partial m^*_{c,t}}{\partial i_{c,t}} = \\ &- \left(1 + \frac{\left[g\left(v^*_{c,t}\right) x_{c,t} \right]^2}{\theta_{c,t}} \left[1 - \left(r_{c,t} - \bar{r}_{c,t} \right) \frac{g'\left(v^*_{c,t}\right)}{g\left(v^*_{c,t}\right)} \right] \right)^{-1} . \end{aligned}$$

The second-order condition associated with the minimization in (8) implies that this expression is less than -1, the effect in the absence of an enforcement response. Thus the endogenous enforcement response dampens the response to the shift in norms. The dynamic responses are similarly dampened by endogenous enforcement with:

$$\begin{aligned} \frac{dv^*_{c,t}}{dv^*_{c,t-1}} &= \frac{\partial v^*_{c,t}}{\partial v^*_{c,t-1}} + \frac{\partial v^*_{c,t}}{\partial m^*_{c,t}} \cdot \frac{\partial m^*_{c,t}}{\partial v_{c,t-1}} \\ &= -\mu \Delta_v(v^*_{t-1}) \left(1 + \frac{\left[g\left(v^*_{c,t}\right) x_{c,t} \right]^2}{\theta_{c,t}} \left[1 - \left(r_{c,t} - \bar{r}_{c,t} \right) \frac{g'\left(v^*_{c,t}\right)}{g\left(v^*_{c,t}\right)} \right] \right)^{-1} . \end{aligned}$$

Summary Putting the results on permanent enforcement shocks to $m_{c,t}$ and heterogeneous shocks to intrinsic motivation $i_{c,t}$ together, we can also test Corollary 1. Specifically, we can consider the impact of the shifts in tax enforcement in the post-poll-tax period triggered by changes in the political majority controlling a council. Corollary 1 can then be tested by comparing the evasion responses to these enforcement shocks in councils that had different levels of tax evasion due to heterogeneous shocks to norms during the poll-tax period.

3 Data

Our data forms an unbalanced panel of 376 local authorities (councils) in England and Wales over 30 years between 1980 and 2009. This section describes the sources and definitions of our measures of tax evasion, electoral outcomes and tax enforcement. Throughout, our unit of observation is a council-year. Councils are separated into different classes referred to as London Borough, Metropolitan District, English Unitaries, English Districts, and Welsh Unitaries. These differ in several dimensions, including their electoral structure. However, all councils share two important characteristics: they are responsible for collecting the tax bases that we study, and their local policies are determined by the political make up of a legislative assembly of locally elected councillors.

3.1 Tax Evasion

A Brief History of Local Tax Bases Although there were changes in the tax base during the period that we study, the local council has retained responsibility for enforcing and spending the revenue it collects from taxes levied on households.[14] Prior to the introduction of the poll tax, a system of local rates had been in use since 1601 with minor exceptions. Rates were levied on all properties based on a measure of their rental value and was assessed by the Valuation Office which would uprate the value in line with improvements. Rates were payable by the occupiers of a property whether it was used for domestic or business purposes.

In 1990, domestic rates were replaced by the community charge, popularly referred to as "the poll tax". This delinked the tax base from property values and was levied at a flat rate per head tax. A small number of groups – including nuns, criminals and recipients of income support – were exempted. Other lower income groups, such as students and those

The expression on the right-hand side is smaller in absolute magnitude than $-\mu\Delta_v(v^*_{t-1})$, which was the response in the exogenous enforcement model.

[14]Councils had complete ownership of revenue collected from business property taxes only up until 1989. Under the 'national non-domestic rates' from 1990, the business property tax continued to be enforced by the council, but the revenue was transfered to central government, and then partially redistributed back to councils, according to a centrally set multiplier.

registered as unemployed, were liable for 20% of the standard amount. Otherwise, the poll tax charge was levied independently of an individual's income and wealth. In particular, it was independent of the size and value of the housing. Ostensibly, the aim of this reform was to improve political accountability by creating an equal stake for every citizen in a local jurisdiction. But the experiment badly backfired, with major protests and riots accompanied by unprecedented levels of tax evasion.

In 1993, the poll tax was abolished and replaced by the current council tax. This tax is based on the value a property would have sold for in the open market on April 1st 1991.[15] The Valuation Office individually assessed each property and assigned it to one out of a given set of preassigned valuation brackets. The council sets the council tax rate, which implies a liability for each bracket. Thus, the council tax results in one bill for each household which occupies any specific property.

Definition and Sources We calculate a measure of yearly average tax evasion for each council ($G(v^*_{c,t})$ in the model) as the difference between net collected tax revenue and net tax liability in a given year ($x_{c,t}$ in the model). This is then expressed as a percentage of net liability. That is the measure of evasion used in Figure 1 for the three different tax bases in the three periods 1980-89, 1990-92 and 1993-2009. It is also our main outcome measure of evasion throughout the paper.[16]

Under the current council-tax system (from 1993), as well as the rates system (in 1980-89), councils combine a registry list of all properties with independently assessed valuations of these properties to draw up a tax liability for all households. Under the poll tax (during the years 1990-92), councils relied on population registers used in the rates system to count the number of adult individuals liable for the tax. This makes the total liability per household a straightforward calculation. Since no deductions are allowed against other taxes, yearly household payments are known to the councils. This makes it straightforward – for the councils and for research purposes – to measure and track tax evasion.

No publicly available long-run administrative estimates of evasion rates exist, either for the council tax or for the poll tax or the rates system. However, the Department for Communities and Local Government, together with the Office of National Statistics, published estimates of collection and evasion rates for the council tax over the period 2006-2011 (Communities and Local Government, 2011). For 2009, our average measure of evasion for the UK is 2.69%,

[15] There have been talks of re-valuation of properties in England, but these have systematically been postponed. However, in Wales, re-valuation of properties occured in April 2003.

[16] We calculate tax evasion separately for each year. Collected revenue is measured net of any tax that was collected from outstanding arrears from previous years. Similarly, net liability is calculated as gross liability minus all exemptions and outstanding arrears carried forward from previous years. We are thus reasonably confident that our measure of evasion is net of any lagged evasion-related error component, which is important for interpreting our decay and dynamic path results.

against theirs of 2.90%. It is reassuring that, at the council-matched level,[17] the correlation is 0.99.

Our definition of evasion allows us to maintain a consistent measure over the entire time period. Data on evasion is constructed from two series produced by the Chartered Institute for Public Finance and Accountancy (CIPFA).[18] We have digitized CIPFA's series for all years prior to 1996, with a resulting sample size of 8,719 council-year evasion observations.[19] To the best of our knowledge, this dataset is the first to measure tax evasion in a consistent way for the three regimes of local household property taxation in the UK.[20]

Evasion in the Three Tax Regimes According to our measure, the pre-1990 rates system had high compliance with mean evasion at 2.8%. By contrast, the introduction of the poll tax immediately led to an immediate rise in evasion. Compared to the last two years of the rates system (1988-89), average evasion in the first two years of the poll tax went up by nearly 550%. At the same time, the distribution of evasion across councils shifted notably rightward with a flattening out of the distribution (Figure A1 of the Online Appendix shows the marginal density distributions). This indicates a heterogeneous change in evasion behavior, which can be readily interpreted as a set of heterogenous shifts in norms ($i_{c,t}$ in the model).[21] The most plausible interpretation of this heterogeneity is the different socioeconomic make up of different areas of the UK. At the shift towards the council tax over 1993-94, the distribution of evasion responses started moving back to the left with a large relative decrease in the spread. Figure 1 shows that the average evasion on the council tax base in these two transition years is close to 6.3%. At around half the average evasion in the last year of the poll-tax system, this is still 125% higher than average evasion in the rates system. The distribution of evasion across councils during the remaining years of our sample (1995-2009) more closely resembles the pre-poll tax distribution, but a higher mean as well as a larger spread suggest persistent effects of the poll-tax shock on evasion behavior.

[17] Council-level evasion measures in the administrative data were only available in 2008-11

[18] CIPFA is a professional accountancy body which collects a large set of statistics on the functioning on the councils. CIPFAStats produces the Revenue Collection series and has been producing local government data for over 100 years.

[19] For years 1980-1989 we relied on the annual "Rate Collection Statistics, Actual"; from 1990 to 2009, we use the annual "Revenue Collection Statistics, Actual."

[20] Besley, Preston and Ridge (1997) study the determinants of evasion during the poll tax era and our data are consistent with theirs during this period.

[21] When the poll tax was introduced in 1990, there was also a significant increase in average local tax rates. But the increase in VAT-rates in 1991 allowed for a large average reduction in poll tax liability of 110 pounds (relative to an average of 340 pounds). Nevertheless, evasion continued to steeply increase in 1991 (Figure 1).

3.2 Electoral Outcomes

To explore the relationship between majority control and evasion (recall Figure 2), we collect data on electoral outcomes in all councils between 1980 and 2009. First-past-the-post elections are held at the level of the ward, a smaller geographical unit than the council. Each ward returns between one and three members to represent it on the local council. Currently, English districts, London boroughs and Unitaries average 23 wards. The distribution of council size is roughly bell-shaped, with a mean and standard deviation of 49 and 12 seats, respectively.

Our data include a breakdown of council seats by political party in all of the councils in all years.[22] Based on 10,434 council-year composition observations, we can construct a measure of single-party majority control. Specifically, we define a binary indicator equal to one whenever one of the political parties controls 50% or more of the total seats on the council. This captures the possibility that policies are more cohesive when a single party rather than a coalition runs the council. In particular, we hypothesize that this cohesion might facilitate greater agreement on the use of tax revenue and therefore a stronger incentive to enforce the payment of outstanding tax liabilities.

The electoral cycle varies depending on the type of authority. London boroughs elect all members at a single election every four years, while metropolitan districts return a third of their members on a rotating basis in three out of every four years. Unitaries and non-metropolitan districts have a choice to opt for either system and are allowed to change between the two. This heterogeneity in the number of returned seats per election and in the timing of elections is well suited to our empirical Regression Discontinuity Design (RDD). We use narrow shifts in political majority control of the council, and the number of years this tight majority remains in place, as sources of identifying variation. The specific definitions of close elections are presented in Section 4.2.

To the best of our knowledge, this paper is the first to use data on UK local electoral outcomes up until 2009. Besley and Preston (2007) use local council seat-share data over the 1973-98 period to study how districting bias in favor of a party impacts electoral incentives and policy outcomes. Eggers et al. (2013) use such data over the 1945-2003 period in their meta-study of close election outcomes.[23] However, neither of these papers studies the impact of electoral outcomes on local tax evasion.

[22] These data were obtained from the Elections Centre at Plymouth University.

[23] That paper is motivated by critiques of RDD studies of U.S House elections, on the argument that the previous vote share remains highly correlated with victory even in close elections. Howevere, Eggers et al. (2013) find no evidence of such sorting in the case of close UK local elections, which provides support of the identifying assumptions for our RDD framework.

3.3 Enforcement

We collected measures of enforcement in order to test the relationship between switches in majority control and council-tax enforcement. This relationship is intended to support our use of majority switches as shocks to tax enforcement of the kind that were studied theoretically in the previous section.

The data source used here is the same series of CIPFA publications used to construct the evasion measure (Section 3.1). If a household does not comply with council-tax payments, the first action of the council is to send out a reminder of payment due. If non-payment persists, or payment in full is not received, the council can summon the household to attend a court hearing. Only when a summons order has been issued may the council proceed to recover the debt using other methods than direct payment, including (in order of severity) taking money directly from wages and benefits, ordering bailiffs to collect the amount due, placing a lien on the property, and starting proceedings for a prison sentence. In practice, the debt is usually recovered before the final steps are reached. However, the summons is needed to initiate a more severe action. Thus reminders sent is routine and constitutes a 'soft' signal of enforcement while issuing a summons is a more directed and costly effort by the council.

Based on this, we chose the ratio of court summons issued to non-payers relative to the number of reminders issued to non-payers in a council-year as our core enforcement measure. In our sample, the council sends out an average of 0.31 summons per reminder (standard deviation 0.28, 25th percentile 0.17, 75th percentile 0.35). If this measure captures exogenous enforcement as defined in our theory, then it should predict decreases in tax evasion. On the other hand, if this measure simply reflects an endogenous response to evasion, we would observe a positive correlation with evasion. If we regress them on the council tax base in a cross-sectional regression, then both reminders and summons are positively correlated with evasion. However in a within-council regression – i.e., including council fixed effects – the ratio of summons to reminders is negatively correlated with evasion, with an elasticity of -0.62 (standard deviation 0.12). This suggests that our core measure could be a good measurement of enforcement effort. In the empirical section to follow, we interpret the variation in this ratio induced by majority switches as an exogenous shock to enforcement corresponding to Proposition 1.

4 Evidence

In this section, we use the data introduced in Section 3 to shed light on the theoretical predictions formulated in Section 2. In the first subsection, we look at the persistence of social norms, by highlighting the heterogenous evasion responses to the "poll-tax shock" and by following the evolution of tax evasion in the council-tax regime that followed the abolition of the poll tax. Here, we test the predictions in Proposition 2. In the second subsection, we consider the impact on tax evasion via shifts in enforcement generated by random switches in and out of single-party majority in local councils. Combining this analysis with the findings from the first subsection, we can evaluate the predictions in Proposition 1 and Corollary 1. Specifically, we try to gauge whether the effect of the narrow political shifts on tax evasion is indeed heterogenous depending on the initial level of evasion.

4.1 Persistence of Social Norms

Figure 1 discussed in the introduction shows that average tax evasion – measured as described in Section 3.1 – goes up to between 10 and 15% during the years of the poll tax. It then begins to decline immediately after the introduction of the council tax in 1993. We will interpret the changes in evasion during the poll-tax period as council-specific shifts in the average intrinsic motivation to comply with taxes ($i_{c,t}$ in the model). Then, we can then study the dynamics using the predictions about the impulse-response function in Proposition 2. In particular, we expect councils with the largest increases in tax evasion between 1990 and 1992 to have a larger share of tax evaders in the council-tax era. Moreover, we expect this share to fall over time but to stay above the share of tax evaders in councils with less poll-tax evasion.

Figure 3 about here

For high and low, a natural sample split is between councils with above and below median evasion during the poll-tax era. Figure 3 compares the evasion level data for these two sub-groups with the above-median poll tax evading councils marked in red and the below-median poll-tax evasion councils marked in blue. The graph is striking. We see no difference in tax evasion in the decade preceding the poll-tax experiment. However, following this experiment, the share of tax evaders in the high poll-tax evasion councils lies everywhere above that in the low poll-tax evasion councils. This is consistent with the basic idea of a dynamically evolving social norm for evasion in our model.

Non-parametric Estimates Table 1 examines the persistence of evasion, in relation to evasion in the poll-tax era, more formally by within-council non-parametric estimation. Specifically, we regress evasion in the council-tax period on an indicator for above-median poll-tax evasion interacted with a full set of year indicators from 1993 to 2008 (2009 is the left-out indicator). In effect, we are estimating separate year effects for the two sub-groups in Figure 3. Column 1 includes only council fixed effects and year fixed effects. The former capture a plethora of fixed sociodemographic factors which are likely to affect evasion at all points in time and thereby capture the 'normal' value of $i_{c,t}$.

All the year dummies for high poll-tax evasion councils are significantly different from zero from 1993 until 2002. This suggests a persistent effect up to ten years after the poll tax is abolished. The estimated coefficients are plotted in Figure 4 together with their 95% confidence intervals. Column 2 adds to the specification a set of linear council-specific time trends. This changes the estimated coefficients only very marginally. Thus, the dynamic path followed by high poll-tax evading councils looks strikingly different from that of low poll-tax evading councils.

Table 1 about here

Figure 4 about here

Robustness Checks A plausible critique of these results is that the council-specific shifts in tax evasion in the poll-tax era need not only reflect variation in intrinsic motivation to comply with taxes. In particular, they may vary systematically with economic, social and political variables. For example, people in Labour-dominated councils may have been more upset about the Thatcher government's poll-tax policy and will thus be more motivated to evade taxes as a form of protest. The Online Appendix constructs a measure of residual tax evasion based on the residuals from a regression that includes a number of observable council-specific variables, including the size of the poll-tax liability, (log) per-capita income, (log) population, the seat shares of the Conservative and Labour parties, and dummies for Conservative and Labour majority control (see Table A1). Figure 5 shows estimated coefficients analogous to those reported in Figure 4, but where the indicator is now based on whether the council had above-median *residual* poll tax evasion. If anything, these results are stronger than those for gross tax evasion in Figure 4.

Figure 5 about here

Similarly, all of the results in Figure 3 and Table 1 also hold up when we rerun the analysis for this measure of residual tax evasion (see Table A2 and Figure A2).

A standard concern about these kind of difference-in-difference estimates is that they may reflect some pre-trend which is accentuated after the supposed natural experiment. To verify that this is not the case, we run the same regression as in Table 1 for tax evasion for the rates system during 1980-89. Here, we interact year indicators for 1981-1989 (leaving out the 1980 dummy) with the indicator for above-median poll-tax evasion. The estimated coefficients are plotted in Figure 6. None of these is statistically different from zero except for a marginally significant 1984 indicator. Thus, whatever source of heterogeneity is uncovered by poll-tax compliance to persist for ten years was not observed in the prior period. This makes it plausible to attribute the evasion patterns to a break-down of norms following the introduction of the poll tax.

Figure 6 about here

An equivalent exercise using the residual poll tax evasion indicator gives very similar results (Online Appendix, Figure A3).

Finally, our whole analysis of heterogenous persistence splits the sample by the median level of tax evasion during the poll-tax period. As shown in the Online Appendix, all the results go through if we instead split the sample of councils into those below and above the 75th percentile of evasion during the poll-tax tax period (see Figures B1-B3 and Table B1).

Summary Taken together, the results show persuasive evidence in line with the idea that the poll tax shifted tax compliance norms, and that these shifting norms exerted a significant but declining effect on tax evasion for around a decade after the poll tax. Specifically, councils with high poll-tax evasion had significantly higher tax evasion throughout this decade compared to councils with low poll-tax evasion.

4.2 Enforcement

One concern with the results presented so far is that they do not consider how council enforcement decisions are determined. Ideally, we would like to find a factor which plausibly influences enforcement without having other direct effects on evasion. Here is where the close elections, which trigger changes in political control, come in. When elections are close in this way, we assume that the random variations in election outcomes do not reflect factors that have a direct bearing on individual evasion decisions.

Close Elections We study how narrow shifts into, or out of, single-party control (discussed in Section 3.2) affect tax evasion and our measure of enforcement (discussed in Section 3.3). Close elections are defined as elections that lie within the optimal bandwidth for RDD estimation proposed by Imbens and Kalanyaramanan (2012) – IK in the following. When applied to our data, their algorithm returns a bandwidth just above 3 percentage points. We also consider alternative definitions with half and double the optimal IK bandwidth. The number of close elections is sizeable with all three definitions – 883, 1877 and 3470 elections respectively over the entire sample period.[24]

The Impact Effects of Majority Shifts We now show that narrow shifts in and out of single-party council majority systematically affect the levels of tax evasion and enforcement ($G(v^*_{c,t})$ and $m_{c,t}$ in the model). Figure 2 already gave some evidence in support of this possibility, which we now explore in a more systematic way. To that end, Table 2 presents

[24] Figure A4 in the Online Appendix plots the number of close elections in all sample years according to the three bandwidth sizes

RDD estimates of the *impact effects* of a random switch into single-party majority. The upper pane shows estimates for tax evasion while the lower pane shows estimates for enforcement. The specification throughout the table is an RDD-design based on local-linear regression within narrow intervals, namely the optimal IK bandwidth, as well as half and double this bandwidth. In each panel, we show four sets of estimates, with (i) no controls, (ii) council fixed effects, (iii) these plus year fixed effects, and (iv) these plus controls for tax liability and (log) per-capita income.

Table 2 about here

The reduced-form results for tax evasion in the upper panel are strong. The estimates for the optimal IK bandwidth suggest that a random switch into single-party majority reduces tax evasion by about 2 percentage points, which is just below the mean of the dependent variable in the sample. This effect is quite precisely estimated and changes little as we include different sets of controls. The estimates for the smaller bandwidth are (considerably) higher, while those for the larger bandwidth are a little lower.

The results for the ratio of summons to reminders – our measure of tax enforcement – are somewhat weaker. The point estimates with the optimal IK bandwidth suggest that a switch into a single-party majority raises this ratio by about 0.06, which is about 20% of its mean (0.31). But only three out of the four estimates are statistically significant at the 10% level or better. In this case, the point estimates for smaller as well as larger bandwidths are generally lower as well as noisier. The estimates are also less stable when we vary the set of controls.

Robustness Checks To assess whether these results are robust, Table 3 provides estimates with some alternative RDD specifications. Here, we vary the interval for the running variable – i.e., the seat share percentage for the largest party – to be $\pm 5\%$, $\pm 10\%$, and $\pm 20\%$ from the switchpoint at 50%. All regressions include a control function, which is either quadratic or cubic. For tax evasion in the upper pane, we only show the estimates without any controls (as the results in Table 2 were robust to including controls). But for the enforcement proxy in the lower pane, we show the estimates with and without controls.

Table 3 about here

The earlier estimates for tax evasion hold up well, both for the quadratic and cubic control functions. Thus, the effect of a switch into single-party majority control varies around the earlier estimate of about -2 percentage points. As in Table 2, the estimates for tax enforcement are less precise. They are significant only when we include the full set of controls, both for the quadratic and the cubic control functions.

Figure 7 about here

As another robustness test, we show how the RDD estimates for tax evasion change with the interval for the running variable, always using the same local linear specification as in Table 2 (without any controls). Figure 7 shows the resulting estimates for small stepwise increase of the width of the estimation interval around its switchpoint at 50%. The estimate stabilizes somewhere just above -2 percentage points as the interval grows toward $\pm 10\%$.

Following the standard practice in papers based on RDD (see e.g., Imbens and Lemieux, 2008), we also present some tests of the identifying assumptions that underpin the empirical design. Thus, Figure 8 shows a diagram, which corresponds to the McCrary (2008) test for continuity of the running variable around the switch point. There is no visible discontinuity of the single-majority seat share margin. We also carry out placebo tests to ensure that switches in the running variable are not associated with jumps in any predetermined variable. Table 4 uses the same specifications as in Table 2, and shows that there are no jumps neither in the council tax liability nor in council income per capita.

Figure 8 about here

Table 4 about here

Dynamic Effects of Majority Switches The results in the last section refer only to the impact effects on enforcement and evasion of a random switch into single-party majority. But Proposition 1 and Corollary 1 in the theory refer to the impulse-response function of tax evasion, following a permanent change in enforcement. We now ask whether a political shock produces a permanent change in enforcement. To investigate this, we estimate a non-parametric regression where the proxy for enforcement is regressed on an indicator for a switch into majority control in year t interacted with a set of year-since-election indicators for $t+s,\ s=0,...,6$. The regression also includes council fixed effects, year-since-election dummies, a one-period lag of council-tax evasion and a quadratic control function in the largest seat share. The coefficients from the enforcement regression are displayed in Figure 9. The estimates suggest that enforcement (measured as the ratio of summons to reminders) increases in the year of the narrow single-majority switch and then stays higher for the subsequent six years. Apart from a dip in year 4, the point estimates vary around a level just below 0.05, which is 10-15% of the mean summons-reminders ratio (0.31). Four out of seven of them are statistically significant at the 5% level. While these results are not particularly strong, they are consistent with a permanent effect on enforcement from a shift in political control.

Figure 9 about here

Figure 10 about here

Figure 10 shows the estimates for the same specification, but with tax evasion as the dependent variable. We see a clear sign of a cumulatively larger effect over time: a significant negative impact effect just below minus 1 percentage point in year 0 which more than doubles (in absolute value) to year 6. This gradual decrease in evasion is entirely consistent with the prediction in Proposition 1 (for the strategic complements case).

The estimates in Figure 10 correspond to the non-parametric regression in Column 1 of Table 5, which refer to the entire Council-tax period 1993-2009. Column 2 adds to the council fixed effects a set of controls – (log) tax liability, (log) per-capita income, (log) population, and a set of dummies for labor or conservative political control. The point estimates become smaller in absolute value and some lose statistical significance, but their qualitative features with a cumulatively larger effect over time remains.

Table 5 about here

Heterogeneous Dynamic Effects The final question we pose is whether the data indicate a heterogenous effect of permanent enforcement shocks, via different social multipliers at different levels of tax evasion, as predicted in Corollary 1.[25] As in the results reported in Section 4.1, we split the sample into those councils that had above-median evasion and below-median evasion in the poll-tax period. Column 1 and Column 3 in Table 6 show estimates similar to those in Table 5, when we include council fixed effects and six-year fixed effects.[26] Even though the estimates are quite imprecise, all the estimated coefficients, except one, on the interacted majority-switch and year indicators are larger in absolute value for the below-median poll-tax evasion councils than for the above-median poll-tax evasion councils. These coefficients are displayed in Figure 11. Columns 2 and 4 show that the same results obtain when we also include the standard set of council-specific controls – (log) tax liability, (log) per-capita income, (log) population, and dummies for labor and conservative political control.

Table 6 about here

Figure 11 about here

[25] The RDD estimates of the impact of random switch into majority on enforcement (Table 2, lower panel) do not differ across the two samples of above and below-median evasion in the poll tax period. Results not reported here show that the 95% confidence interval of the point estimates for the two samples systematically overlap.

[26] We do not include single-year fixed effects, as they would absorb most of the year-to-year variation due to uneven majority swiches.

Robustness Checks The results hold up equally well when we replace the gross level of tax evasion with the residual level of tax evasion discussed in Section 4.1. Regression output, with and without controls, is reported in the Online Appendix (Table A3) and the estimated coefficients corresponding to Figure 11 are shown in Figure 12.

Figure 12 about here

As in Section 4.1, we can also perform the analysis by changing the sample split from councils below and above median evasion in the poll-tax era to those below and above the 75th percentile. The Online Appendix shows that the results reported above only get stronger with this alternative sample split (Table B2 and Figure B4).

Summary Our results on permanent enforcement shocks triggered by switches in and out of single-party majority square well with the model predictions summarized in Corollary 1. In terms of those predictions, the finding that an enforcement shock has a larger effect on council-tax evasion for councils with smaller poll-tax tax evasion means that a larger social multiplier $\frac{1}{1+\mu\Delta_v(\hat{v}_c)}$ outweighs the effect of a smaller density $g(\hat{v}_c)$ around the initial cutpoints for evasion.

Through the lens of the model, we have thus found *prima facie* evidence for an interaction of standard effects from enforcement and signalling-based social norms. In line with that interpretation, social norms exercise a larger crowding in of enforcement at lower levels of tax evasion, which shows up as larger social multiplier. The evidence also passes a number of robustness checks.

5 Conclusion

We have studied the persistence of social norms in tax evasion and the interaction between these norms and traditional forms of enforcement. We have built a model of the dynamics of tax evasion, by extending the approach in Benabou and Tirole (2011) to incorporate adaptive dynamics. The framework is helpful in choosing an empirical specification and permits a sharper interpretation of the econometric results.

The empirical analysis revolves around the introduction and abolition of the poll tax in English and Welsh councils in the early 1990s. This arguably undermined intrinsic motivation to pay taxes due to the perceived unfairness of the tax. Non-parametric estimates suggest that the negative shock to compliance in the poll-tax era reduced tax compliance norms in a persistent way, exerting a significant upward effect on tax evasion for around a decade after the abolition of the poll tax. Specifically, councils with high poll-tax evasion had higher tax evasion throughout this decade compared to councils with low poll-tax evasion, in line with the impulse-response function predicted by the theory for a temporary shock to the intrinsic motives to pay taxes. The findings are robust to common concerns such as pre-trends, omitted variables, and alternative ways of measuring the key variables.

We also provide evidence for social multipliers in tax-evasion behavior and interactions between incentives due to enforcement and the dynamics of social norms. Estimating dynamic paths of enforcement and evasion triggered by close election switches into majority control of a single party, our results suggest that a permanent increase in enforcement induces a cumulative negative effect on tax evasion. We also find a heterogenous crowding-in effect from enforcement, in the sense that the cumulative effect on tax evasion is larger in the councils with smaller poll-tax evasion, in line with the predicted impulse-response functions. To the best of our knowledge these empirical results are among the first to show explicit evidence for interactions between enforcement incentives and social norms in tax compliance.[27]

Although our focus has been on the positive implications of social norms, the join between theory and data leaves open the possibility of a normative analysis based on a sufficient-statistics approach (see Chetty 2009). Our empirical analysis uses the theory to identify two sets of critical effects: (i) the effect over time – the impulse-response function – on tax evasion of a temporary change in the intrinsic incentives to pay taxes, (ii) the impulse-response-function on tax evasion of a permanent change in enforcement, at different points of tax evasion. These are the key elasticties that would enter an analysis of optimal investments in tax enforcement in the presence of social norms. However, our observation that social norms may adjust slowly implies that the reduced-form elasticties are time-varying equilibrium responses rather than structural parameters.[28] Exploring the implications of models with norms for the normative analysis of tax compliance is an important topic for future applied research.

[27] See also Jia and Persson (2013) for related findings in a quite different context.

[28] This observation is related to the point in Slemrod and Kopczuk (2002) the the taxable income elasticity can depend on government enforcement policies.

References

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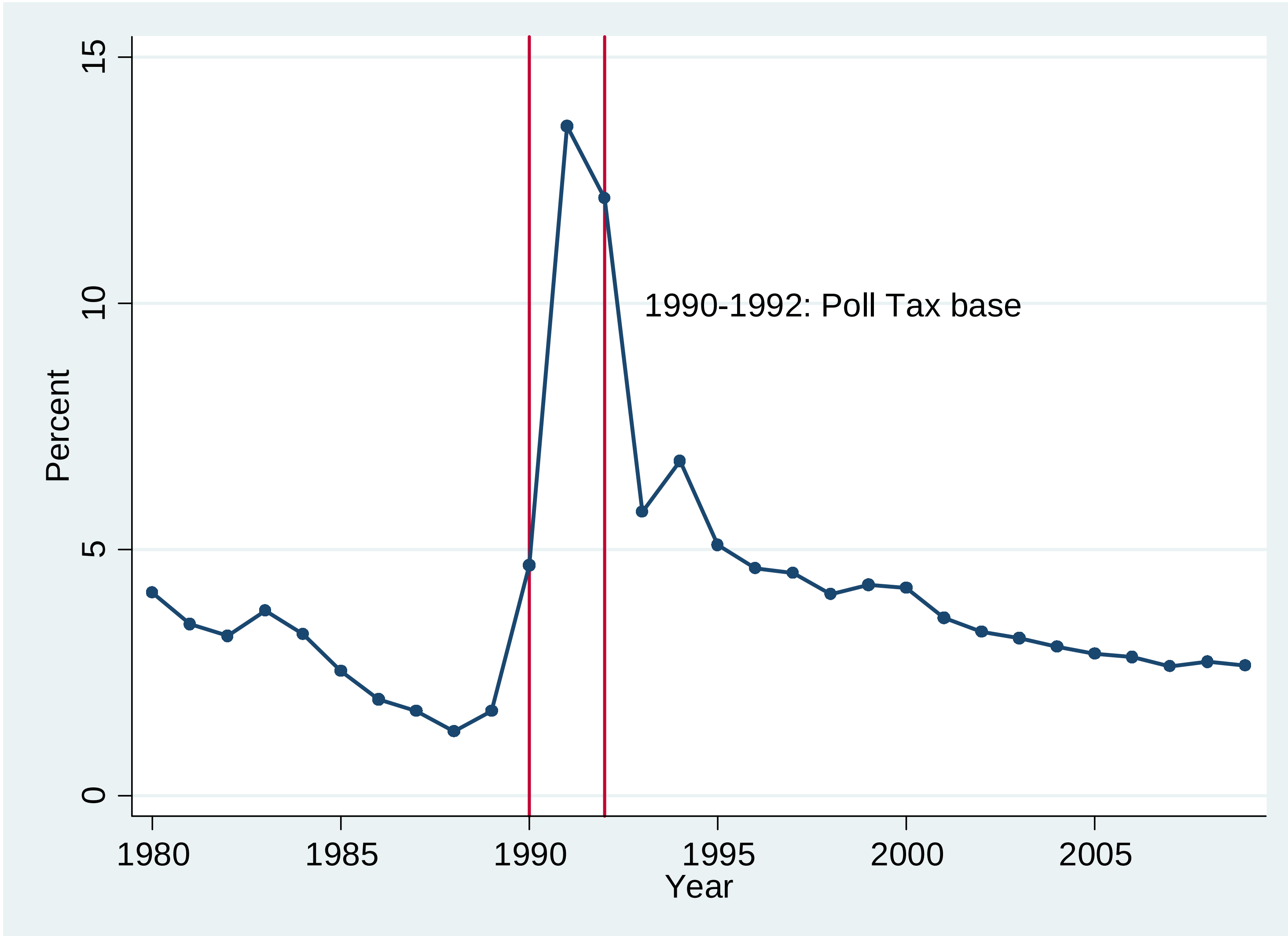
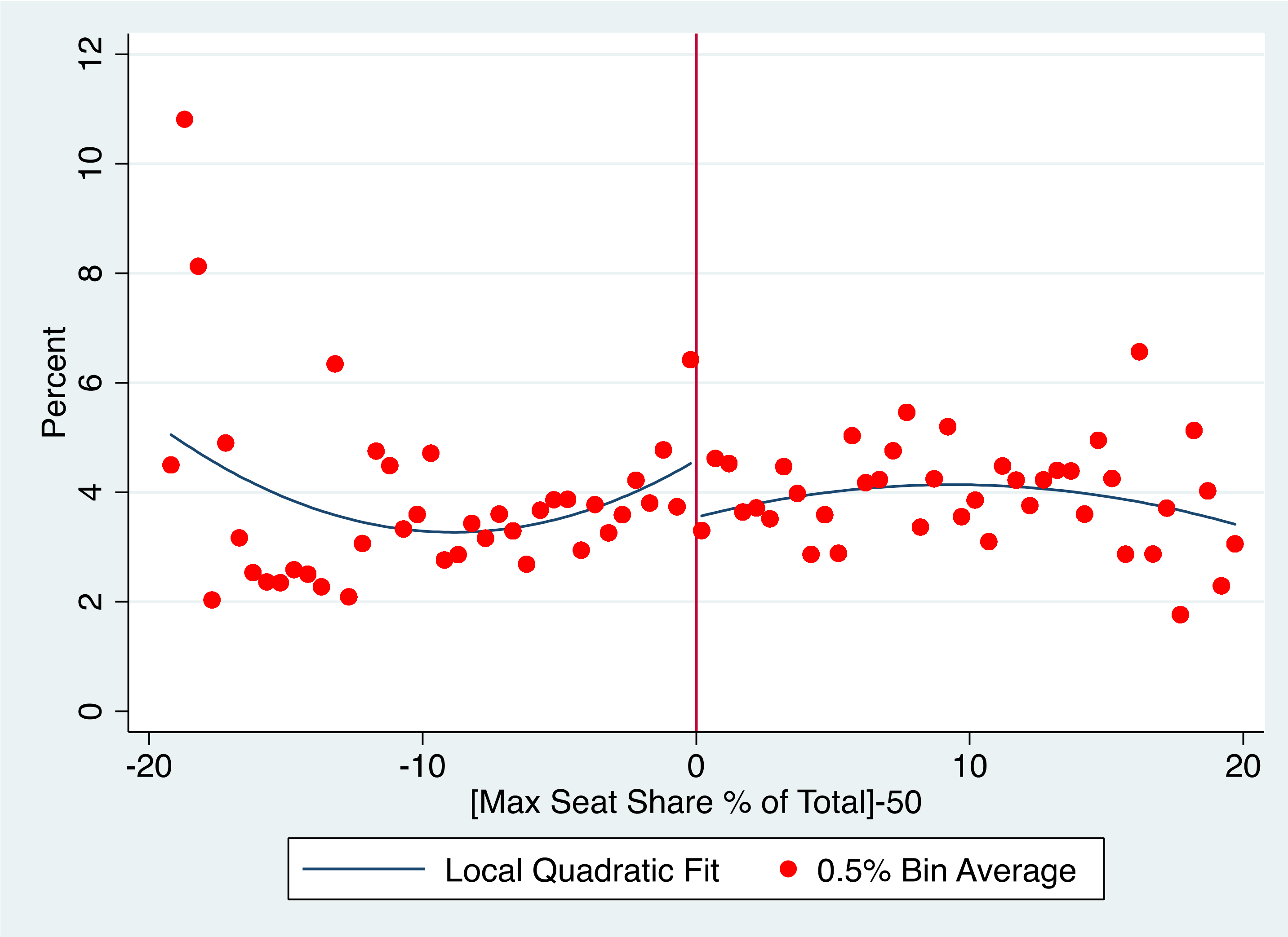
Figure 1 Tax Evasion 1980-2009



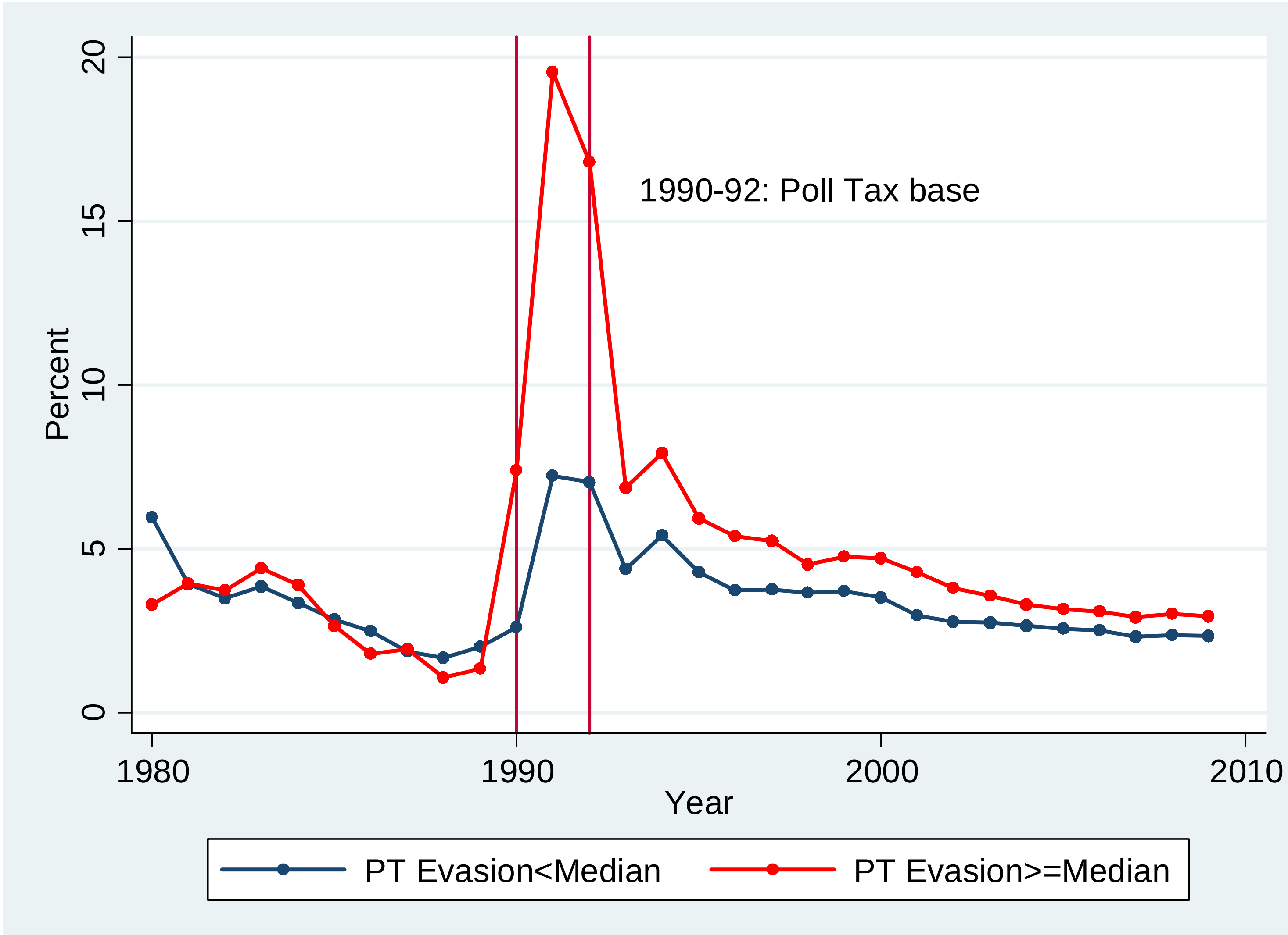
***Notes**:* Each observation is a yearly average across all councils of our main measure of evasion, the difference between net collected tax revenue and net tax liability on the local tax base. During 1990-1992, a property tax base was replaced by the poll tax, which was levied at a flat rate per head. See Section 3 of the text for further details.

Figure 2 Single-Party Majority and Tax Evasion



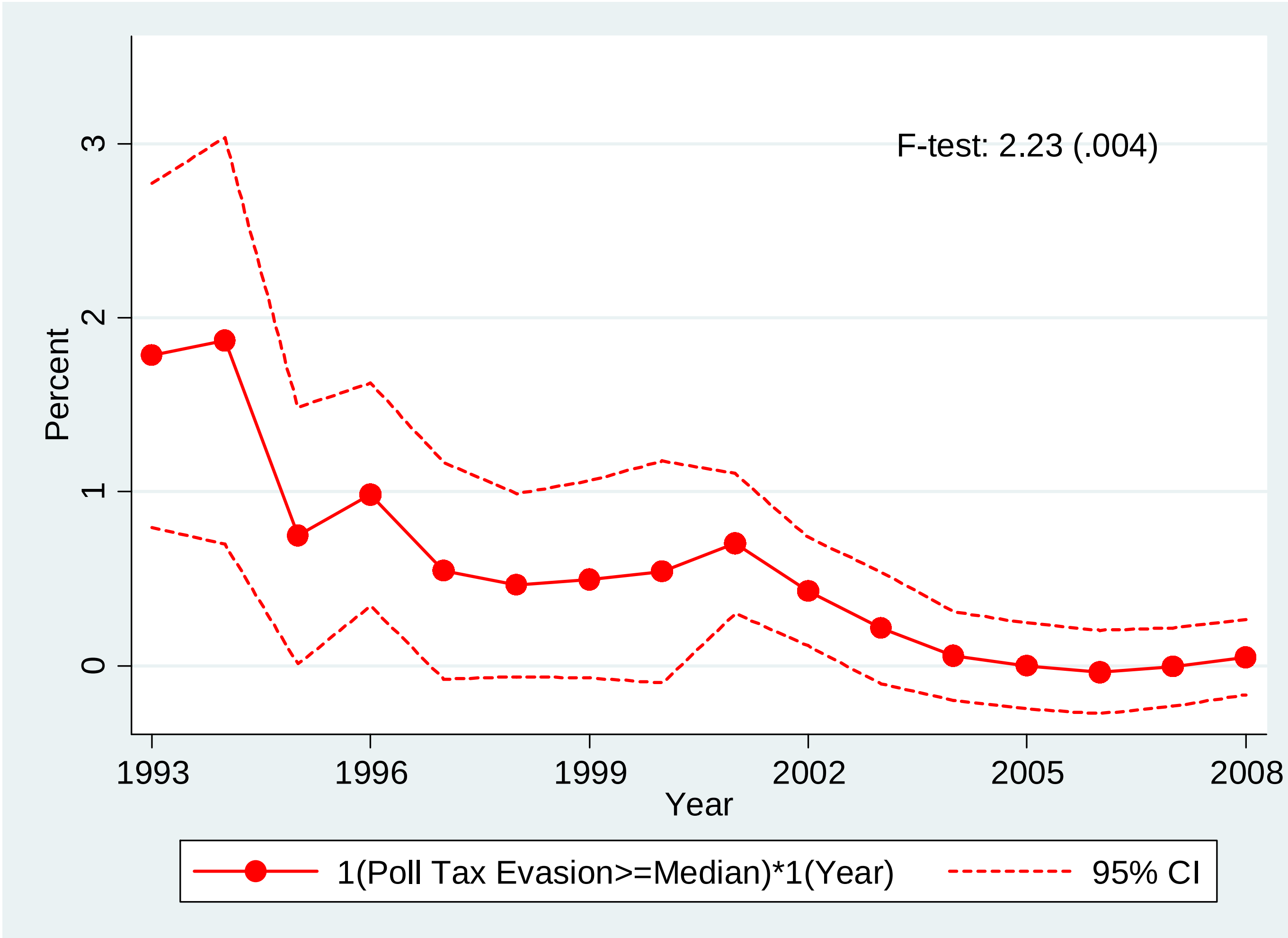
Notes: Each dot represents average tax evasion in a 0.5% bin of the difference between the largest party seat share and 50% in a given council-year, over the full sample 1980-2009. The vertical line is the single-party majority cut-off at 0. On each side of the cut-off, a separate quadratic control function is fitted to the set of observations.

Figure 3 Tax Evasion by Poll-Tax Evasion



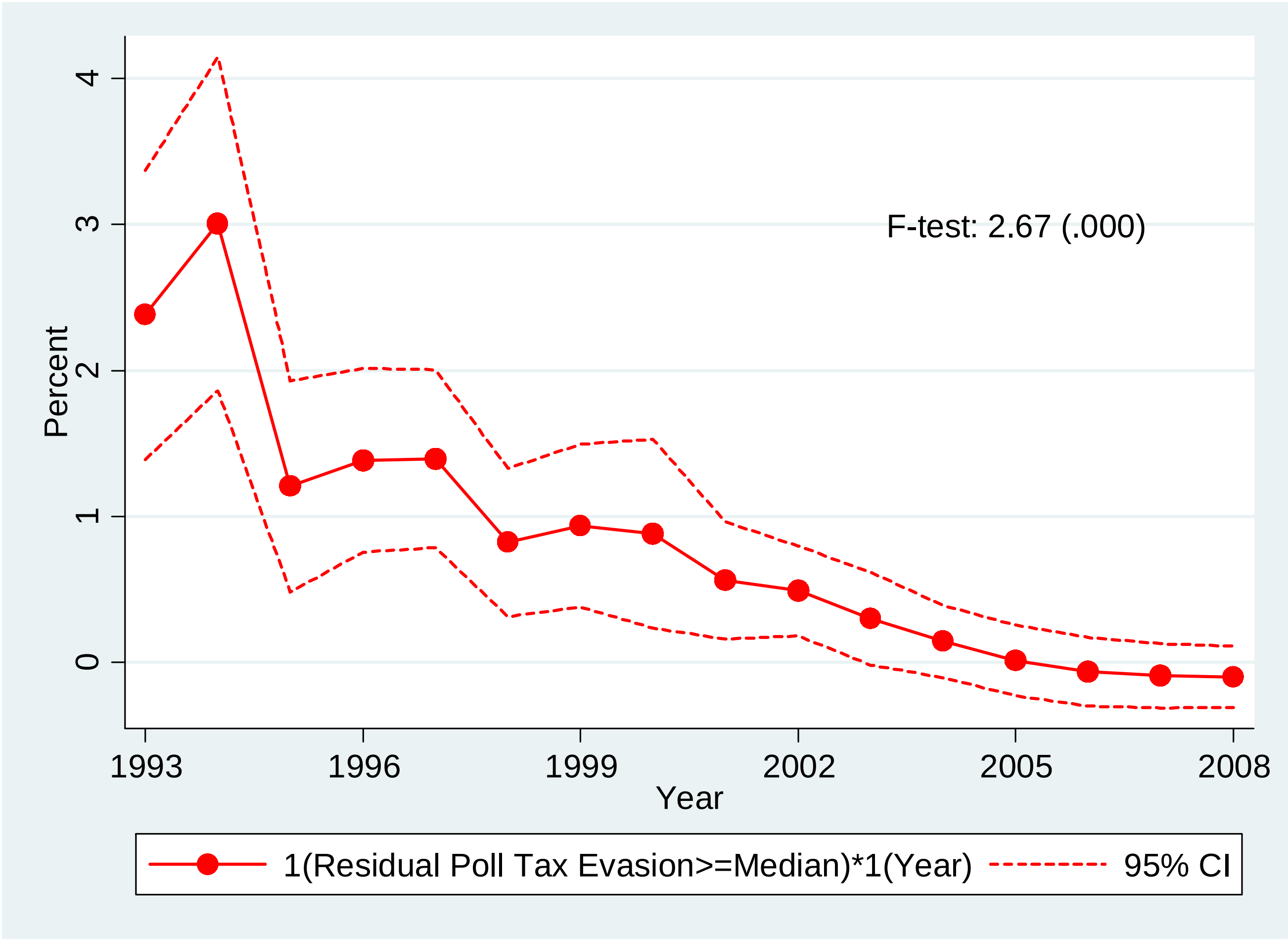
***Notes**:* Each yearly observation is an average of tax evasion across all councils in one of two subsamples: the blue line refers to the councils where (average) tax evasion in the poll-tax period was below the median; the red line refers to councils where poll-tax evasion was above the median. The cut-point – i.e., median poll-tax evasion between 1990 and 1992 – is at 9.27%.

Figure 4 Council-Tax Evasion by Poll-Tax Evasion



Notes**:* This graph plots the **1**(Year)1**(Poll Tax Evasion>=Median) coefficients from a regression of council-tax evasion on a set of year dummies, year-dummies interacted with a high poll-tax evasion dummy, and council fixed effects. The sample period is 1993-2009, which corresponds to the Council Tax period. The omitted year-dummy is 2009. Dashed lines denote the 95% confidence interval for the interaction term. The F-test (and its p-value) refers to the joint significance of all interactions **1**(Year)***1**(Poll Tax Evasion>=Median). The underlying regression results are displayed in column 1 of Table 1. See Figure 3 *Notes* and the main text for details on construction of **1**(Poll Tax Evasion>=Median).

Figure 5 Council-Tax Evasion by Residual Poll-Tax Evasion



Notes**:* This graph plots the **1**(Year)1**(Residual Poll Tax Evasion>=Median) coefficients from a regression of council-tax evasion on a set of year dummies, year-dummies interacted with a high residual poll-tax evasion dummy, and council fixed effects. The sample period is 1993-2009, which corresponds to the council-tax period. The omitted year-dummy is 2009. Dashed lines denote the 95% confidence interval of the interaction term. The F-test (and its p-value) refers to the joint significance of all interactions **1**(Year)***1**(Residual Poll Tax Evasion>=Median). Full regression output is given in column 1 of Table A1. See the main text (Section 4.1) for details on construction of **1**(Residual Poll Tax Evasion>=Median).

Table 1 Evolution of Council-Tax Evasion by High and Low Poll-Tax Evasion

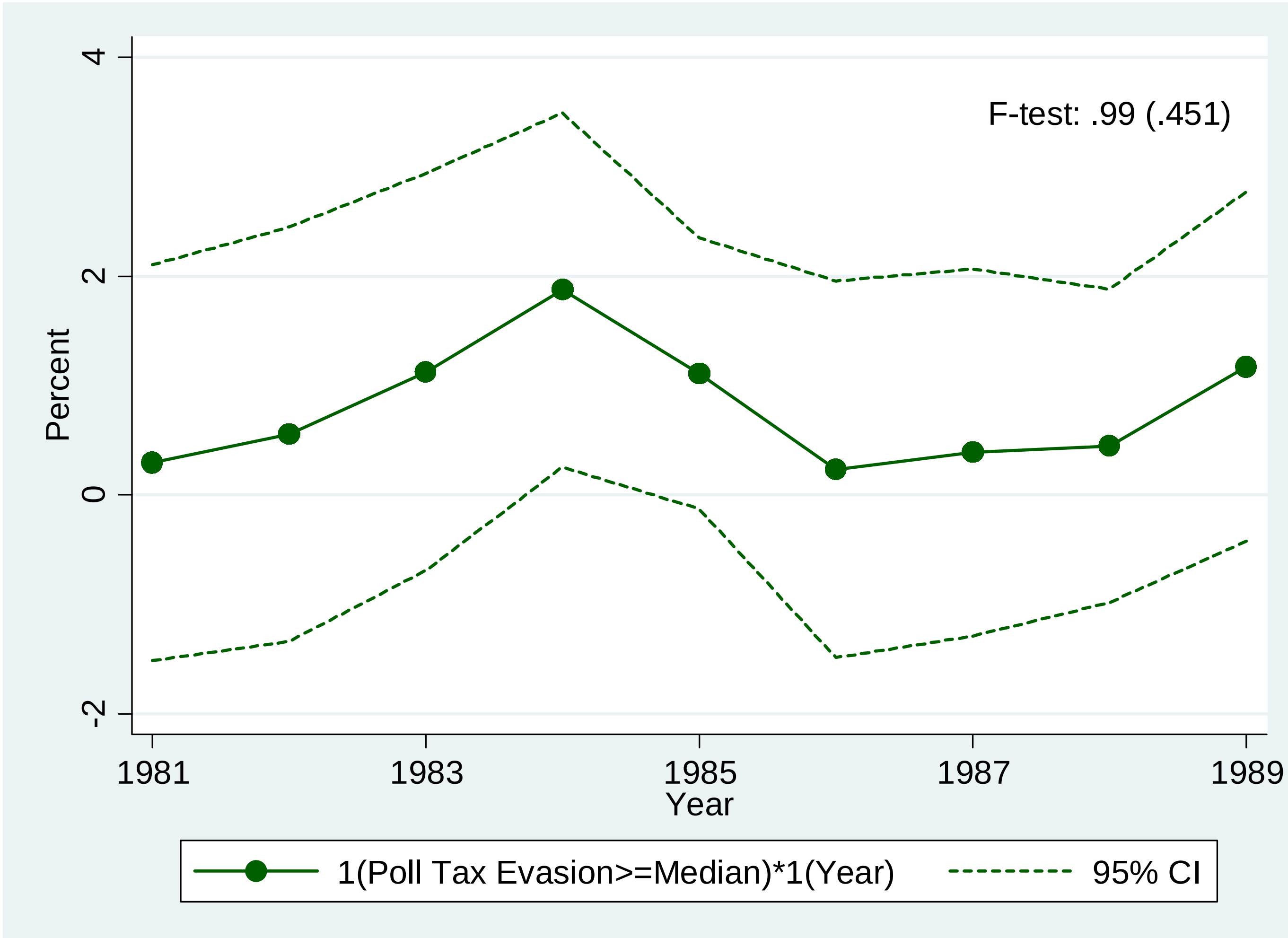
LHS	Council Tax Evasion :=(Net Collectable - Net Collected)/(Net Collectable)*100	
	(1)	(2)
1(PT Evasion >=Median PT Evasion) *1(Year==1993)	1.784 (.507) ***	1.790 (.526) ***
*1(Year==1994)	1.867 (.598) ***	1.872 (.621) ***
*1(Year==1995)	.748 (.378) **	.753 (.393) *
*1(Year==1996)	.984 (.328) ***	.989 (.341) ***
*1(Year==1997)	.546 (.319) *	.551 (.332) *
*1(Year==1998)	.463 (.269) *	.466 (.280) *
*1(Year==1999)	.496 (.290) *	.499 (.301) *
*1(Year==2000)	.539 (.327) *	.542 (.339)
*1(Year==2001)	.702 (.206) ***	.705 (.213) ***
*1(Year==2002)	.426 (.159) ***	.428 (.165) ***
*1(Year==2003)	.217 (.165)	.219 (.171)
*1(Year==2004)	.056 (.130)	.057 (.135)
*1(Year==2005)	-.001 (.126)	-.000 (.131)
*1(Year==2006)	-.035 (.122)	-.0344 (.127)
*1(Year2007)	-.007 (.115)	-.006 (.119)
*1(Year==2008)	.048 (.110)	.049 (.115)
F-test on joint significance of all 1(Year)*1(High PT Evasion)	2.23 (.004)	2.07 (.009)
Council Fixed Effects	Yes	Yes
Year Dummies	Yes	Yes
Council-Specific Linear Time Trend	No	Yes
# Observations	4219	
Mean LHS	3.725	

***Notes**:* Standard errors in parentheses are clustered at the council level. *, **, *** denote significance at the 10%, 5%, 1% level respectively. The sample consists of council-years from 1993 to 2009. Omitted year-dummy is 2009. Column 1 shows the β estimates from the model

$$e_{i,t} = \kappa + \beta_t \cdot \left(1(HighPT)_i \cdot \delta_t\right) + \delta_t + \mu_i + \varepsilon_{i,t},$$

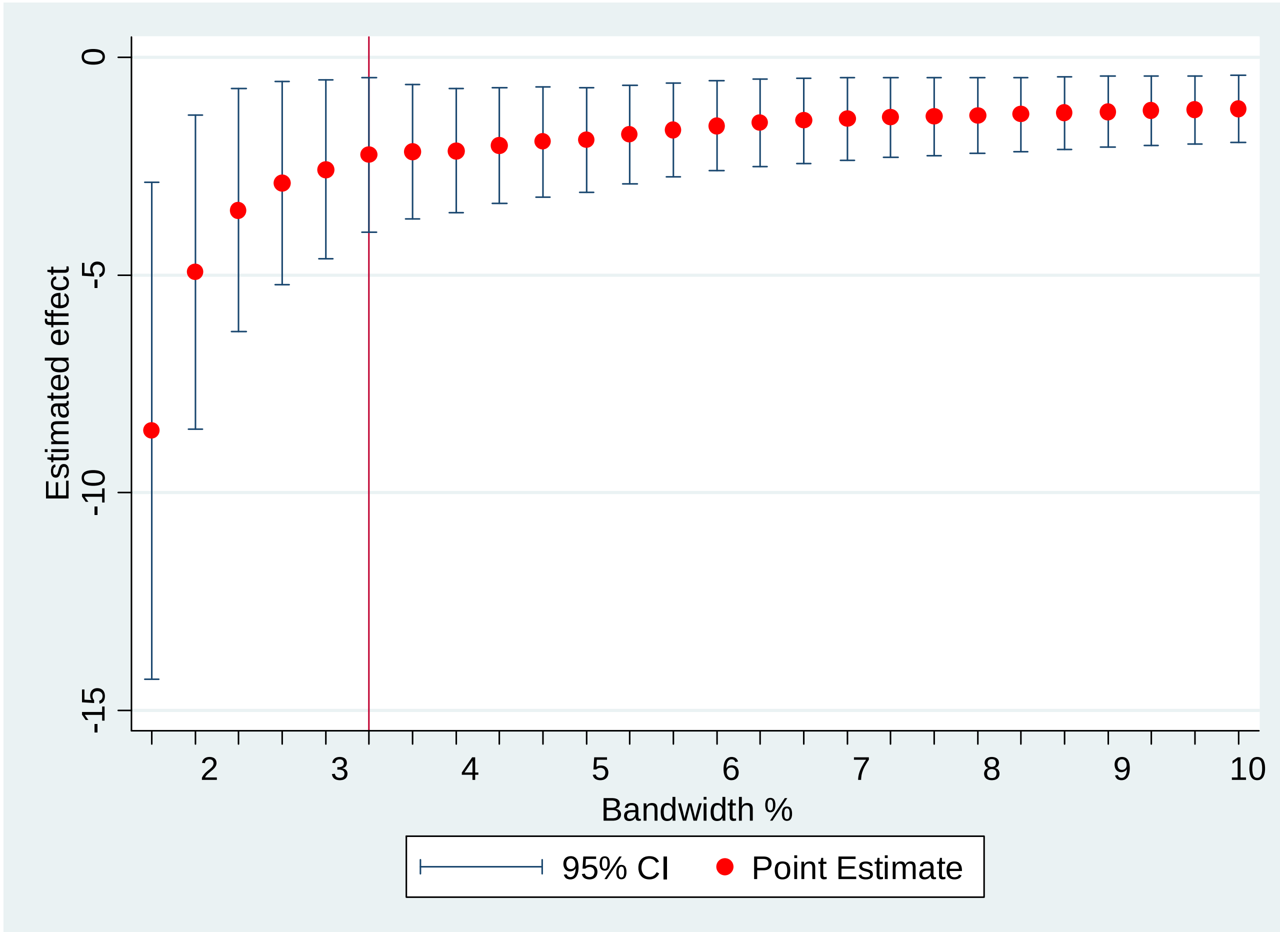
where $e_{i,t}$ is the council-year measure of tax evasion, $1(HighPT)_i$ is a council-specific dummy equal to 1 if the council had average poll-tax evasion above median poll tax evasion, δ_t is a set of year-dummies, and μ_i is a council fixed effect. Column 2 refers to the same model, augmented with council-specific linear time-trends.

Figure 6 Domestic-Rates Evasion by Poll-Tax Evasion



Notes**:* This graph plots the **1**(Year)1**(Poll Tax Evasion>=Median) coefficients from a regression of domestic-rates evasion on a set of year dummies, year-dummies interacted with a high poll-tax evasion dummy, and council fixed effects. The sample period is 1980-89, which corresponds to the domestic-rates period of our sample. Omitted year-dummy is 1980. Dashed lines denote the 95% confidence interval of the interaction term. The F-test (and its p-value) refers to the joint significance of all interactions **1**(Year)***1**(Poll Tax Evasion>=Median). The underlying regression model is the same as that in the *Notes* to Table 1.

Figure 7 Single-Majority Impact Effect on Tax Evasion by Estimation Bandwidth



Notes*:* This graph plots the point estimates from an RDD for the impact effect on tax evasion of a switch into single-party majority. The vertical line at 3.32% shows the optimal bandwidth for the running variable determined by the Imbens and Kalyanaraman (2009) algorithm for the running variable – here, the difference between the seat share for the largest party in the council and 50%. Each point is the estimate of a separate local linear RDD regression, as the bandwidth varies from half the I-K optimum (at 1.66%) to 3 times (at 10%) this optimum. Vertical blue lines denote the 95% confidence intervals for the point estimates. The RDD estimates for bandwidths corresponding to one half, equal to, and twice the I-K optimum are also reported in Table 2 (in the left corner of the upper pane).

Table 2 RDD Estimates of the Impact Effects of Single Majority on Tax Evasion and Enforcement

	LHS: Tax Evasion:= [Net collectable in year - Net collected in year]/[Net collectable in year]*100											
Bandwidth (+)	1.661	3.321	6.642	1.661	3.321	6.642	1.661	3.321	6.642	1.661	3.321	6.642
1(Maj Ctl)	-8.577	-2.237	-1.452	-8.533	-2.240	-1.459	-8.391	-1.829	-1.121	-8.606	-2.015	-1.066
	(2.91) ***	(.907)**	(.498) ***	(2.851) ***	(.903) **	(.497) ***	(3.046) ***	(.896) **	(.477) **	(3.062) ***	(.881) **	(.475) **
Controls		No			Council fixed effects			Council FE, year FE		Council FE, year FE, tax liability, log per cap income		
# Observations	708	1533	2804	708	1533	2804	708	1533	2804	708	1533	2804
Mean LHS	4.033											
	LHS:Enforcement:= [# Summonses]/[# Reminders]											
Bandwidth (+)	1.061	2.123	4.246	1.064	2.123	4.246	1.064	2.123	4.246	1.064	2.123	4.246
1(Maj Ctl)	.042	.062	.044	.004	.059	.044	.027	.061	.021	.069	.054	.014
	(.105)	(.035)*	(.024)*	(.113)	(.035)*	(.024)*	(.176)	(.039)	(.024)	(.272)	(.041)	(.023)
Controls		No			Council fixed effects			Council FE, year FE		Council FE, year FE, tax liability, log per cap income		
# Observations	393	859	1662	607	1237	2394	607	1237	2394	607	1237	2394
Mean LHS	.310											

***Notes**:* This table presents RDD estimates of the impact effects of a random switch into single-party majority. The upper panel shows estimates for tax evasion while the lower panel shows estimates for enforcement, defined as the ratio of summons to reminders. All etimations are based on a local linear regression. Each pane shows the RDD estimates across four specifications (left to right): (i) no controls, (ii) council fixed effects, (iii) these plus year fixed effects, and (iv) these plus controls for tax liability and (log) per-capita income. Within each specification, point estimates are presented for bandwidths from (left to right): (i) half, (ii) equal to, (iii) double the optimum chosen by the Imbens and Kalyanaraman (2009 algorithm, which minimizes squared bias plus variance. Underneath each specification, we report the number of observations that lie witihn the given bandwidth. See the main text (Section 4.2) for further details. Standard errors in parentheses are clustered at the council level. *, **, *** denote significance at the 10%, 5%, 1% level, respectively.

Table 3 Alternative RDD Specifcations and Bandwidths

LHS: Tax Evasion:= [Net collectable in year - Net collected in year]/[Net collectable in year]*100

Bandwidth	5%		10%		20%	
1(Majority Control)	-3.086	-2.561	-2.333	-3.161	-1.704	-2.461
w/o controls	(1.343) **	(2.495)	(.651) ***	(1.092) ***	(.437) ***	(.616) ***
Control Function	Quadratic	Cubic	Quadratic	Cubic	Quadratic	Cubic
# Observations	2287		3933		6071	

LHS: Enforcement:= [# Summonses]/[# Reminders]

Bandwidth	5%		10%		20%	
1(Majority Control)						
w/o controls	.047	.095	.041	.076	.014	.039
	(.039)	(.064)	(.028)	(.038) **	(.025)	(.028)
w controls	.090	.133	.079	.155	.030	.084
	(.042) **	(.066) **	(.039) **	(.062) **	(.028)	(.043)*
Control Function	Quadratic	Cubic	Quadratic	Cubic	Quadratic	Cubic
# Observations	1948		3327		5094	

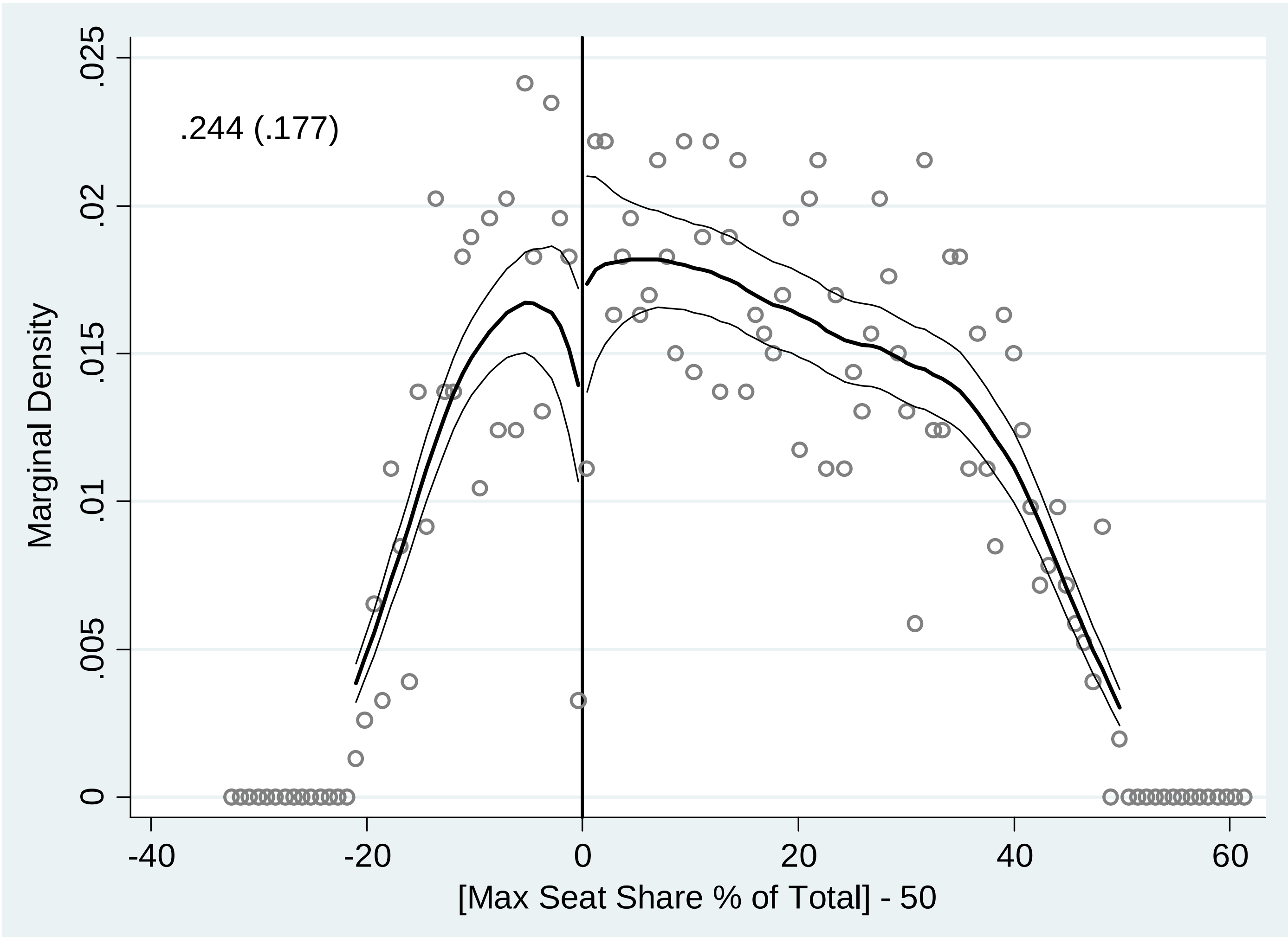
***Notes**:* This table presents RDD estimates of the impact effects of majority switch on tax evasion and enforcement. The upper pane shows estimates for tax evasion, while the lower pane shows estimates for our enforcement measure, the ratio of summons to reminders. Each pane shows RDD estimates from three specifications with a bandwidth of(left to right): (i) 5%, (ii) 10%, (iii) 20%. In each specification, we present point estimates with quadratic and cubic control functions in the running variable, i.e., the difference between the seat share of the largest party and 50%. The upper pane shows results without any controls. The lower pane shows results without any controls, and with a set council-specific controls: log per capita income, tax liability and log population. The number of observations used are reported below each specification. Standard errors in parenthesis. *, **, *** denote significance at the 10%, 5%, 1% level respectively. See main text (Section 4.2) for further details.

Table 4 Placebo RDD on Tax Liability and Log Per-Capita Income

							LHS: Domestic Tax Liability per Household						
Bandwidth (+)	4.41	8.83	17.66	4.41	8.83	17.66		4.41	8.83	17.66	4.41	8.83	17.66
1(Majority Control)	42.41	29.09	38.09	42.71	29.03	37.08		-3.92	9.93	26.58	-17.62	-.155	24.26
	(37.33)	(24.85)	(25.44)	(37.34)	(24.84)	(25.06)		(10.34)	(6.57)	(18.48)	(10.25)	(6.49)	(21.78)
Controls		No			Council fixed effects				Council FE, year FE			Council FE, year FE, log per cap income, log population	
# Observations	2375	4189	6686	2375	4189	6686		2375	4189	6686	2375	4189	6686
Mean LHS							556.8						
							LHS: Log per Capita Income						
Bandwidth (+)	1.11	2.22	4.44	1.11	2.22	4.44		1.11	2.22	4.44	1.11	2.22	4.44
1(Majority Control)	-.027	.237	.252	-.055	.241	.251		.778	.-104	.036	.389	-.034	.051
	(.822)	(.228)	(.128)**	(.836)	(.229)	(.113) **		(.311) **	(.049) **	(.015) **	(.296)	(.049)	(.029)**
Controls		No			Council fixed effects				Council FE, year FE			Council FE, year FE, log population, tax liability	
# Observations	607	1271	2509	607	1271	2509		607	1271	2509	607	1271	2509
Mean LHS							8.896						

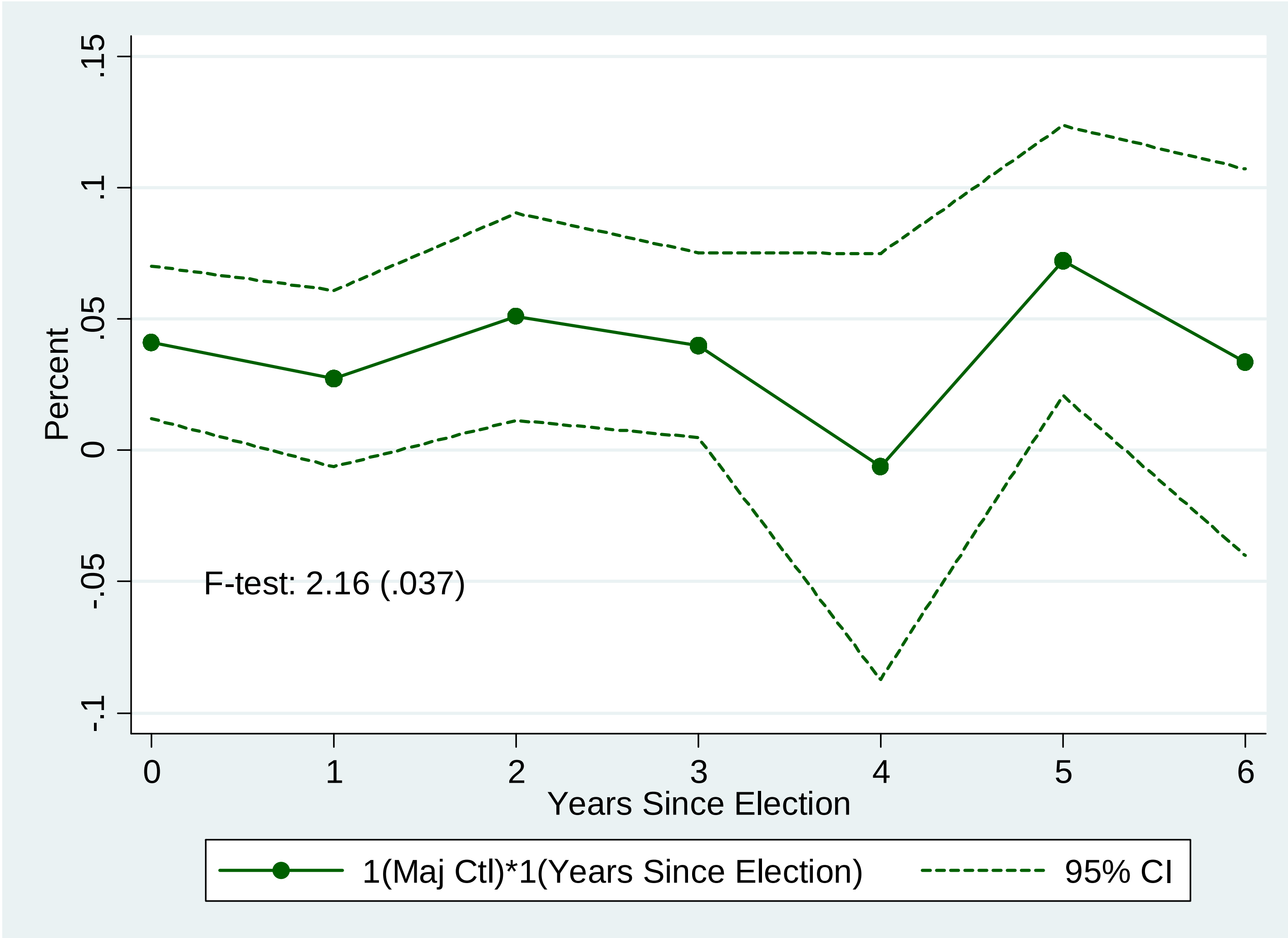
Notes: This table presents RDD estimates of the impact effects of a random switch into single-party majority. The upper pane shows estimates for local household tax liability, while the lower pane shows estimates for log per capita income. All estimates are based on a local linear regression. Each pane shows results across four specifications (left to right): (i) no controls, (ii) council fixed effects, (iii) these plus year fixed effects, and (iv) these plus controls for tax liability, log population and log per capita income (tax liability in lower panel). In each specification, we present estimates as the bandwidth varies from (left to right): (i) half of, (ii) equal to, (iii) double the optimal bandwidth calculated from Imbens and Kalyanaraman (2009) algorithm, which minimizes squared bias plus variance. We also show the number of observations corresponding to these bandwidths. Standard errors in parenthesis. *, **, *** denote significance at the 10%, 5%, 1% level respectively. See the main text (Section 4.2) for further details.

Fig 8 McCrary Test around Majority Threshold



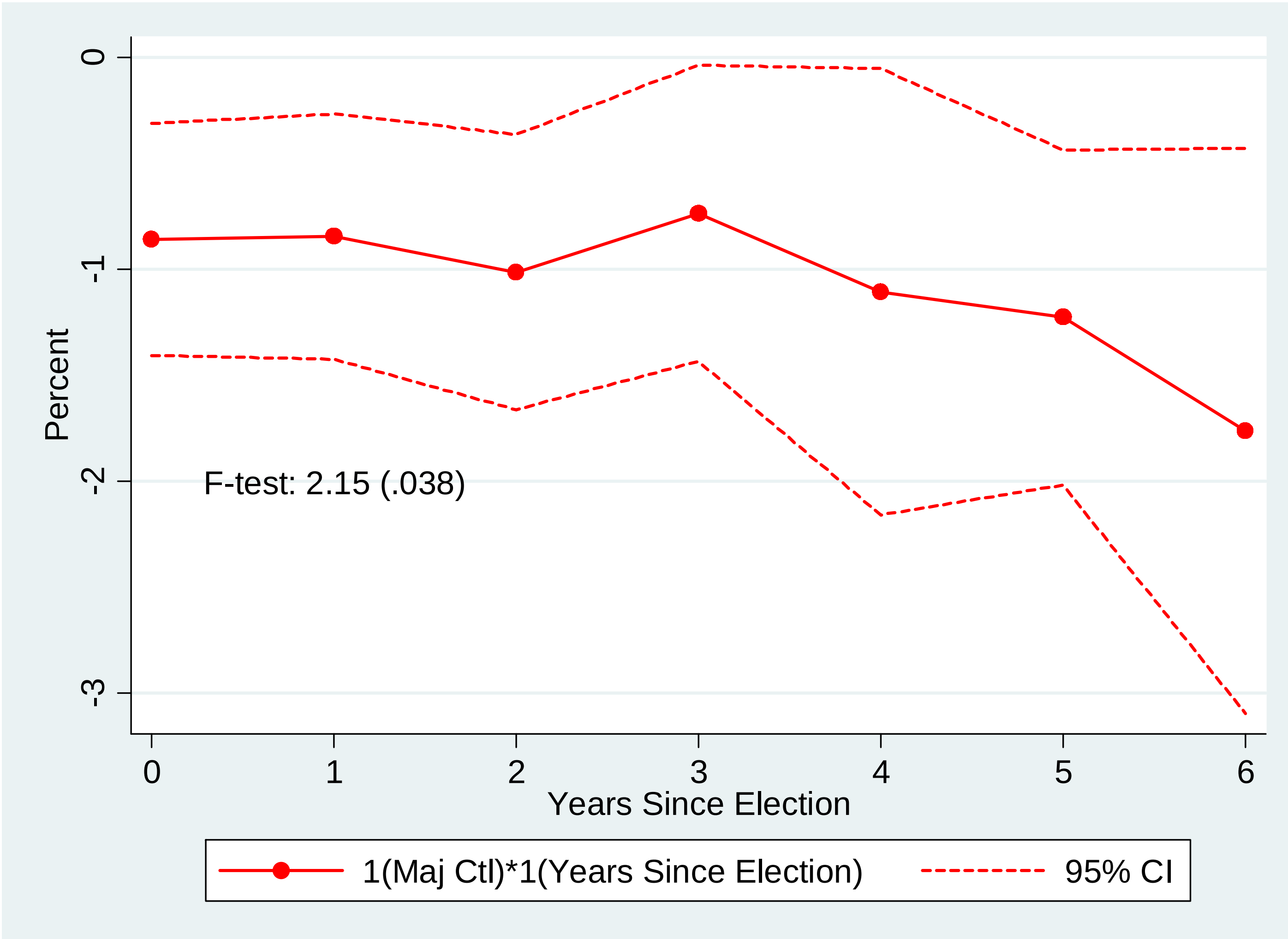
Notes: This graph displays the result of the McCrary (2008) test for continuity in the running variable, i.e. the difference between the largest seat-share on the council and 50%. The vertical line denotes the threshold value of 0. The bandwidth is optimally selected. The test employs a local-linear density estimator and delivers a test statistic for the null hypothesis that the difference in marginal densities between the two sides of the threshold is zero. This statistic (its p-value) is reported in upper left corner. The sample consists of council-years between 1980 and 2009.

Figure 9 Dynamic Impact of Single-Party Majority on Enforcement



Notes**:* This graph plots the **1**(Majority Control)1**(Years since election) coefficients from a regression of our enforcement measure on the indicator for switch into majority, **1**(Majority Control), seven years since election dummies **1**(Years since election), their interactions, lagged council-specific tax evasion, and a quadratic control function in the largest political seat-share. The enforcement measure is the ratio [#Summonses]/[#Reminders]. The sample period is 1993-2009, which corresponds to the council-tax period. Dashed lines denote the 95% confidence interval on the interaction terms. The F-test (and its p-value) refers to the joint significance of the (seven) interaction terms. The regression model is identical to the one in the Notes of Table 5, except for the different dependent variable. See the text (Section 4.2) for further details.

Figure 10 Dynamic Impact of Single-Party Majority on Tax Evasion



Notes**:* This graph plots the **1**(Majority Control)1**(Years Since Election) coefficients from a regression of our measure of tax evasion on the indicator for a switch into majority **1**(Majority Control), seven years since election dummies **1**(Years Since Election), their interactions, lagged council-specific tax evasion, and a quadratic control function in the largest political seat-share. The sample period is 1993-2009, which corresponds to the council-tax period. Dashed lines demark the 95% confidence interval for the interaction terms. The F-test (and its p-value) refers to the joint significance of the seven interaction terms. The full regression output underlying the graph is displayed in column 1 of Table 5. The model estimated is the one shown in the Notes of Table 5. See the text (Section 4.2) for further details.

Table 5 Impulse Response Results

LHS: Tax Evasion:= [Net collectable in year - Net collected in year]/[Net collectable in year]*100

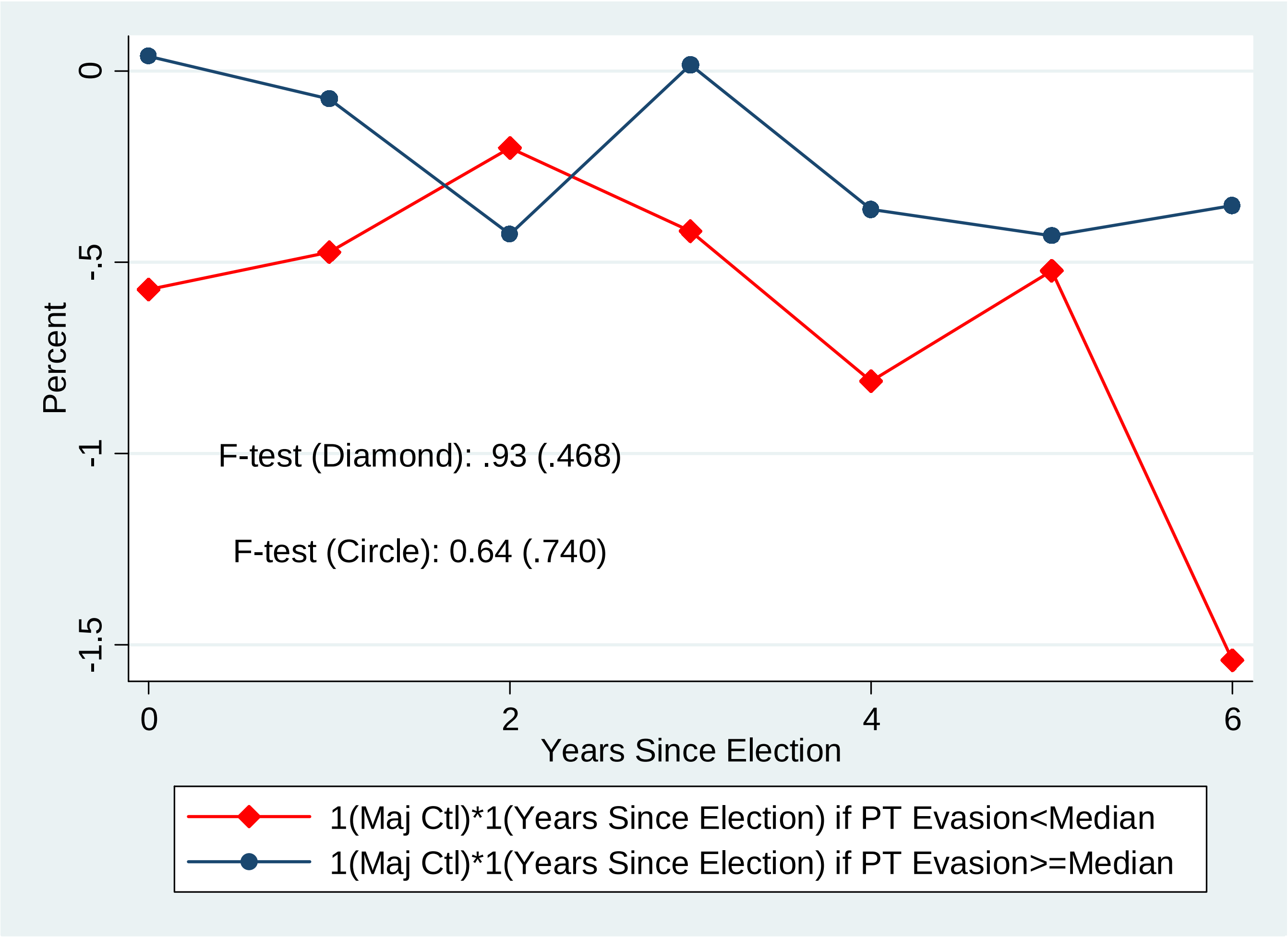
RHS	(1)	(2)
1(Maj Ctl)		
*1(Year Since Election=0)	-.857	-.441
	(.280) ***	(.251) *
*1(Year Since Election=1)	-.844	-.443
	(.296) ***	(.262) *
*1(Year Since Election=2)	-1.012	-.598
	(.333) ***	(.296) **
*1(Year Since Election=3)	-.734	-.333
	(.358) **	(.314)
*1(Year Since Election=4)	-1.104	-.604
	(.540) **	(.493)
*1(Year Since Election=5)	-1.226	-.659
	(.405) ***	(.354) *
*1(Year Since Election=6)	-1.761	-1.263
	(.683) ***	(.627) **
F-test (p-value)	2.15	1.11
	(.038)	(.354)
Council Fixed Effect	Yes	Yes
Controls (Tax liability, political control, population, per capita income)	No	Yes
# Observations	4300	
Mean LHS	3.725	

***Notes**:* All regressions include seven year-since-election dummies, a lagged dependent variable and a second-order control function in the largest seat-share by itself and interacted with **1**(Maj Ctl). The estimated model is

$$e_{i,t} = \kappa + \alpha \cdot e_{i,t-1} + \sum_{j=0}^{6} \tau_{i,j} + \sum_{j=0}^{6} \theta_j \cdot \left(\tau_{i,j} \cdot 1(MajCtl)_{i,j}\right) + \beta \cdot f(\max share)_{i,t} + \phi \cdot \left(f(\max share)_{i,t} \cdot 1(MajCtl)_{i,t}\right) + \delta_t + \mu_i + \varepsilon_{i,t},$$

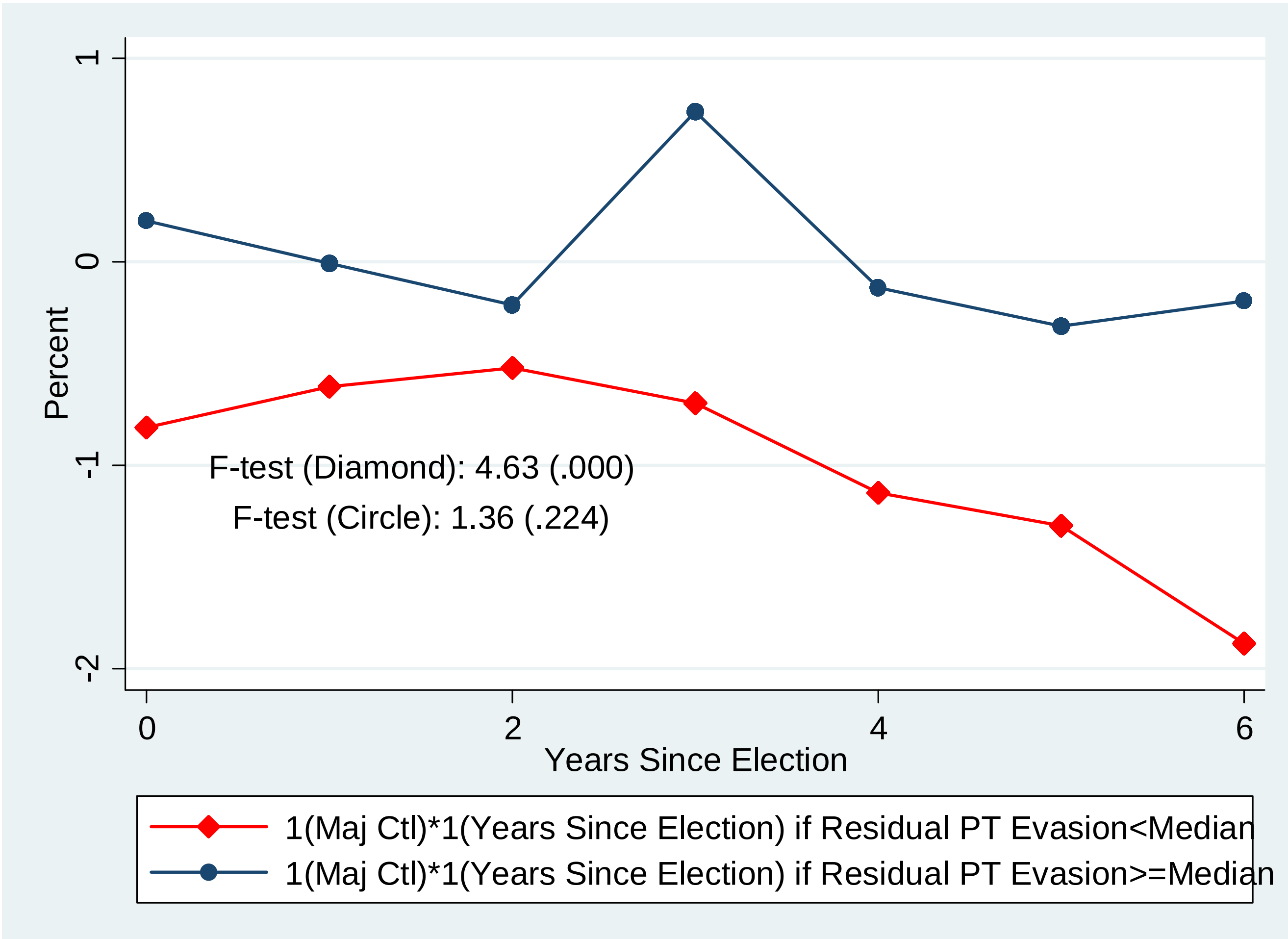
where $e_{i,t}$ is council-year specific tax evasion, $\tau_{i,j}$ is a council-specific year-since-election dummy, $1(MajCtl)_{i,j}$ is a dummy for single-party majority in the council-year, $f(\max share)_{i,t}$ is a second-order control function in the largest seat-share on the council, δ_t is a set of six-year period dummies, and μ_i is a council fixed effect. Column2 adds council-specific controls. Standard errors are clustered at the council level. *, **, *** denote significance at the 10%, 5% and 1% level respectively. The sample includes all years from 1993 to 2009.

Figure 11 Dynamic Impact on Council-Tax Evasion across Poll-Tax Evasion



Notes**: This graph plots the **1**(Majority Control)1**(Years Since Election) coefficients from a regression of our measure of tax evasion on the indicator for switch into majority **1**(Majority Control), seven years since election dummies **1**(Years Since Election), their interactions, lagged council-specific tax evasion, and a quadratic control function in the largest political seat-share. The red line with diamonds shows the interaction coefficients for the councils that had poll-tax evasion below the median pol tax evasion, while the black line with circles shows the same estimates for the councils with above median poll-tax evasion. The F-test (and its p-value) refers to the joint significance of the set of seven interaction terms. Full regression output for the graph is given in columns 1 and 3 of Table 6. The model estimated is in notes of Table 5, conditioning the sample on the high poll-tax evasion dummy. See the text (Sections 4.1 and 4.2) for further details and the construction of the high and low poll-tax evasion subsamples. The sample runs from 1993 to 2009.

Figure 12 Dynamic Impact on Council-Tax Evasion across Residual Poll-Tax Evasion



Notes*:* This graph is constructed in exactly the same way as Figure 11, except that the sample spilt is based on *residual* poll-tax evasion being below (the red line) and above (the black line) the median.

Table 6 Heterogeneous Impulse Responses across Poll-Tax Evasion

LHS: Tax Evasion:= [Net collectable in year - Net collected in year]/[Net collectable in year]*100

Sample Restriction	Council PT Evasion<=Median PT Evasion		Council PT Evasion>Median PT Evasion	
	(1)	(2)	(3)	(4)
RHS				
1(Maj Ctl)				
*1(Year Since Election=0)	-.569	-.462	.038	.246
	(.342) *	(.332)	(.396)	(.418)
*1(Year Since Election=1)	-.472	-.405	-.072	.157
	(.353)	(.340)	(.391)	(.413)
*1(Year Since Election=2)	-.200	-.140	-.425	-.254
	(.403)	(.391)	(.489)	(.493)
*1(Year Since Election=3)	-.417	-.311	.017	.223
	(.389)	(.386)	(.552)	(.541)
*1(Year Since Election=4)	-.809	-.737	-.362	-.264
	(.729)	(.718)	(.831)	(.836)
*1(Year Since Election=5)	-.522	-.335	-.429	-.324
	(.551)	(.550)	(.488)	(.500)
*1(Year Since Election=6)	-1.540	-1.333	-.350	-.337
	(1.033)	(1.011)	(.722)	(.724)
F-test (p-value)	0.93	0.78	0.62	0.89
	(.486)	(.602)	(.740)	(.519)
Council Fixed Effect	Yes	Yes	Yes	Yes
6-year period dummies	Yes	Yes	Yes	Yes
Controls (Tax liability, political affiliation, population, per capita income)	No	Yes	No	Yes
Mean LHS	3.153		4.245	
# Observations	1966		1884	

***Notes**:* All regressions include seven year-since-election dummies, a lagged dependent variable and a second-order control function in the largest seat-share by itself and interacted with **1**(Maj Ctl). The estimated model is

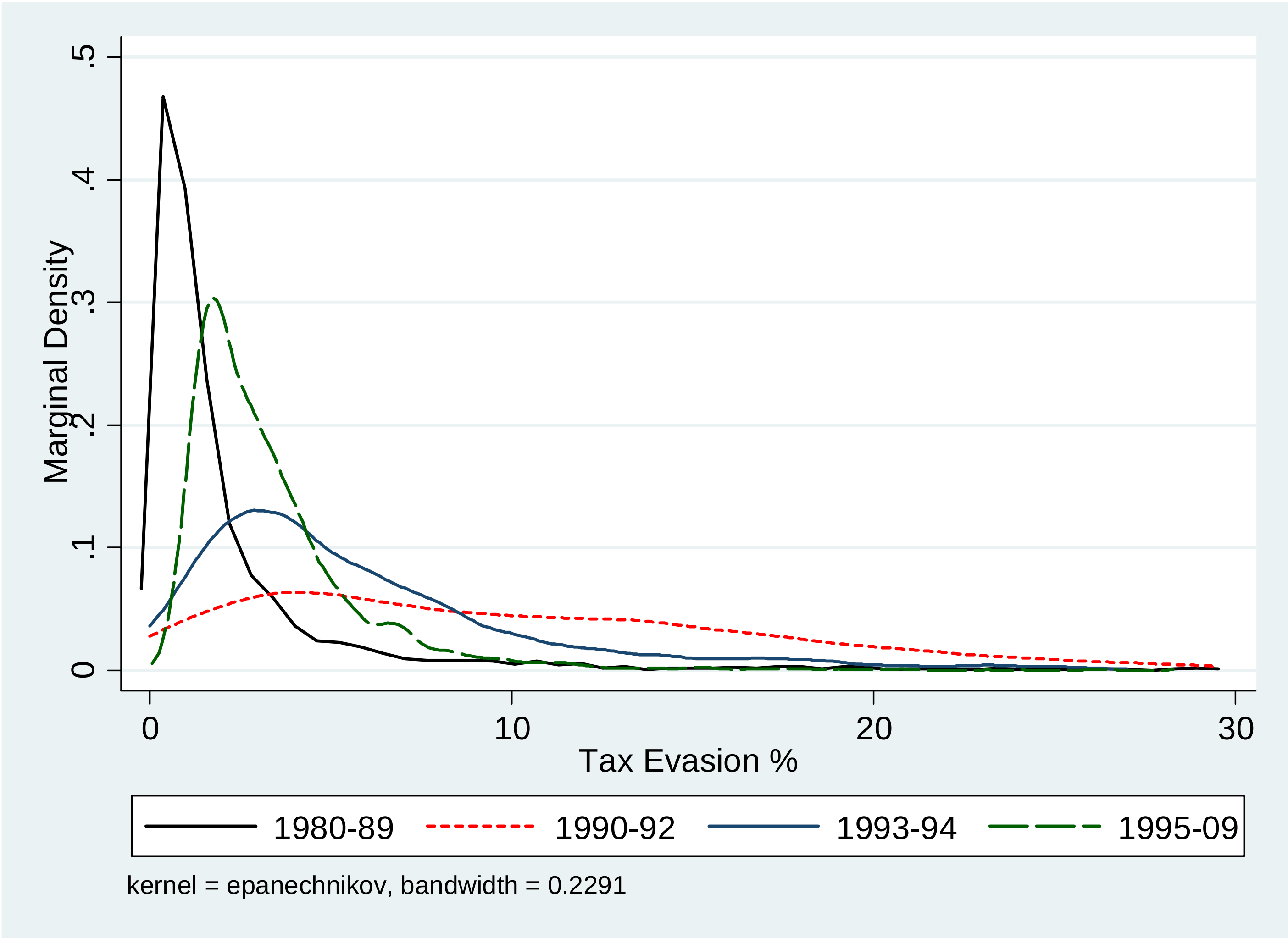
$$e_{i,t} = \kappa + \alpha \cdot e_{i,t-1} + \sum_{j=0}^{6} \tau_{i,j} + \sum_{j=0}^{6} \theta_j \cdot \left(\tau_{i,j} \cdot 1(MajCtl)_{i,j}\right) + \beta \cdot f(\max share)_{i,t} + \phi \cdot \left(f(\max share)_{i,t} \cdot 1(MajCtl)_{i,t}\right) + \delta_t + \mu_i + \varepsilon_{i,t}$$

where $e_{i,t}$ is council-year specific tax evasion, $\tau_{i,j}$ is a council-specific year-since-election dummy, $1(MajCtl)_{i,j}$ is a dummy for single-party majority in the council-year, $f(\max share)_{i,t}$ is a second-order control function in the largest seat-share on the council, δ_t is a set of six-year period dummies, and μ_i is a council fixed effect. Columns 2 and 4 add council-specific controls. The sample includes all years from 1993 to 2009, and all councils with below median poll-tax evasion (columns 1 and 2), or with above median poll-tax evasion (columns 3 and 4). Standard errors are clustered at the council level. *, **, *** denote significance at the 10%, 5% and 1% level respectively.

Online Appendix

Appendix A

Figure A1 Marginal Density Distribution of Tax Evasion across Periods



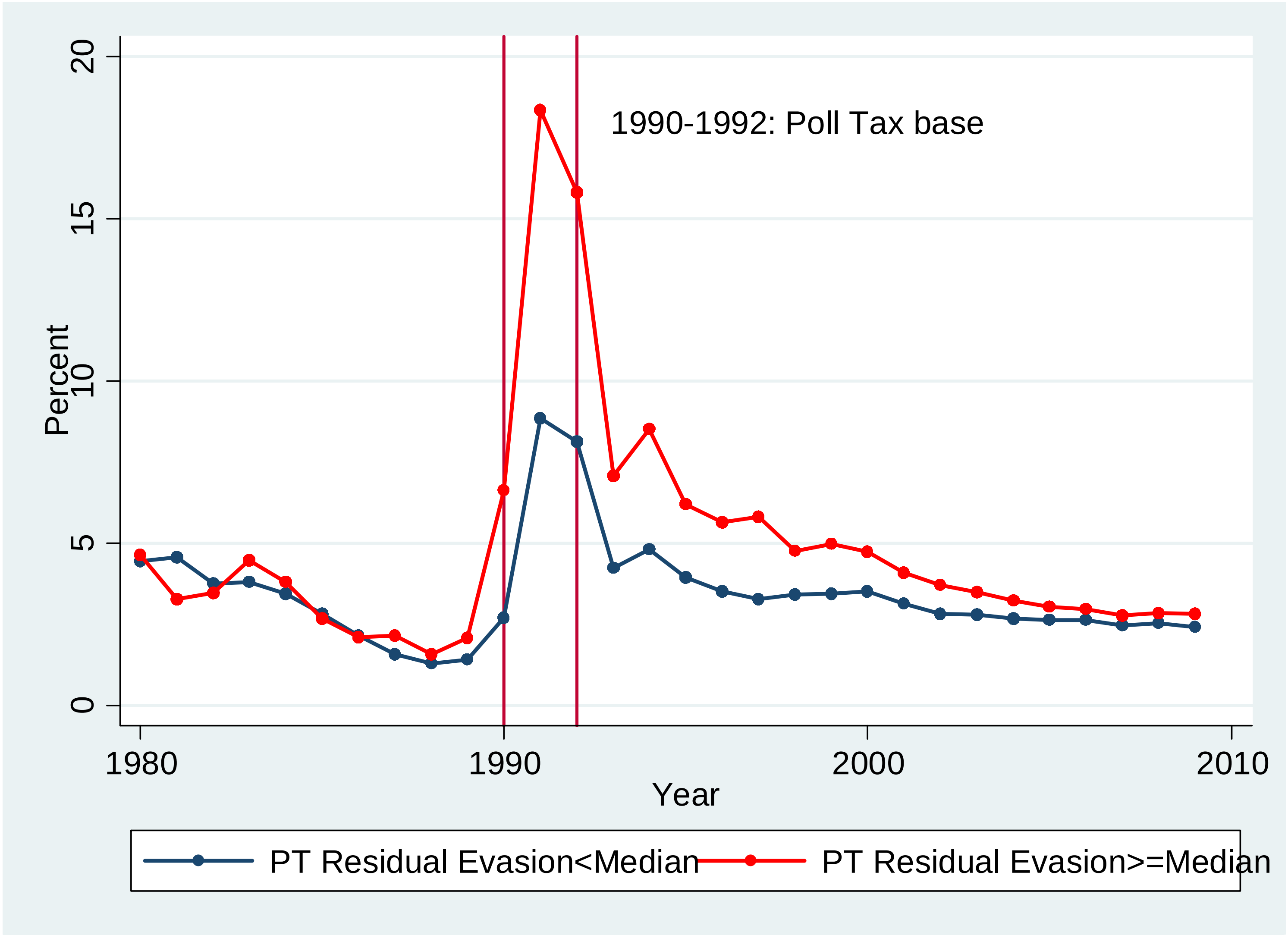
Notes: This graph plots the marginal density distribution of tax evasion across 4 time-periods: 198-89 (Domestic Rates tax base); 1990-92 (Poll Tax base); 1993-94 (first 2 years of Council Tax base); 1995-2009 (remaining sample years of Council Tax base). Tax evasion is truncated at 30%, which equals (almost exactly) the 99th percentile for all time-periods except 1995-09 where it equals the 99.9th percentile. See Section 3.1 for further details on the construction of the tax evasion measure, and description of tax evasion under the separate time-periods.

Table A1 Constructing the Poll-Tax Residual

LHS	Poll Tax Evasion:= (Net Collectable - Net Collected)/(Net Collectable)*100			
RHS	**(1)**	**(2)**	**(3)**	**(4)**
Poll Tax liability	.032 (.006) ***	.028 (.006) ***	.029 (.006) ***	.023 (.006) ***
Log per capita income		-28.470 (3.764) ***	-29.917 (4.070) ***	-21.988 (4.605) ***
Log population			-1.193 (.636) *	-1.499 (.601) **
Conservative seat share				-.021 (.021)
Conservative control				-1.098 (..872)
Labour seat share				-.026 (.022)
Labor control				3.239 (.702) ***
Year dummies, controls for council class and region	Included			
Observations	684			
Mean LHS	10.562			

***Notes**:* This table estimates a cross-council model of determinants of poll-tax evasion. The unit of observation is council-year. Standard errors corrected for heteroskedasticity *, **, *** denote significance at 10%, 5%, and 1% level respectively. Residual poll-tax evasion in the main text is defined as the residual component of poll-tax evasion based on the model in Column 4. Sample years: 1990-1992, which correspond to the 3-year period where the poll tax was in place.

Figure A2 Tax Evasion by Residual Poll-Tax Evasion



***Notes**:* Each observation is a yearly average of tax evasion across all councils in one of two subgroups: the blue sample is the set of councils which had average residual tax evasion over the Poll tax period below median residual poll tax evasion; the red sample is the set of councils with average residual tax evasion above median residual Poll tax evasion. See main text (Section 4.1) and *notes* to Table A1 for the construction of the residual Poll tax evasion variable.

Table A2 Council-Tax Evasion by Residual Poll-Tax Evasion

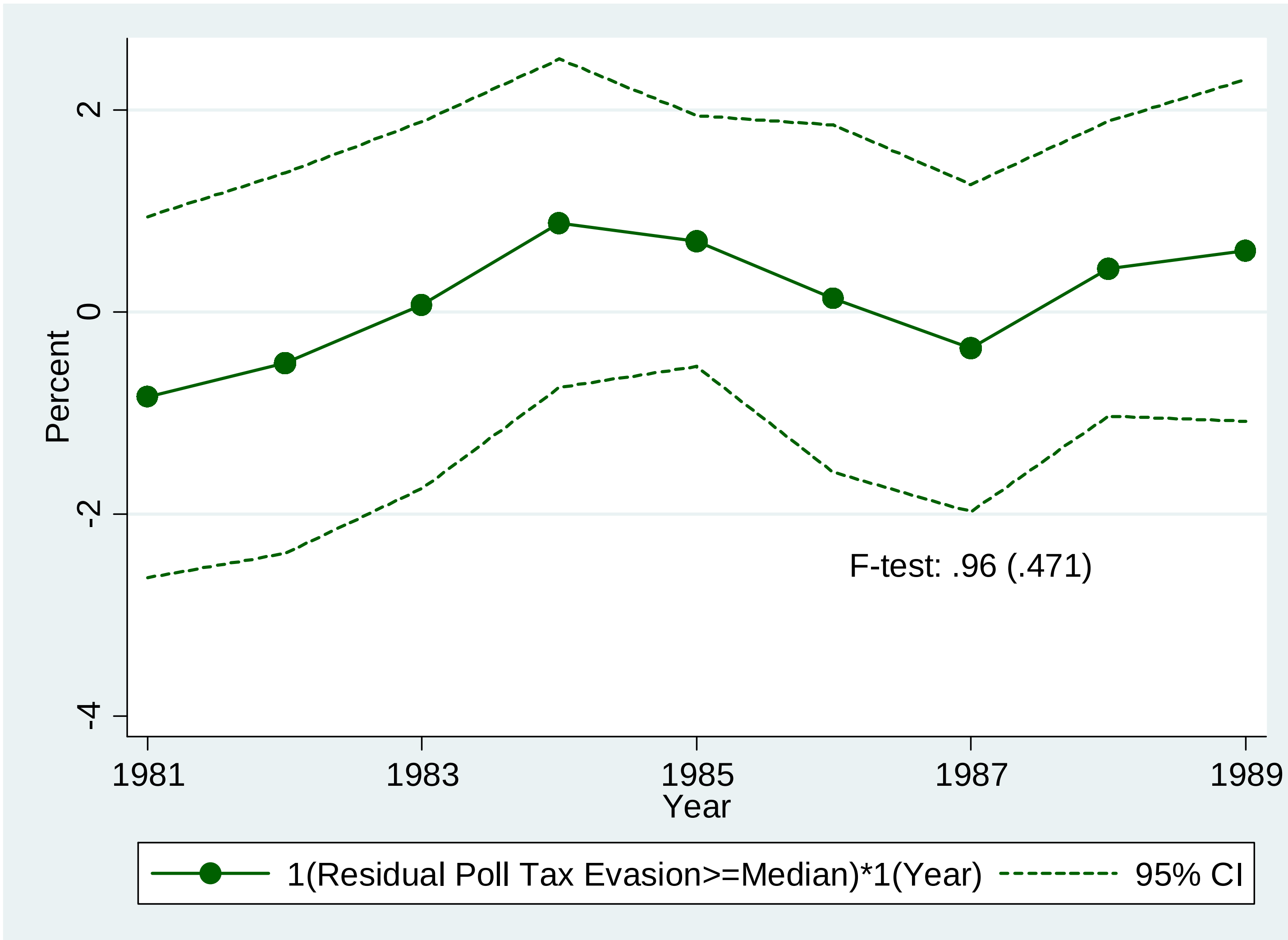
LHS	Council Tax Evasion :=(Net Collectable - Net Collected)/(Net Collectable)*100		
	(1)	(2)	(3)
RHS			
1(PT Residual Evasion >=Median PT Residual Evasion)			
*1(Year==1993)	2.379 (.507) ***	2.434 (.511) ***	2.383 (.527) ***
*1(Year==1994)	3.004 (.585) ***	3.056 (.576) ***	3.009 (.608) ***
*1(Year==1995)	1.205 (.370) ***	1.204 (.364) ***	1.210 (.385) ***
*1(Year==1996)	1.384 (.323) ***	1.378 (.321) ***	1.388 (.335) ***
*1(Year==1997)	1.395 (.312) ***	1.452 (.317) ***	1.401 (.324) ***
*1(Year==1998)	.821 (.260) ***	.826 (.265) ***	.824 (.270) ***
*1(Year==1999)	.937 (.285) ***	.927 (.286) ***	.939 (.296) ***
*1(Year==2000)	.882 (.331) **	.855 (.329) ***	.884 (.344) **
*1(Year==2001)	.561 (.205) ***	.527 (.203) ***	.563 (.213) ***
*1(Year==2002)	.490 (.157) ***	.460 (.152) ***	.492 (.163) ***
*1(Year==2003)	.299 (.162) *	.266 (.165)	.300 (.168) *
*1(Year==2004)	.143 (.126)	.113 (.127)	.144 (.131)
*1(Year==2005)	.013 (.123)	-.013 (.125)	.014 (.128)
*1(Year==2006)	-.063 (.120)	-.081 (.122)	-.062 (.124)
*1(Year2007)	-.091 (.112)	-.098 (.114)	-.090 (.117)
*1(Year==2008)	-.098 (.108)	-.124 (.108)	-.097 (.112)
F-test on joint significance of all 1(Year)*1(High PT Evasion)	2.67 (.000)	2.84 (.000)	2.48 (.001)
Council Fixed Effects	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Control Function in Max Share; Linear Time Trend	No	Yes	No
Council-Specific Linear Time Trend	No	No	Yes
# Observations		4207	
Mean LHS		3.725	

***Notes**:* Standard errors clustered at the council level. *, **, *** denote significance at the 10%, 5%, 1% level respectively. Sample years: 1993-2009. Column 1 estimates the following model

$$e_{i,t} = \kappa + \beta_t \cdot (1(HighPTResidual)_i \cdot \delta_t) + \delta_t + \mu_i + \varepsilon_{i,t}$$

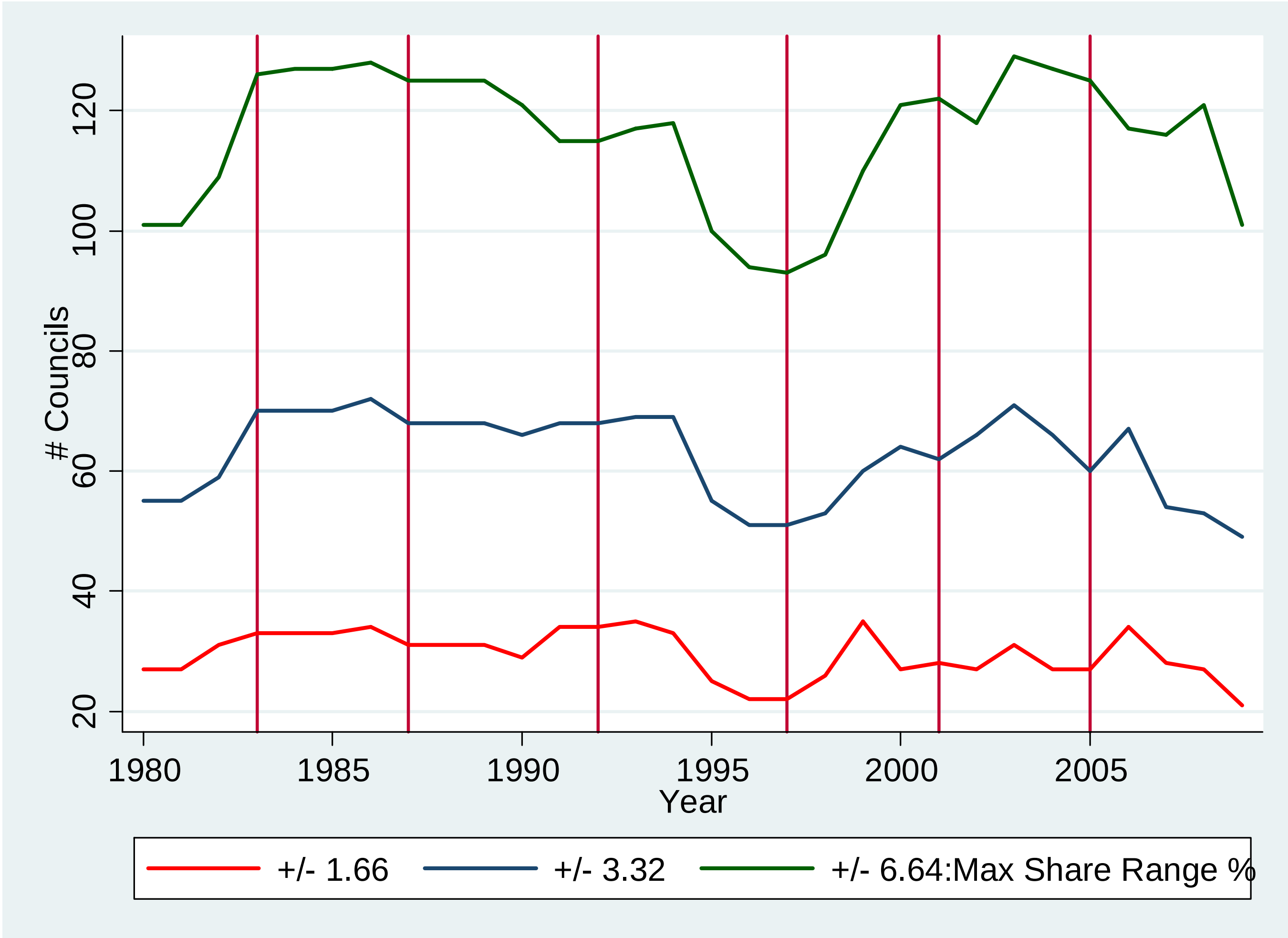
where $e_{i,t}$ is the council-year measure of tax evasion, $1(HighPTResidual)_i$ is a council-specific dummy equal to 1 if the council had average residual Poll tax evasion above median residual poll-tax evasion, δ_t is a set of year-dummies, and μ_i is a council fixed effect. Column1 displays β_t. Column.2 adds a linear time-trend and an interactive second-order control function in the largest-seat share. Column 3 instead adds a council-specific linear time-trends. See Section 4.1 and *Notes* to TableA1 for details on residual poll-tax evasion.

Figure A3 Domestic Rates Evasion by Residual Poll Tax Evasion



Notes*:* This graph plots the **1**(Year)***1**(Residual Poll Tax Evasion>=Median) coefficients from a regression of domestic-rates evasion on a set of year dummies, year-dummies interacted with a high residual poll tax evasion dummy, and council fixed effects. The sample period is 1980-89, which corresponds to the Domestic Rates period. The omitted year-dummy is 1980. Dashed lines denote the 95% confidence interval of the interaction term. The F-test (p-value) is on the joint significance of all interactions **1**(Year)***1**(Residual Poll Tax Evasion>=Median). The model estimated is the same as in the one in the *Notes* to Table A2.

Figure A4 Number of Close Elections over Time



***Notes**:* This graph shows the number of council-specific close elections in each year between 1980 1nd 2009 of the sample for different definitions of `close'. The blue line defines `close' as the optimal bandwidth for RDD proposed by Imbens and Kalanyaramanan (2012) applied to tax evasion, and is equal to 3.32 percentage points. The red and black lines correspond to definitions of half and double this optimum bandwidth. Vertical red lines denote years of UK general elections.

Table A3 Heterogeneous Impulse Responses across Poll Tax Residual Evasion

LHS: Council Tax Evasion :=(Net Collectable - Net Collected)/(Net Collectable)*100

Sample Restriction	PT Residual Evasion<=Median PT Residual Evasion		PT Residual Evasion>Median PT Residual Evasion	
	(1)	(2)	(3)	(4)
RHS				
1(Maj Ctl)				
*1(Year Since Election=0)	-.812	-.783	.201	.526
	(.291) ***	(.291) ***	(.453)	(.524)
*1(Year Since Election=1)	-.611	-.590	-.004	.296
	(.307) **	(.306) *	(.458)	(.522)
*1(Year Since Election=2)	-.520	-.526	-.209	.067
	(.328)	(.324)	(.545)	(.594)
*1(Year Since Election=3)	-.695	-.666	.738	1.026
	(.342) **	(.339) *	(.585)	(.638)
*1(Year Since Election=4)	-1.134	-1.011	-.124	-.063
	(.327) ***	(.333) ***	(.971)	(.971)
*1(Year Since Election=5)	-1.294	-1.222	-.315	-.165
	(.303) ***	(.301) ***	(.565)	(.595)
*1(Year Since Election=6)	-1.874	-1.892	-.193	-.121
	(.704) ***	(.697) ***	(1.022)	(.997)
F-test (p-value)	4.63	4.31	1.36	1.85
	(.000)	(.000)	(.224)	(.081)
Council Fixed Effect	Yes	Yes	Yes	Yes
6-year period dummies	Yes	Yes	Yes	Yes
Controls: Tax liability per dwelling, political affiliation, population, per capita income	No	Yes	No	Yes
Mean LHS	3.153		4.247	
# Observations	1973		1861	

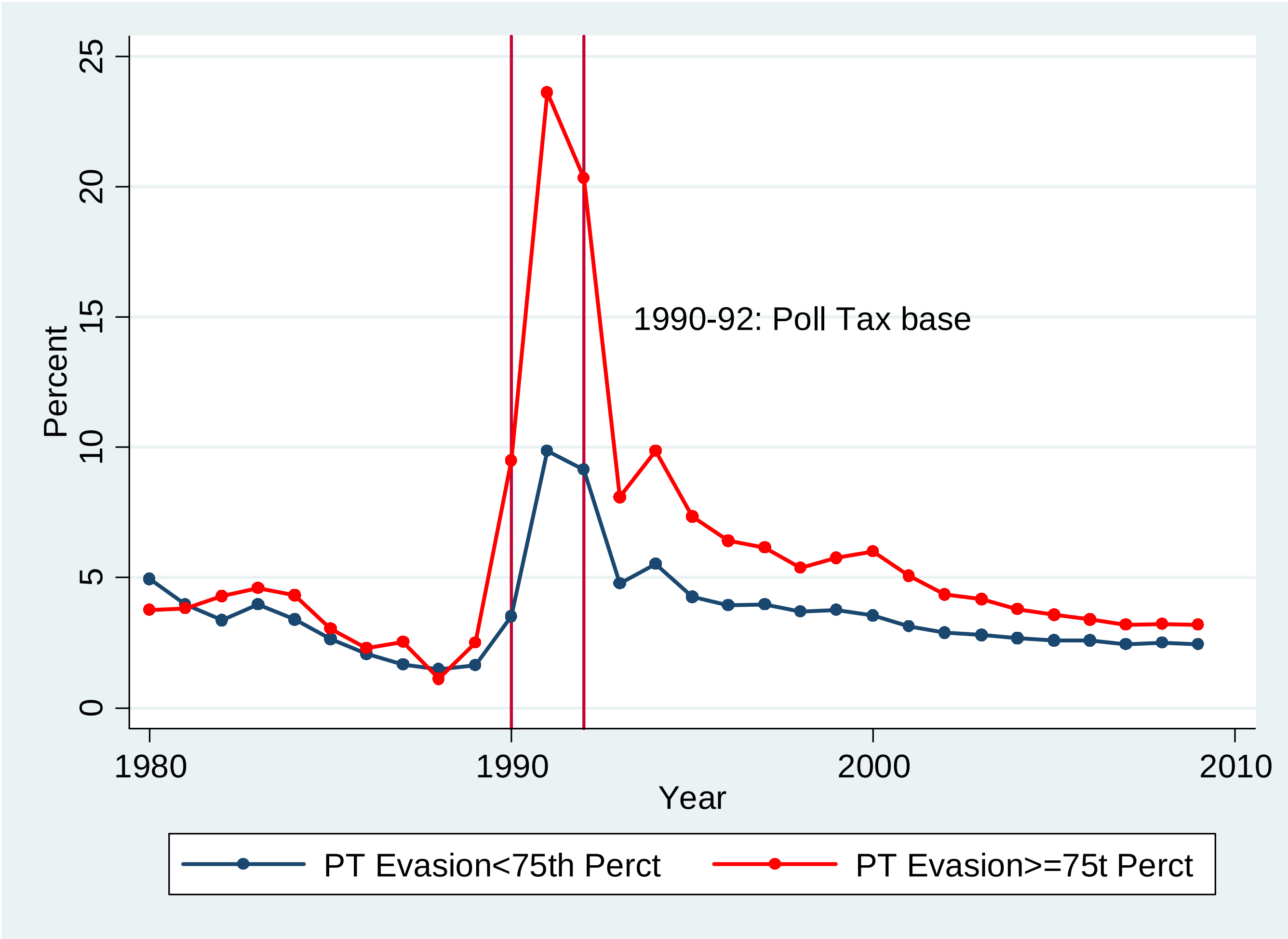
Notes: All regressions include seven year-since-election dummies, a lagged dependent variable and a second-order control function in the largest seat-share by itself and interacted with **1**(Maj Ctl). The estimated model is

$$e_{i,t} = \kappa + \alpha \cdot e_{i,t-1} + \sum_{j=0}^{6} \tau_{i,j} + \sum_{j=0}^{6} \theta_j \cdot \left(\tau_{i,j} \cdot 1(MajCtl)_{i,j}\right) + \beta \cdot f(\max share)_{i,t} + \phi \cdot \left(f(\max share)_{i,t} \cdot 1(MajCtl)_{i,t}\right) + \delta_t + \mu_i + \varepsilon_{i,t},$$

where $e_{i,t}$ is council-year specific tax evasion, $\tau_{i,j}$ is a council-specific year-since-election dummy, $1(MajCtl)_{i,j}$ is a dummy for single-party majority in the council-year, $f(\max share)_{i,t}$ is a second-order control function in the largest seat-share on the council, δ_t is a set of six-year period dummies, and μ_i is a council fixed effect. Columns 2 and 4 add council-specific controls. The sample includes all years from 1993 to 2009, and all councils with below median residual poll-tax evasion (columns 1 and 2), or with above median residual poll-tax evasion (columns 3 and 4). Standard errors are clustered at the council level. *, **, *** denote significance at the 10%, 5% and 1% level, respectively.

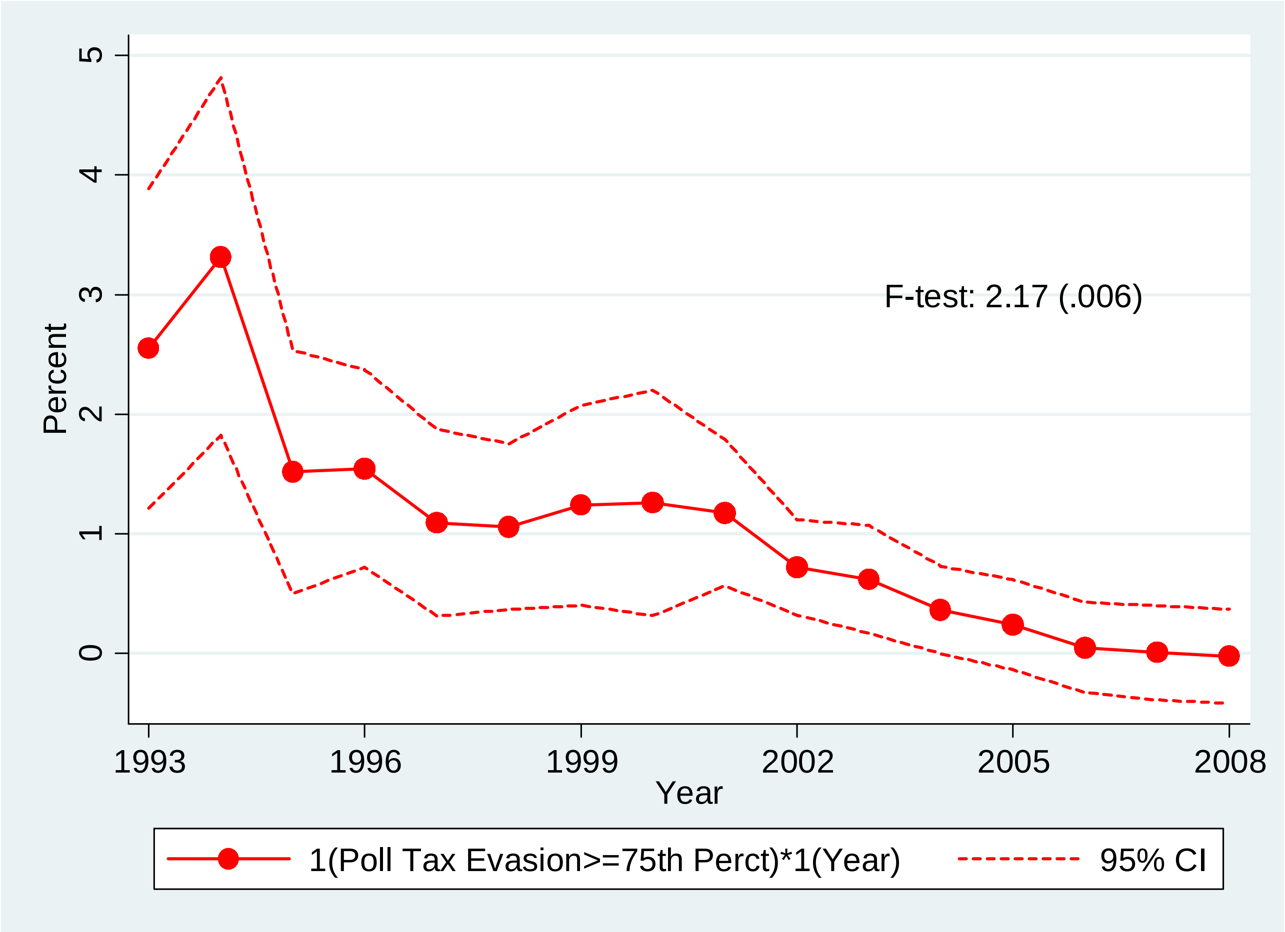
Appendix B

Figure B1 Tax Evasion by Poll Tax Evasion



***Notes**:* Each observation is a yearly average of tax evasion across all councils in one of two subgroups: the blue sample is the set of councils which had average tax evasion over the poll tax period below the 75^{th} percentile of poll tax evasion; the red sample is the set of councils with average tax evasion above 75^{th} percentile poll tax evasion. Mean poll tax non-compliance in the red (blue) group was 19.24% (7.70%).

Figure B2 Council Tax Evasion by Poll Tax Evasion



Notes**:* This graph plots the **1**(Year)1**(Poll Tax Evasion>=75th Percent) coefficients from a regression of council tax evasion on a set of year dummies, year-dummies interacted with a high poll tax evasion dummy, and council fixed effects. The sample period is 1993-2009, which corresponds to the Council Tax period. Omitted year-dummy is 2009. Dashed lines denote the 95% confidence interval of the interaction term. The F-test (p-value) refers to the joint significance of all interactions **1**(Year)***1**(Poll Tax Evasion>=75th Percent). Full regression output is given in column 1 of Table B1.

Table B1 Evolution of Council-Tax Evasion across Poll-Tax Evasion

Table 1: Evolution of Council Tax Evasion across PT Evasion

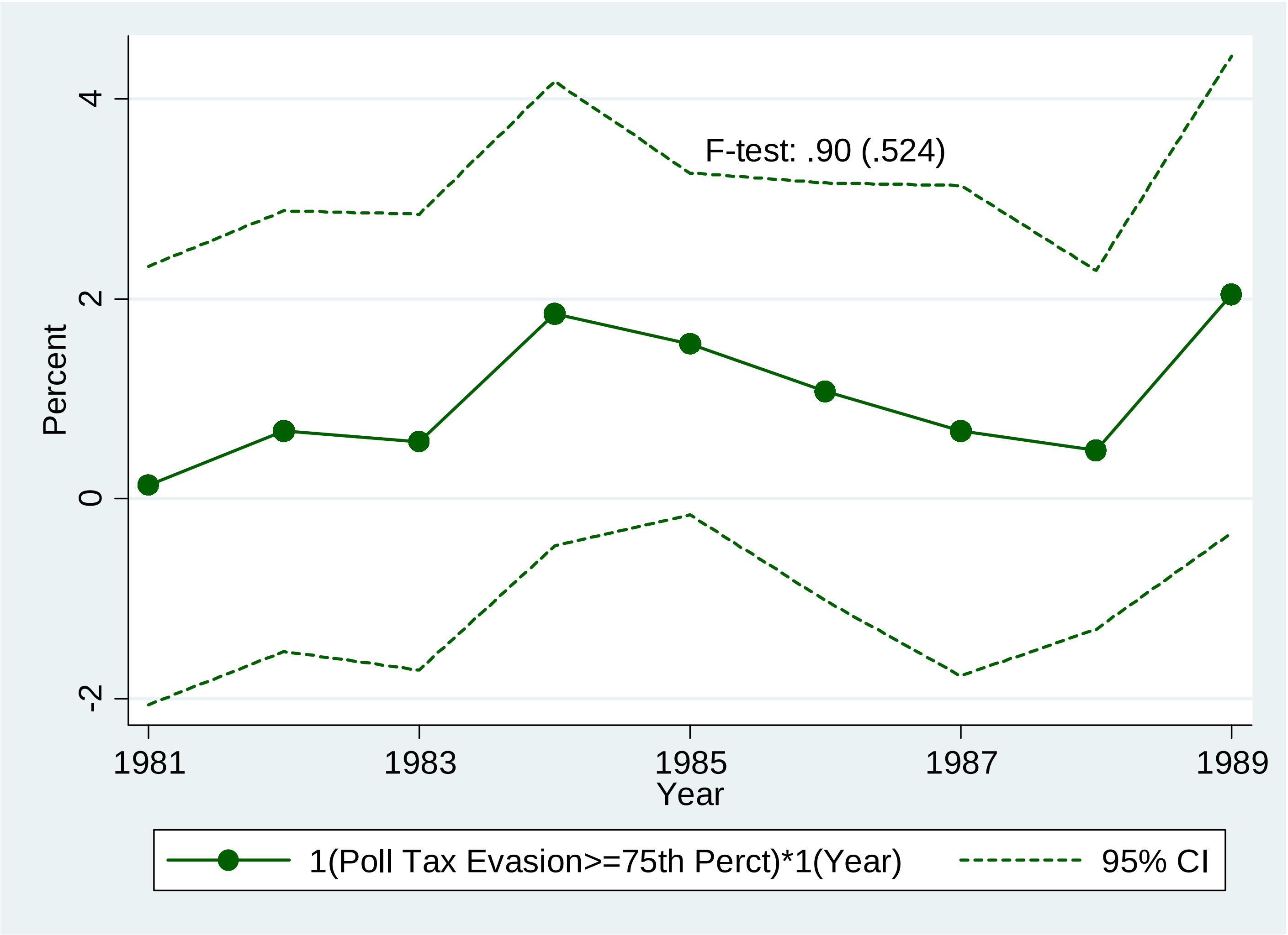
LHS	Council Tax Evasion :=(Net Collectable - Net Collected)/(Net Collectable)*100	
	(1)	(2)
1(PT Evasion >=75th Percentile PT Evasion) *1(Year==1993)	2.549 (.685) ***	2.555 (.711) ***
*1(Year==1994)	3.318 (.766) ***	3.325 (.795) ***
*1(Year==1995)	1.516 (.522) ***	1.524 (.542) ***
*1(Year==1996)	1.545 (.423) ***	1.551 (.439) ***
*1(Year==1997)	1.091 (.400) ***	1.097 (.416) ***
*1(Year==1998)	1.059 (.355) ***	1.063 (.368) ***
*1(Year==1999)	1.238 (.429) ***	1.241 (.445) ***
*1(Year==2000)	1.257 (.483) ***	1.261 (.501) **
*1(Year==2001)	1.175 (.314) ***	1.178 (.325) ***
*1(Year==2002)	.718 (.204) ***	.721 (.212) ***
*1(Year==2003)	.618 (.231) ***	.620 (.239) ***
*1(Year==2004)	.362 (.187) *	.364 (.194) *
*1(Year==2005)	.238 (.193)	.240 (.201)
*1(Year==2006)	.048 (.193)	.049 (.201)
*1(Year2007)	.003 (.201)	.004 (.209)
*1(Year==2008)	-.025 (.202)	-.024 (.210)
F-test on joint significance of all 1(Year)*1(High PT Evasion)	2.17 (.006)	2.02 (.011)
Council Fixed Effects	Yes	Yes
Year Dummies	Yes	Yes
Council-Specific Linear Time Trend	No	Yes
# Observations	4219	

***Notes**:* Standard errors clustered at the council level. *, **, *** denote significance at the 10%, 5%, 1% level respectively. Sample years: 1993-2009. Col 1 estimates the following model

$$e_{i,t} = \kappa + \beta_t \cdot \left(1(HighPT)_i \cdot \delta_t\right) + \delta_t + \mu_i + \varepsilon_{i,t}$$

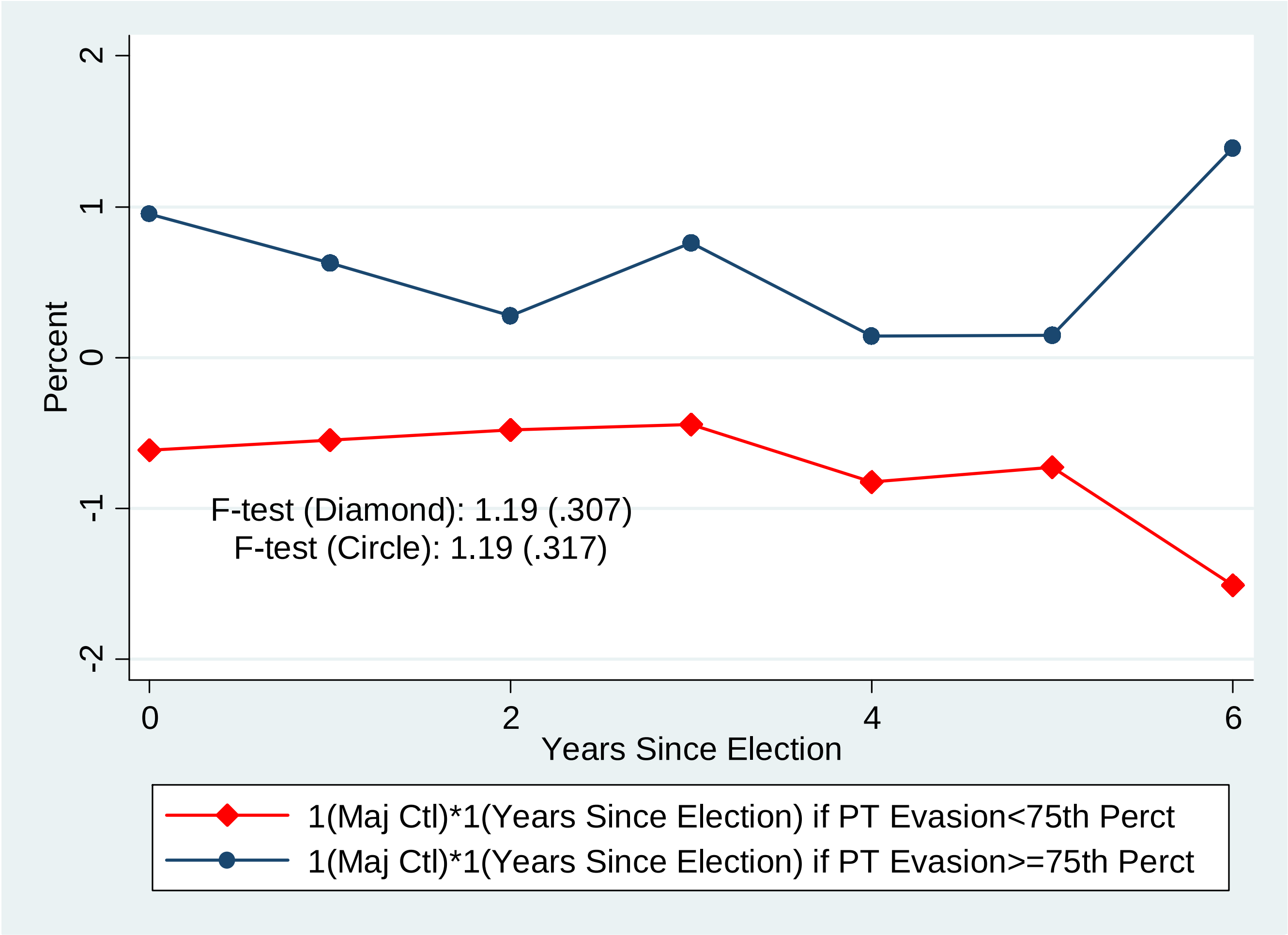
where $e_{i,t}$ is the council-year measure of tax evasion, $1(HighPT)_i$ is a council-specific dummy equal to 1 if the council had average Poll tax evasion above median poll tax evasion, δ_t is a set of year-dummies, and μ_i is a council fixed effect. Col.2 is the same model, augmented with a council-specific linear time-trend.

Figure B3 Domestic Rates Evasion by Poll Tax Evasion



Notes*:* This graph plots the **1**(Year)***1**(Poll Tax Evasion>=75th Percent) coefficients from a regression of Domestic Rates evasion on a set of year dummies, year-dummies interacted with a high poll tax evasion dummy, and council fixed effects. The sample period is 1980-89, which corresponds to the Domestic Rates period. 1980 is the omitted year-dummy. Dashed lines denote the 95% confidence interval of the interaction term. The F-test (and its p-value) refers to the joint significance of all interactions **1**(Year)***1**(Poll Tax Evasion>=75th Percent). The model estimated is the same as in *Notes* to Table B1.

Figure B4 Dynamic Impact on Council Tax Evasion across Poll Tax Evasion



Notes*:* This graph plots the **1**(Majority Control)***1**(Years Since Election) coefficients from a regression of our measure of tax evasion on the indicator for switch into majority **1**(Majority Control), seven years since election dummies **1**(Years Since Election), their interactions, lagged council-specific tax evasion, and a quadratic control function in the largest political seat-share. There are two separate sets of coefficients: the red line is based on the group of councils which had poll-tax evasion below 75th percentile poll-tax evasion; the black line is based on the group with above 75th percentile poll-tax evasion. Sample period is 1993-2009. Dashed lines denote the 95% confidence interval on the interaction terms. The F-test (p-value) refers to the joint significance of the set of seven interaction terms. Full regression output for the graph is given in columns 1 and 3 of Table B2. The model estimated is in the notes of Table B2, conditioning the sample on the high poll-tax evasion dummy.

Table B2 Heterogeneous Impulse Responses across Poll Tax Evasion

LHS: Tax Evasion:= [Net collectable in year - Net collected in year]/[Net collectable in year]*100

Sample Restriction	Council PT Evasion<=75th Percentile PT Evasion		Council PT Evasion>75th Percentile PT Evasion	
	(1)	(2)	(3)	(4)
RHS				
1(Maj Ctl)				
*1(Year Since Election=0)	-.615	-.526	.953	1.363
	(.282) **	(.275) *	(.537) *	(.669) **
*1(Year Since Election=1)	-.547	-.488	.626	1.071
	(.293) *	(.283) *	(.466)	(.606) *
*1(Year Since Election=2)	-.477	-.437	.275	.583
	(.333)	(.323)	(.790)	(.851)
*1(Year Since Election=3)	-.442	-.366	.760	1.117
	(.335)	(.329)	(.838)	(.885)
*1(Year Since Election=4)	-.824	-.686	.144	-.008
	(.489) *	(.466)	(1.300)	(1.332)
*1(Year Since Election=5)	-.728	-.533	.149	-.145
	(.367) **	(.376)	(.698)	(.480)
*1(Year Since Election=6)	-1.511	-1.412	1.390	1.413
	(.721) **	(.706) **	(1.018)	(1.119)
F-test (p-value)	1.19	0.95	1.19	1.48
	(.307)	(.470)	(.317)	(.186)
Council Fixed Effect	Yes	Yes	Yes	Yes
6-year period dummies	Yes	Yes	Yes	Yes
Controls (Tax liability, political control, population, per capita income)	No	Yes	No	Yes
Mean LHS	3.267		4.984	
# Observations	2918		932	

***Notes**:* All regressions include seven year since election dummies, a lagged dependent variable and a second-order control function in the largest seat-share by itself and interacted with **1**(Maj Ctl). The model estimated is

$$e_{i,t} = \kappa + \alpha \cdot e_{i,t-1} + \sum_{j=0}^{6} \tau_{i,j} + \sum_{j=0}^{6} \theta_j \cdot \left(\tau_{i,j} \cdot 1(MajCtl)_{i,j}\right) + \beta \cdot f(\max share)_{i,t} + \phi \cdot \left(f(\max share)_{i,t} \cdot 1(MajCtl)_{i,t}\right) + \delta_t + \mu_i + \varepsilon_{i,t}$$

where $e_{i,t}$ is council-year specific tax evasion, $\tau_{i,j}$ is a council-specific year since election dummy, $1(MajCtl)_{i,j}$ is a dummy for single-party majority in the council-year, $f(\max share)_{i,t}$ is a second-order control function in the largest seat-share on the council, δ_t is a set of six-year period dummies, and μ_i is a council fixed effect. Columns 2 and 4 add council-specific controls. Columns 1-2 estimate the model for the sample of councils with poll-tax evasion below 75th percentile poll tax evasion; Columns 3-4 estimate the model for the sample of councils with above 75th percentile poll-tax evasion. Standard errors clustered at the council level. *, **, *** denote significance at the 10%, 5% and 1% level respectively. Sample period is 1993-2009.