

# Norms, Enforcement, and Tax Evasion\*

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## Abstract

This paper studies individual and social motives in tax evasion. We build a simple dynamic model that incorporates these motives and their interaction. The social motives underpin the role of norms and is the source of the dynamics that we study. Our empirical analysis exploits the adoption in 1990 of a poll tax to fund local government in the UK, 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.

“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. ... 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)

## 1 Introduction

Sustaining the high government spending levels typical of most advanced economies requires high fiscal capacity. The latter depends not only on institutions to detect and punish tax non-compliance, but also on intrinsic motives that curb individual desires to cheat the government. Individual taxpayers may also care about how their tax compliance is perceived by others, leaving a role for social interactions to shape norms of compliance. Even though this idea has been widely discussed, it remains poorly understood from a theoretical and empirical point of view. One issue concerns the robustness of social tax-compliance norms: can they be eroded by shocks and how do norms persist over time? Another concerns the interaction between the individual and social motives to comply with taxes: do these weaken or reinforce each other? This paper attempts to make progress on both sets of issues by exploiting a unique natural experiment in fiscal history, the poll tax introduced by the Thatcher government in the early 1990s and which led to high levels of evasion.

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The first contribution of the paper is theoretical. It lays out a model in which individuals can evade taxes, and where the incentives depend on public tax enforcement (detection and fines), intrinsic motivation, and how not paying taxes affects their reputation. The latter creates a role for social interactions and yields a micro-foundation for social norms in tax compliance. The model is used to study the equilibrium dynamics of norms and tax evasion. We derive responses of tax compliance to a temporary shock to intrinsic motivation and a permanent shock to tax enforcement. The main role of the model is to guide the empirical analysis.

The second contribution of the paper is empirical. We exploit two kinds of natural experiments in the United Kingdom. The first is the poll tax itself which replaced a long-standing system of taxation by local governments (councils) based on rental values of properties. Officially named the Community Charge, the poll tax was levied on an equal basis within a jurisdiction for all citizens of voting age. The tax was deemed unfair by many, triggered mass evasion, and led to a U-turn which restored a property-based tax only three years later. As the breakdown in compliance was heterogeneous across councils, it can be interpreted as an array of (council-specific) temporary shocks to the intrinsic motive to pay taxes. The second set of natural experiments exploits narrow election victories in non-synchronous council elections in the period following the poll tax. Since 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.

Section 2 of the paper formulates our model. We build on insights from several pieces of literature. The traditional economic literature starts with Allingham and Sandmo (1972), who examine the gamble citizens take by not complying with their taxes, given the probability to be detected in an audit and the existing legal penalties (see e.g., Cowell 1990 and Slemrod and Yitzhaki 2002 for surveys). Our model incorporates such material compliance motives.

Tax compliance also depends on intrinsic motives. A variety of different labels are used for this in the existing 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”.<sup>1</sup>

Social interactions may also be important in the creation of norms of compliance.<sup>2</sup> This is highlighted in the quote above by Posner (2000). Although concrete applications to tax compliance are few, social scientists have developed different approaches to social norms. One simple way of modeling them is to put a desire to conform with others directly into preferences. A literature in social psychology – started by the experiments reported in Asch (1955) – suggests such an interpretation. Economists have taken a similar approach, e.g., Akerlof and Yellen (1990) in their study of efficiency wages as a reciprocal norm of fair effort

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<sup>1</sup>Luttmer and Singhal (2014) provide a review of the literature on intrinsic motivation in the context of tax compliance. A recent contribution by Dwenger et al. (2014) studies compliance with the local Church tax in Germany; despite a lack of both perceived and actual enforcement, the authors find that 20 percent of individuals pay at least as much tax as is owed, providing strong evidence of intrinsically motivated compliance behaviour.

<sup>2</sup>See, for example, Myles and Naylor (1996).

for a fair wage. Another approach to micro-founding norms, 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.

The approach taken here is based on the desire of individuals to build a reputation. In this we follow Benabou and Tirole (2011).<sup>3</sup> The approach gives way to a range of comparative statics which does not assume a priori whether social norms crowd in (complement) or crowd out (substitute) standard economic incentives. The model in section 2 extends Benabou and Tirole’s model to a dynamic setting to study the interplay among extrinsic, intrinsic and social motives in tax evasion. We then study the comparative statics and dynamics in response to temporary shocks to the intrinsic motives to pay taxes, and to a permanent shock to tax enforcement.<sup>4</sup>

Section 3 of the paper describes the empirical context and our panel data on tax evasion, enforcement, and political majorities over thirty years (1980-2009) in the 346 councils of England and Wales. Since we do not have individual data on compliance, we focus on the average level of compliance at the council level.<sup>5</sup> We construct a consistent measure of tax evasion across three regimes: the (property-based) domestic rates from 1980 to 1989, the (person-based) poll-tax from 1990 to 1992, and the (property-based) council-tax from 1993 and onwards. Figure 1 shows average tax evasion across all councils for each year in our sample. Evasion before the poll tax was around 3% and on a declining trend. The poll-tax period saw an abrupt upward shift, as average evasion reached between 10 and 15%. After the return to property-based taxes in 1993, evasion returned gradually towards pre-poll-tax levels. This time pattern squares well with the idea that shocks to intrinsic motives to pay taxes might have quite persistent effects, due to the dynamics of social norms.<sup>6</sup>

Figure 1 about here

Since elections are staggered across councils and years, we get many close election outcomes in each calendar year. We exploit the fact that these close elections trigger shifts into or out of single-party control that are as good as random. Moreover, single-party majorities are systematically associated with less tax evasion. Figure 2 shows a standard Regression Discontinuity Design (RDD) diagram, where each dot represents half a percent of the sample (about 50 council-election years), and the horizontal axis shows the seat share of the largest political party minus the 50-percent cutoff. The quadratic control functions left and right 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 also consider how discretionary tax

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<sup>3</sup>A somewhat different signalling approach is taken in Posner (2000).

<sup>4</sup>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.

<sup>5</sup>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.

<sup>6</sup>This persistence is consistent with the evidence presented in Helliwell, Wang and Xu (2013).

enforcement varies with majority shifts and show that the drop in tax evasion most likely reflects more vigorous enforcement by single-party council majorities.

Figure 2 about here

Section 4 of the paper presents our econometric evidence, beginning with tax-evasion changes in the poll-tax regime. These are heterogeneous across councils which can be attributed to different demographic, economic and political compositions of any particular council. Non-parametric estimates of tax-evasion dynamics after the poll-tax show clearly that evasion falls more slowly in councils where it was high during the poll-tax period – as predicted by the theory in Section 2. Moreover, this result does not reflect pre-trends and is robust to alternative empirical specifications.

Next, we analyze the effects of narrow shifts into single-party majorities after 1993. Our RDD approach shows that these shifts are associated with stricter enforcement effort by councils and lower tax evasion. There is both an immediate “impact effect” and a sustained effect over time, suggesting that we can indeed interpret a narrow political shift as a permanent enforcement shock. We show that the results are robust to a number of alternative RDD specifications and that the RDD is properly identified.

Finally, we exploit the earlier persistence findings and ask if the level of poll-tax evasion shapes the effects on tax evasion in the council-tax period. We find that an enforcement shock has a smaller effect in councils with high levels of poll-tax evasion – a result that confirms the predicted interaction effect between individual and social motives for tax compliance.<sup>7</sup> As with the results on persistence, these findings are robust to alternative measurements and definitions.

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

## 2 Theory

### 2.1 The model

**Basic Structure** The theoretical framework builds on Benabou and Tirole’s (2011) model of social norms. However, it augments their model to include some simple adaptive dynamics. We measure time in discrete periods, indexed by  $t$ , that correspond to years in the data. There are  $C$  councils, indexed by  $c$ , each of which is populated by a continuum of agents of size one. Taxpayers 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  $e = 1$

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<sup>7</sup>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.

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.

Taxpayers may also be intrinsically motivated to pay their taxes. The mean level of such motivation, denoted  $i_{c,t}$ , may vary among councils and over time. However, taxpayers also vary in their intrinsic motivation. We let higher values of  $\nu$  denote a greater proclivity to pay taxes – i.e., a higher intrinsic motivation, which can be positive or negative. For example Helliwell (2003) reports a positive correlation with expressing a desire never to cheat on taxes and subjective well-being. We assume that  $v$  has a symmetric distribution with a single mode (median and mean) at zero, common in all councils and time periods. The p.d.f and c.d.f. of this distribution are denoted by  $g(v)$  and  $G(v)$ .

In addition to intrinsic motivation  $\nu$ , taxpayers care about their reputation for being perceived as pro-socially motivated. Following Benabou and Tirole (2011), this component of their utility depends on the signal that compliance sends about their type. In our setting, it becomes a source of social interaction within a council since the effect on the signal of complying depends on the behavior of others.

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

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

The final term in (1) is the social signalling term: the influence on the taxpayer of his/her reputation (or self image) – i.e., how society views her (or how she views herself) given her evasion decision,  $e$ . It reflects the taxpayer’s “expected type”, i.e., the average value of intrinsic motivation parameter  $\nu$  among those that choose action  $e$ . Clearly, those who comply with their taxes will be among those with a high value of  $v$ . The key assumption is that people are highly regarded when they are good citizens and pay their taxes, and hence appear to have a high value of  $\nu$ . Parameter  $\mu$  is the weight that taxpayers place on their reputation relative to their individual well-being.

**The Evasion Decision** Individuals choose  $e$  to maximize (1). The resulting decision rule is characterized by a cutoff value,  $v_{c,t}^*$  defined by

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

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  $G(v_{c,t}^*)$ .

The first term  $m_{c,t} - x_{c,t}$  in (2) represents the material cost/benefit from compliance, while the second  $i_{c,t} + v_{c,t}^*$  is the critical level of intrinsic motivation. The third term,  $\mu [E(v|e = 1) - E(v|e = 0)]$ , represents

the reputational cost of evading, which depends on how such acts are perceived. This is where social interactions enter the picture. Another way to read the cutoff condition is that the individual marginal cost of evading (the first two terms) exactly balances the social benefit of complying (the third term).

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

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

By the property of truncated means, the value of  $\Delta(v_{c,t-1}^*)$  is always positive, i.e., there is a positive gain in reputation from paying taxes faithfully.<sup>8</sup> All model dynamics, as well as all social interactions, are embodied in (3).

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

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

Standard arguments show that the equilibrium dynamics are determined by the derivative  $\Delta_v$ , (minus) the root of the difference equation. We will assume throughout that  $-1 < -\Delta_v < 1$  so if  $x, m$ , and  $i$  are constant, the cutoff – and hence the share of tax evaders – 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  $\Delta_v$  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.

To understand the sign of  $\Delta_v$ , 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  $\Delta$  has a

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<sup>8</sup>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:

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

unique interior minimum located at zero (due to the symmetry of the distribution). Hence  $\Delta_v < 0$  for low values of  $v_{c,t-1}^*$ , when few people (less than half) evade and  $\Delta_v > 0$  for high values of  $v_{c,t-1}^*$ , when many (more than half) evade.<sup>9</sup>

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, when  $\Delta_v > 0$ , tax-evasion decisions are strategic substitutes, such that higher evasion in year  $t - 1$  leads to lower evasion in  $t$ .

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,  $i_{c,t}$ . We could the predictions in full generality across the cases of strategic complements and substitutes.<sup>10</sup> In our empirical application, however, the maximal evasion rates are on the order of 0.3. Therefore, we simplify the exposition by focusing on the case where the share of evaders is always less than half, and hence  $\Delta_v < 0$ .

**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, 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.

Under the assumption of strategic complementarity ( $\Delta_v < 0$ ), we have the following result:

**Prediction 1** *Permanently stricter tax enforcement implies an impulse-response function, where the share of tax evaders shifts down in proportion to the change in  $m_c$  on impact and then declines monotonically*

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<sup>9</sup>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".

<sup>10</sup>An earlier working-paper version (Besley, Jensen and Persson, 2014) provides a full set of results.

to a new value  $G(\hat{v}'_c)$  with  $\hat{v}'_c < \hat{v}_c$ .

**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

$$v_{c,t}^* - v_{c,t-1}^* = -(-\mu)^{t-1-T} [\prod_{s=T}^{s=t-2} \Delta_v(v_{c,s}^*)] (m'_c - \hat{m}_c). \quad (5)$$

Since  $\Delta_v(v_{c,t}^*) < 0$  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  $t$ .

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

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

Because the social multiplier in (6) is larger than 1 when  $\Delta_v(\hat{v}_c) < 0$ , we get  $\hat{v}'_c - \hat{v}_c > m'_c - \hat{m}_c$ . 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 starting from a specific initial condition. We now consider what can be said about the adjustment in councils that start out with different levels of tax evasion. Suppose we compare two councils with different initial shares of tax evaders  $G(\hat{v}_c^{low}) < G(\hat{v}_c^{high})$ . A priori, the same permanent enforcement shock has an ambiguous effect on the incidence of tax evasion in the council with the lower share of evaders. 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 makes  $\Delta_v$  lower and the ‘social multiplier’ for the cutoff value  $\frac{1}{1 + \mu \Delta_v(\hat{v}_c)}$  higher under the (relatively) weak assumption that  $\Delta_{vv} > 0$ <sup>11</sup>. But the enforcement effect also depends on the fraction of agents who find themselves around the shifts in cutoffs  $\hat{v}_c^{low}$  and  $\hat{v}_c^{high}$ , as measured by the respective densities  $g(\hat{v}_c)$ . In the empirically relevant case, with a small initial share of tax evaders (lower than one half), a lower share is associated with a lower density, which makes the overall effect ambiguous.

Given this discussion, we have the following corollary:

**Prediction 2** *Suppose that we compare two councils with different initial share of tax evaders  $G(\hat{v}_c^{low}) < G(\hat{v}_c^{high})$ . A larger effect – even the same effect – on tax evasion at  $\hat{v}_c^{low}$  compared to  $\hat{v}_c^{high}$  in the data, is compelling evidence for a higher social multiplier at  $\hat{v}_c^{low}$ .*

As we discuss further below, this prediction can be evaluated empirically by exploiting different initial conditions tied to evasion during the poll-tax period.

<sup>11</sup>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).



**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, this corresponds to a council-specific shift in evasion triggered by the Thatcher government's introduction of a poll tax. Many taxpayers perceived the poll tax to be unfair, because there was no link between the tax liability and the ability to pay.<sup>12</sup> This reduced the intrinsic motivation to pay taxes, but the underlying shock was temporary: the poll tax was abolished in 1993 and replaced by a property-value based system akin to the one that had prevailed before 1990.

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

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

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 discrete return to the previous level of compliance. However, since  $\mu > 0$ , the dynamic path is persistent as studied below.

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

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

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

**Prediction 3** *The impulse-response function for the share of tax evaders of a temporary decline in intrinsic motivation has a discrete initial jump from  $G(\hat{v}_c)$  at  $\underline{T}$ , and a monotonic increase in the range between  $G(\hat{v}_c + \hat{i}_c - i'_c)$  and  $G(\tilde{v}_c)$  as long as  $\bar{T} \geq t \geq \underline{T}$ . Thereafter, the share of tax evaders starts to fall monotonically back to  $G(\hat{v}_c)$ .*

**Proof.** These results follow from the fact that the model can be solved recursively. Thus, as long as  $\bar{T} \geq t \geq \underline{T}$  – 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  $v_{c,t}^* - v_{c,t-1}^* = -(-\mu)^{t-1-T} [\Pi_{s=T}^{s=t-2} \Delta_v(v_{c,s}^*)] (i'_c - \hat{i}_c)$  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 way, as  $\Delta_v < 0$  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 (see Figure 3 below), we hypothesize there was a common starting value for tax evasion. However, we postulate that councils experienced heterogeneous

<sup>12</sup>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.

shocks  $i'_c - \hat{i}_c$ , reflecting the different socioeconomic makeup of the relevant population. Prediction 3 says 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 evasion "shocks" throughout the period of adjustment to the new steady state.

**Prediction 2 Redux** 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 Prediction 2. 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. We can then compare 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.

**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

$$r_{c,t} = (1 - G(v_{c,t}^*))x_{c,t} . \quad (7)$$

Suppose that the council has a target revenue  $\bar{r}_{c,t}$  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 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  $t$ ,<sup>13</sup> taking the social norm in the previous period as given, so

$$m_{c,t}^* = \operatorname{argmin}_m \left\{ \frac{1}{2}[(r_{c,t} - \bar{r}_{c,t})^2 + \theta_{c,t}m^2] \right\} = \frac{(\bar{r}_{c,t} - r_{c,t})g(v_{c,t}^*)x_{c,t}}{\theta_{c,t}} . \quad (8)$$

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

Using this simple policy rule, we can show that the contemporaneous response, as well as the dynamic

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<sup>13</sup>This is a purely static objective – a more ambitious model would also take into account the dynamic effects, via changing future social norms, of today's policy.

response, of the cutoff  $v_{c,t}^*$  have the same signs but smaller magnitudes than in the absence of enforcement.<sup>14</sup> Therefore, the qualitative properties of Predictions 1-3 remain valid even when enforcement is endogenous.

### 3 Data

This section gives our sources and defines our measures of tax evasion, electoral outcomes and tax enforcement. Our data forms an unbalanced panel of 346 local authorities (councils) in England and Wales over 30 years between 1980 and 2009, so that each observation is a council-year. Councils are separated into classes which differ in several dimensions, including their electoral structure. However, all councils share two important characteristics: they are responsible for collecting the taxes that we study, and their policies are determined by a legislative assembly of locally elected councillors.

#### 3.1 Tax Evasion

**A Brief History of Local Tax Bases** Although the tax base changed during our sample period, the local council has retained responsibility for enforcing and spending the revenue it collects from taxes levied on households.<sup>15</sup> 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. This was assessed by the Valuation Office, which would uprate the value in line with improvements. The occupants were liable to pay tax whether a property was used for domestic or business purposes.

In 1990, domestic rates were replaced by the community charge, popularly referred to as “the poll tax”.<sup>16</sup> This was levied at a flat-rate per-head tax. A few groups – including nuns, criminals and recipients of income

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<sup>14</sup>Consider a shift in  $i_{c,t}$ . Using (7), (8), and (4), the contemporaneous response of the cutoff to this shift is given by:

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

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:

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

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.

<sup>15</sup>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 transferred to central government, and then partially redistributed back to councils, according to a centrally set multiplier.

<sup>16</sup>See Butler, Adonis and Travers (1994) for a discussion of the factors leading up to the introduction of the poll tax and its subsequent abolition.

support – were exempted. Other low-income groups, such as students and unemployed, were liable for 20% of the standard amount. Otherwise, the poll tax was levied independently of an individual’s income and wealth. Ostensibly, this reform was to improve political accountability by creating equal stakes for every citizen. But the tax was deemed unfair since it was not linked to individual circumstances – it broke the link between a property’s value and the tax levy, a hallmark of the earlier regime and a feature of almost every existing system of local taxation. The perceived unfairness resulted in major protests and riots accompanied by unprecedented levels of tax evasion by UK standards.<sup>17</sup>

In 1993, the poll tax was abolished and replaced by the present council tax. It is based on the value a property would have sold for in the open market on April 1st 1991. The Valuation Office individually assessed each property and assigned it to one 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 that occupies a property. This reintroduced the link between the taxes and property values, thus restoring some semblance of fairness in the local tax system. However, no revaluations have taken place after 1991 and no new bands have been introduced with increasing property prices.<sup>18</sup> As the council tax has become decreasingly detached from actual property values, its fairness have come under debate.

There is no simple way of comparing tax levels across the three tax regimes due to the different tax bases. However, we can make a rough guess of the level of taxation per dwelling.<sup>19</sup> This suggests that domestic rates per dwelling in 1989 were around £501 (std. 110), the poll tax per dwelling in 1990 was £677 (std. 214) and the council tax per dwelling in 1993 was £509 (std. 289). However, poll tax number is somewhat misleading, because of cuts in 1991 and 1992 – a per-head reduction by £110 in 1991 brought the poll tax per dwelling down to almost exactly the same liability level as under the domestic rates and the council tax. This exercise suggests that we may want to condition on each council’s poll-tax level when analyzing evasion from the this tax.

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

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<sup>17</sup> It was not the first time in British history that a poll tax had triggered a mass protest – more than 600 years before, in 1381, the poll tax is considered to have had central place in triggering the peasants’ revolt.

<sup>18</sup> There have been talks of re-valuation of properties in England, but these have systematically been postponed. However, in Wales, re-valuation of properties occurred in April 2003.

<sup>19</sup> The methodology from CIPFA (1993, page 8, rows 12 and 16-17) is used to calculate the poll tax per dwelling in 1990. However, using this method, poll tax per dwelling is missing for approximately 30% of the councils. CIPFA (1993) has data on domestic rates per dwelling in 1989 and the council tax per dwelling in 1993.

the paper.<sup>20</sup>

Under the present 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 for any of the three systems. 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%, against theirs of 2.90%. It is reassuring that the correlation is 0.99 at the council-matched level<sup>21</sup>.

Our data on evasion is constructed from two series produced by the Chartered Institute for Public Finance and Accountancy (CIPFA).<sup>22</sup> We have digitized CIPFA’s series for all years prior to 1996, with a resulting sample size of 8,220 council-year evasion observations.<sup>23</sup> 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.<sup>24</sup>

**Evasion in the Three Tax Regimes** By our measure, the pre-1990 rates system had high compliance with mean evasion at 2.8%. 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. This is shown in the marginal density distributions in Figure 3.

Figure 3 about here

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<sup>20</sup>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. 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.

<sup>21</sup>Council-level evasion measures in the administrative data were only available in 2008-11

<sup>22</sup>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.

<sup>23</sup>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.”

<sup>24</sup>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.

This shift in dispersion illustrates a heterogeneous change in evasion behavior, which can be readily interpreted as a set of heterogeneous shifts in intrinsic motives ( $i_{c,t}$  in the model).<sup>25</sup> The most plausible interpretation of this heterogeneity is that different areas in the UK have different socioeconomic make ups. At the shift to the council tax in 1993-94, the distribution of evasion starts 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%. But 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.<sup>26</sup>

### 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 unit than the council (on average 23 wards per council). Each ward returns between one and three members to the local council. 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.<sup>27</sup> Based on 10,434 council-year composition observations, we construct a binary indicator of single-party majority control, which we set equal to one whenever one of the political parties controls 50% or more of the council's total seats. This rests on the idea that policies are more cohesive when a single party rather than a coalition runs the council. In particular, we hypothesize that more cohesion might facilitate greater agreement on the use of tax revenue and therefore a stronger motive 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 can opt for either system and may change between them. This heterogeneity in returned seats and timing of elections suits well 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

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<sup>25</sup>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).

<sup>26</sup>Another difference between the poll tax and the council tax/rates is that the poll tax was levied on individuals rather than properties. It is difficult to translate our evasion measures to a per capita basis consistently. However, our efforts to measure evasion on a per capita basis yielded similar results.

<sup>27</sup>These data were obtained from the Elections Centre at Plymouth University.

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.<sup>28</sup> However, none of these papers studies the impact of electoral outcomes on local tax evasion.

### 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 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 council’s first action is to send out a reminder. 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 other methods to recover the debt, including (in order of severity) taking money directly from wages and benefits, ordering bailiffs to collect the amount, 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. Thus, reminders constitute a ‘soft’ signal of enforcement while issuing a summons is a more directed and costly effort by the council.

Based on this, we use the ratio of the number of court summons relative to the number of reminders in a council-year as our core proxy for enforcement. In our sample, the council sends out an average of 0.31 summons per reminder (std. 0.28, 25th percentile 0.17, 75th percentile 0.35). If this measure proxies for exogenous enforcement ( $m_{c,t}$  in our theory), it should predict decreases in tax evasion. On the other hand, if it reflects an endogenous response to evasion, we would observe a positive correlation with evasion. In a cross-sectional regression, summons over reminders is positively correlated with evasion. However, in a within-council regression – i.e., including council fixed effects – summons over reminders is negatively correlated with evasion, with an elasticity of  $-0.61$  (std. 0.16). This suggests that our core measure is a good proxy of enforcement effort. Below, we interpret changes in the summons/reminders ratio induced by majority switches as exogenous shocks to enforcement corresponding to those in Prediction 1.

## 4 Evidence

We now use the data introduced in Section 3 to shed light on the predictions from Section 2. In a first subsection, we test Prediction 3 on the persistence of social motives in the wake of temporary shocks to

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<sup>28</sup>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. However, Eggers et al. (2013) find no evidence of such sorting in the case of close UK local elections, which supports the identifying assumptions for our RDD framework.

the intrinsic motives to pay. We do this by highlighting the heterogenous evasion responses to the “poll-tax shock” and by following the evolution of tax evasion in the council-tax regime. In the second subsection, we consider the effects of permanent shocks to enforcement. We do this by considering 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 Predictions 1 and 2. Specifically, we 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 Motives

Figure 1 discussed in the introduction shows that average tax evasion goes up to between 10% and 15% during the poll-tax years and then begins to decline immediately after the shift to the council tax in 1993. We will interpret the changes in evasion during the poll-tax period as induced by council-specific shifts in the average intrinsic motivation to comply with taxes ( $i_{c,t}$  in the model). Then, we can study the dynamics using Prediction 3 about the impulse-response function. 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 4 about here

A natural split is between councils with above and below median poll-tax evasion. The left-hand panel of Figure 4 compares these 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 the 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 in our model of a dynamically evolving social norm for evasion.

Table 1 about here

A plausible criticism is that the council-specific shifts in poll-tax evasion need not only reflect variation in intrinsic motives to comply with taxes. In particular, they may vary systematically with economic, social and political variables at the local authority level. For example, people in Labour-dominated councils may have been more upset about the Thatcher government’s poll-tax policy and thus more motivated to evade taxes as a form of protest. Table 1 explores this possibility by reporting the results of a cross-council regression for poll-tax evasion on a range of variables: the size of the poll-tax liability, (log) per-capita income, (log) population, the seat shares of the Conservative and Labour parties, dummies for Conservative



and Labour majority control, the proportion of houses in the top council tax band compared to the bottom band (a measure of housing-value inequality), and the share of renters broken down by private and council landlords (social housing). The correlation patterns in Table 1 make sense. A higher poll tax liability is positively correlated with evasion while higher income is associated with lower evasion. There are insignificant correlations with the political variables except for Labour control. Greater inequality in the value of the housing stock is negatively correlated with poll-tax evasion. The proportion of private renters is positively correlated with evasion (which is plausible if such renters are particularly mobile and more willing/able to move rather than pay).

We use the regression in the final column of Table 1 to construct a measure of conditional poll tax evasion, as the residual from this regression. In this way, our measure is not purely a proxy for these observable sources of heterogeneity across authorities. Dividing the sample based on this conditional measure of evasion, we obtain the right-hand panel of Figure 4. The results for conditional evasion are very comparable to those for gross tax evasion. From now on, whenever we divide the sample, we focus on the results for our conditional measure of poll-tax evasion based on Table 1.

**Non-parametric Estimates** We now examine 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 conditional poll-tax evasion interacted with a full set of year indicators from 1993 to 2008 (2009 is the left-out indicator).<sup>29</sup> In effect, we are estimating separate year effects for the two sub-groups in the right-hand panel of Figure 4. The inclusion of council fixed effects and year fixed effects 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 year dummies for high conditional poll-tax evasion councils are significantly different from zero between 1993 and 2002. This suggests a persistent effect up to ten years after the poll tax is abolished. The estimated coefficients are plotted in Figure 5 together with their 95% confidence intervals.

Figure 5 about here

**The Pre-poll-tax Period as a Robustness Check** If the poll tax disrupted a tax-paying social norm, we should not expect a similar pattern in the period before the introduction of the poll tax. If we did observe a similar pattern, this would be analogous to the assumption of parallel pre-trends being violated in a difference-in-difference estimation.

Figure 6 about here

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<sup>29</sup>Appendix Tables 1 and 2 report the regression estimates for conditional poll tax evasion and raw gross poll-tax evasion and Appendix Figures 2 and 3 display graphically the respective sets of regression results.

To investigate this, we repeat the analysis underlying Figure 5, but for the 1980-89 period. Thus, we interact year indicators for 1981-1989 (leaving out the 1980 dummy) with the indicator for above-median conditional poll-tax evasion and plot the estimated coefficients in Figure 6. None of these is statistically different from zero. In other words, whatever source of heterogeneity is uncovered by poll-tax compliance to persist for ten years, it was not observed in the prior period. This makes it plausible to attribute the evasion patterns to a break-down of social norms following the introduction of the poll tax.<sup>30</sup>

**Summary** Taken together, the results show persuasive evidence in line with the idea that the poll tax shifted the intrinsic motives to pay tax, and that these shifts spilled over into the prevailing social norm, which then 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.<sup>31</sup>

To quantify the amount of evasion implied by our results, we use the average tax evasion over councils and years in the domestic rate period as a counterfactual evasion rate. We then apply this evasion rate to all councils from 1990 onwards and compute the actual evasion less the counterfactual evasion rate multiplied by the tax liability for each council. Finally, to get an aggregate measure, we sum over councils and years. On this basis, we estimate the cumulative tax foregone due to the poll-tax experiment at 4,980,000,000 in 2009 pounds, which is around 26% of the total value of the 2009 council tax liability. This number suggests a fairly weighty “echo effect” from the poll-tax period on local government tax revenue.

## 4.2 Enforcement

One concern with the results presented so far is that they do not consider council enforcement decisions. Ideally, we would like to find a factor which plausibly influences enforcement without any other effects on evasion. This is where the narrow shifts in political control come in. When elections outcomes are close, we can plausibly assume that the resulting shifts in political majority are as good as random and orthogonal to the determinants of individual evasion decisions.

**Close Elections** We study how narrow shifts into, or out of, single-party control (recall Section 3.2) affect tax evasion and our proxy for enforcement (recall Section 3.3). Let us first define close elections as those that lie within the optimal bandwidth for RDD estimation with a linear control function proposed by Imbens and Kalanyaramanan (2012) (IK in what follows). When applied to our data, their algorithm returns a

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<sup>30</sup>Appendix Figure 4 finds no statistical significance for the set of interactions between year-indicators and the indicator for above-median poll-tax evasion.

<sup>31</sup>As shown in Appendix Figure 9, all the results go through if we instead split the sample of councils into those below and above the 75th percentile of conditional evasion during the poll-tax tax period. Finally, Appendix Figure 10 shows the results are robust to controlling for the difference in household tax-liability between the last year of Domestic Rates and the first year of the Poll Tax, in the poll-tax regression (Table 1, Col.5). This measure is not available for all councils in the required years, and leads to a 30 percent decrease in sample-size relative to the sample used in the main text.

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 – 708, 1533 and 2804 elections respectively over the entire sample period.<sup>32</sup>

**The Impact Effects of Majority Shifts** Do 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 favor of this possibility, which we now explore more systematically. To that end, Table 2 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. The whole table is 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 above 50 percent of its sample-mean. 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 proxy for 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 (0.29). But only two out of the four estimates are statistically significant at the 10% level. For smaller as well as larger bandwidths, the point estimates are generally lower, noisier, and 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  $\pm 1.5\%$ ,  $\pm 3\%$ ,  $\pm 5\%$ , and  $\pm 10\%$  from the switchpoint at 50%. All regressions include a control function, which is either linear or quadratic. For tax evasion in the upper panel, 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 panel, we show the estimates with and without controls.

Table 3 about here

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<sup>32</sup>Appendix Figure 8 in the Online Appendix plots the number of close elections in all sample years according to the IK and half the IK bandwidth sizes.

The earlier estimates for tax evasion hold up well. The estimates are larger in absolute terms as the bandwidth is lower, and generally larger with the quadratic than the linear specification. 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 linear and the quadratic 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 changes of the width of the estimation interval around its switchpoint at 50%. The estimate stabilizes just above  $-2$  percentage points as the interval grows.<sup>33 34 35</sup>

**Dynamic Effects of Majority Switches** The results above only concern the impact effects on enforcement and evasion. But Predictions 1 and 2 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 do this, we estimate a non-parametric regression where the enforcement proxy or the evasion measure is regressed on an indicator for a switch into majority control in year  $t$  interacted with a set of year-since-election indicators for  $t + s$ ,  $s = 0, \dots, 6$ . 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 estimated coefficients for the enforcement proxy are displayed in the left-hand panel of Figure 8, where we have re-scaled the point-estimate relative to their sample-means (to allow direct comparison across the two panels). The estimates suggest that enforcement (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 10% of the mean (the point-estimate vary around 0.05, relative to the summons-reminders mean of 0.31). Four out of seven of them are statistically significant at the 5% level. While these results are not overly strong, they are still consistent with a permanent effect on

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<sup>33</sup>Appendix Figure 5 shows the equivalent estimates for enforcement when the interval for the running variable changes. The specification does however include controls. The point-estimate remains broadly stable in the range between the optimal bandwidth and three times the optimal bandwidth.

<sup>34</sup>As another robustness check, Appendix Figure 1 shows that the core evasion RD-result of Figure 2 holds when we restrict the bins of the running-variable to contain equal numbers of observations. This alleviates concerns that the RD evasion result could be driven by a small number of outlier observations situated very locally around the majority cut-off.

<sup>35</sup>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, Appendix Figure 6 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 – see Appendix Table 3.

enforcement from a shift in political control.

Figure 8 about here

The right-hand panel of Figure 8 shows the estimates 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 short of minus 20 percent in year 0, which more than doubles (in absolute value) to year 6. The downward jump and subsequent gradual decrease in evasion are entirely consistent with Prediction 1.<sup>36</sup>

**Heterogeneous Dynamic Effects** The final question we pose concerns the heterogenous effect of permanent enforcement shocks – via different social multipliers at different levels of tax evasion – in Prediction 2.<sup>37</sup> As in Section 4.1, we split the sample into councils above and below median conditional poll-tax evasion. The coefficients are displayed in Figure 9.<sup>38</sup>

Figure 9 about here

All the estimated coefficients on the interacted majority-switch and year indicators are larger in absolute value for the councils with low poll-tax evasion than for those with high poll-tax evasion. The  $F$ -statistic when testing the joint significance of the estimated coefficients is much higher for low poll-tax evasion councils (3.24,  $p$ -value .003), than for high poll-tax evasion councils (1.17,  $p$ -value .323).<sup>39</sup>

**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 Prediction 2. That an enforcement shock has a larger effect on council-tax evasion for councils with smaller poll-tax tax evasion means that, around

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<sup>36</sup>The estimates in the right panel of Figure 8 correspond to the non-parametric regression in Column 1 of Appendix Table 4, which refers to the entire Council-tax period 1993-2009. Column 2 adds to the council fixed effects a set of controls – tax liability, (log) per-capita income, (log) population, a set of seat-shares for labor or conservative 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.

<sup>37</sup>The static RDD within-council estimates of the impact of random switch into majority on enforcement (Table 2, lower panel) do not differ across samples of above and below-median conditional poll-tax evasion nor across samples of above/below median gross poll-tax evasion. Results not reported here show that the 95% confidence interval of the point estimates for the sub-samples systematically overlap.

<sup>38</sup>These results are based on Column 1 and Column 3 in Online Appendix Table 5, which show estimates similar to those in Appendix Table 5, when we include council fixed effects and six-year fixed effects. We do not include single-year fixed effects, as they would absorb most of the year-to-year variation due to uneven majority swiches. Columns 2 and 4 show that the same results obtain when we also include the standard set of council-specific controls – tax liability, (log) per-capita income, (log) population, seat-shares for labor and conservative, and dummies for labor and conservative political control.

<sup>39</sup>The results are qualitatively similar, when we replace the conditional level of poll-tax tax evasion with the gross level of tax evasion discussed in Section 4.1. Regression output, with and without controls, is reported in the Online Appendix Table 6 and the estimated coefficients corresponding to Figure 9 are shown in Online Appendix Figure 7. As in Section 4.1, we can also perform the analysis by changing the sample split from councils below and above median conditional evasion in the poll-tax era to those below and above the 75th percentile of conditional poll-tax. Online Appendix Figure 9 shows that the results based on this alternative sample split are similar to the results reported in the main text.

the initial cutpoints for evasion, a larger social multiplier  $\frac{1}{1+\mu\Delta_v(\hat{v}_c)}$  outweighs the effect of a smaller density  $g(\hat{v}_c)$ .

Through the lens of the model, we have thus found *prima facie* evidence for an interaction of individual and social motives in tax evasion. In line with that interpretation, social norms exercise a larger crowding in of enforcement at lower levels of tax evasion, which shows up as a larger social multiplier.

## 5 Conclusion

This paper has studied the persistence of social motives in tax evasion and the interaction between these motives and traditional individual motives tied e.g., to 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 has helped us design our empirical specifications and permitted a sharper interpretation of the results.

The empirical analysis revolves around a unique natural experiment: the introduction and abolition of the poll tax in English and Welsh councils in the early 1990s. This induced a breakdown in tax compliance in an otherwise law-abiding environment, with much higher levels of evasion than could be seen in a field experiment. This gives an instructive case, where we can study and interpret the dynamics of tax evasion in response to a set of specific identifiable shocks which undermined the intrinsic motivation to comply due to the perceived unfairness of the tax. Non-parametric estimates suggest that these shocks to compliance exerted significant upward pressure on tax evasion for about 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. This is 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 social-norm dynamics. 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 heterogeneous crowding-in effect from enforcement: 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 the first to show explicit evidence for interactions between individual and social motives in tax compliance.<sup>40</sup>

Our approach has been to consider social influence within a local authority. An interesting issue for

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<sup>40</sup>See also Jia and Persson (2014) for related findings in a very different context.

further research is to consider the possibility of social spillovers across jurisdictional boundaries.<sup>41</sup>

Although we have focused on the positive implications of social motives, 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 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 imply key elasticities that would enter an analysis of optimal investments in tax enforcement in the presence of social motives. However, our observation that social norms may adjust slowly implies that the reduced-form elasticities are time-varying equilibrium responses rather than structural parameters.<sup>42</sup> Exploring normative models of tax compliance in the presence of social motives is also an important topic for future research.

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<sup>41</sup>As suggestive evidence we do find, in a within-council regression, that the evasion in contiguous neighboring jurisdictions are positively correlated with that in a given jurisdiction. Moreover, this within-council effect does seem to decay in the period following the abolition of the poll tax.

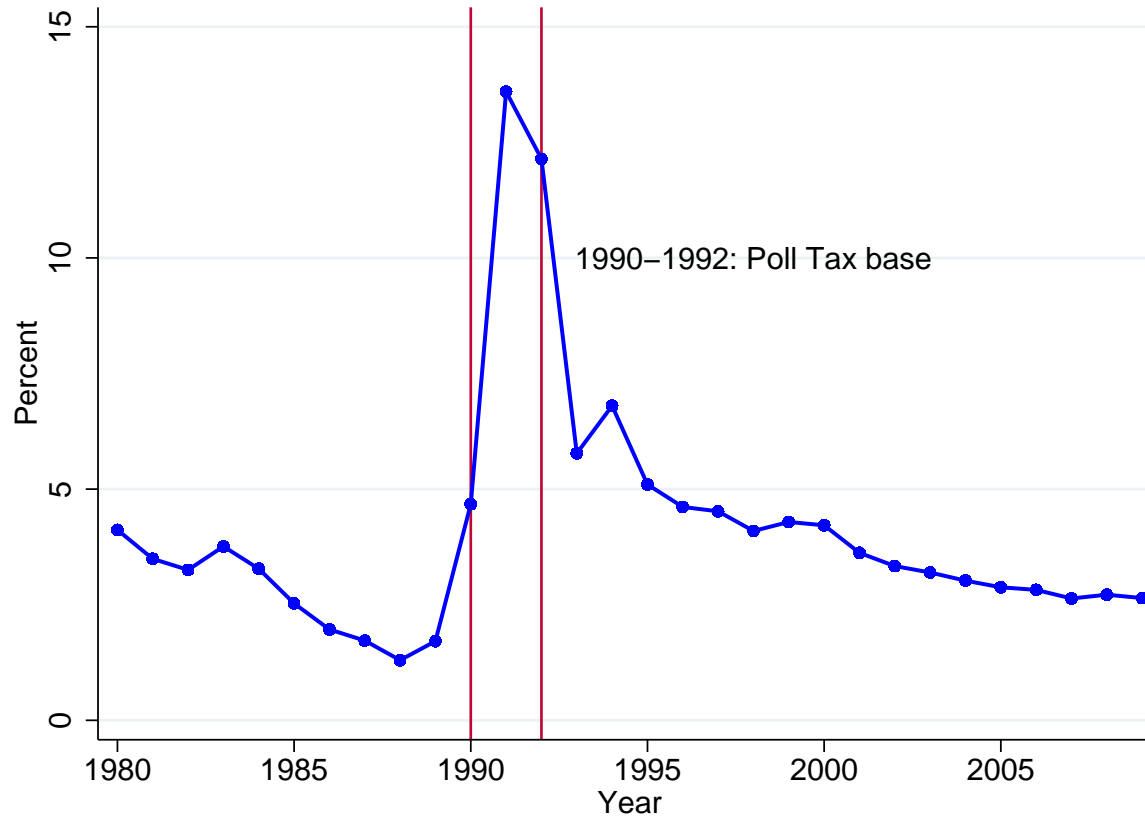
<sup>42</sup>This observation is related to the point in Slemrod and Kopczuk (2002) the the taxable income elasticity can depend on government enforcement policies.

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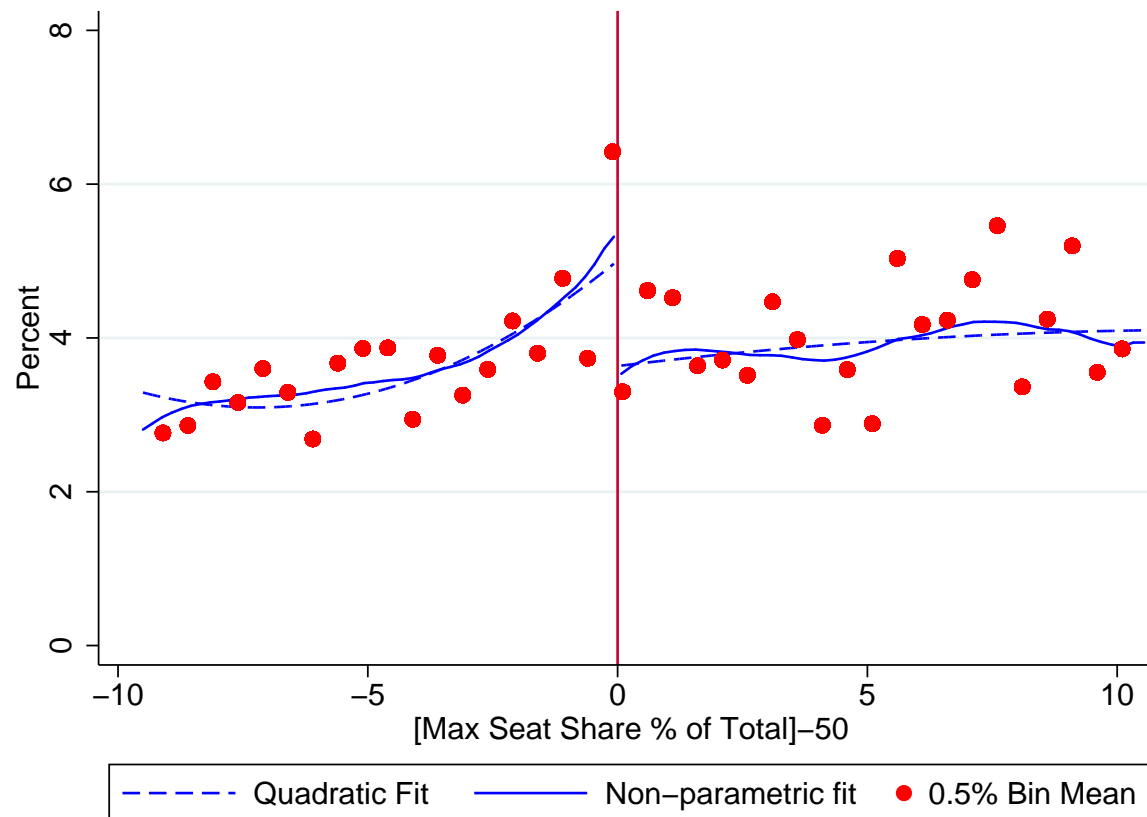
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Figure 1: Tax Evasion 1980-2009



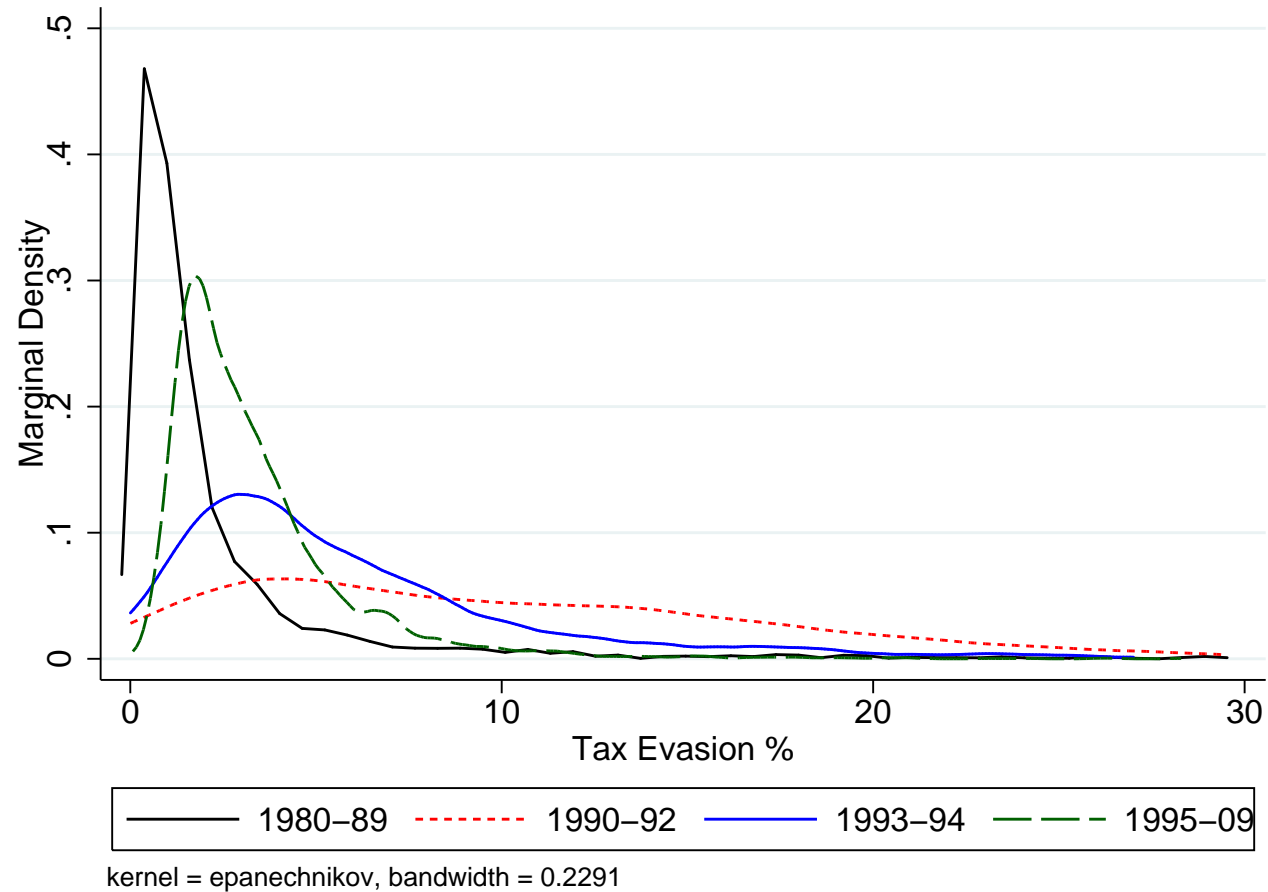
Notes: Each observation is a yearly average across all councils of our main measure of evasion, the difference between net collected tax revenue and net tax liability on the local tax base. During 1990-1992, a property tax base was replaced by the poll tax, which was levied at a flat rate per head. See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

Figure 2: Single-Party Majority and Tax Evasion



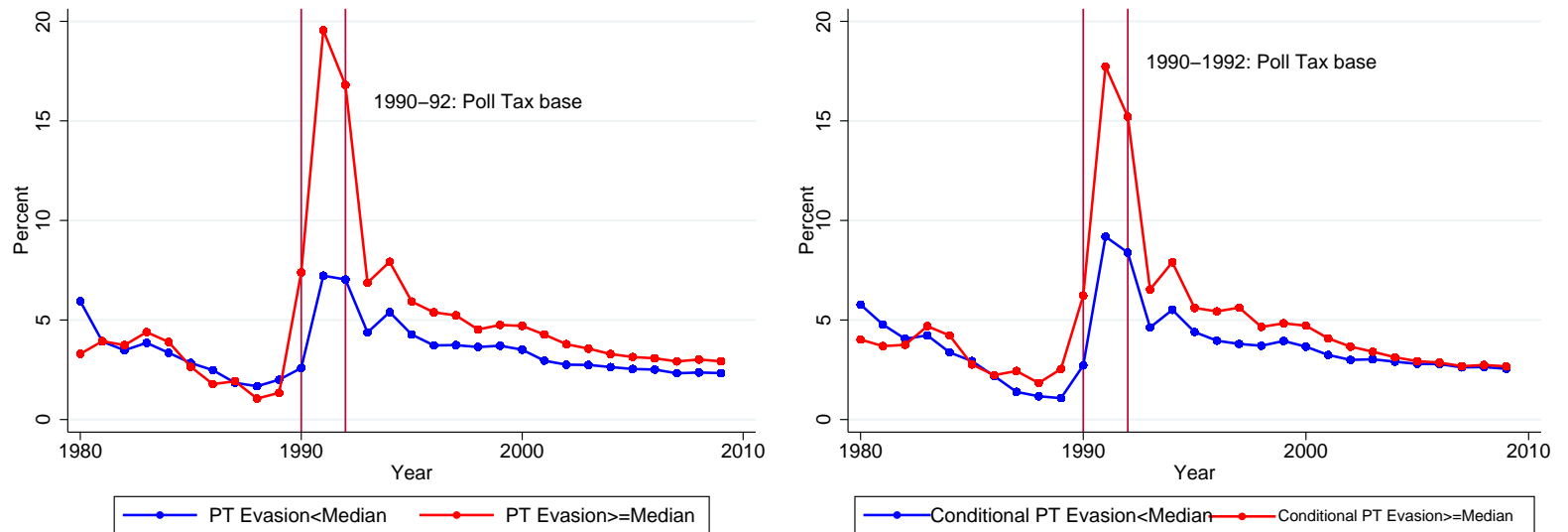
Notes: Each dot represents average tax evasion in a 0.5% bin of the difference between the largest party seat share and 50% in a given council-year, over the full sample 1980-2009. The vertical line is the single-party majority cut-off at 0. Dashed lines are quadratic fits, separately estimated on each side of the cut-off and the underlying council-level data. Solid lines are non-parametric fits from a local linear regression that uses triangular kernels with a bandwidth of 3% separately estimated on either side of the majority threshold, and on the underlying council-level data. The 3% bandwidth was determined as the optimal bandwidth using the Imbens and Kalyanaraman (2009) algorithm.

Figure 3: Marginal Density Distribution of Tax Evasion across Tax-Bases



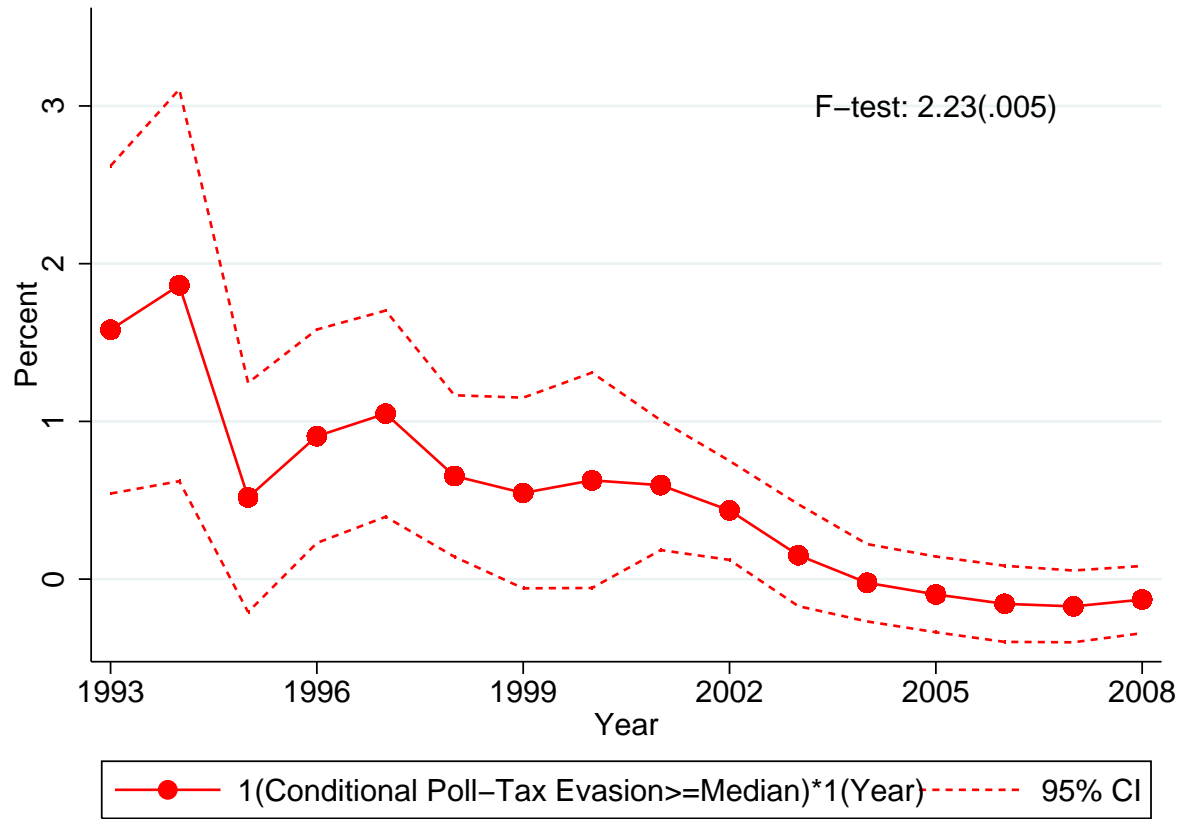
Notes: This graph plots the marginal density distribution of tax evasion across 4 time-periods: 1980-89 (Domestic Rates tax base); 1990-92 (Poll Tax base); 1993-94 (first 2 years of Council Tax base); 1995-2009 (remaining sample years of Council Tax base). Tax evasion is truncated at 30%, which equals (almost exactly) the 99th percentile for all time-periods except 1995-2009 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.

Figure 4: Tax Evasion by Raw Poll-Tax Evasion and Conditional Poll-Tax Evasion



Notes: Each yearly observation in the left-side (right-side) panel 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 (average conditional tax evasion) in the poll-tax period was below the median; the red line refers to councils where poll-tax evasion (conditional poll-tax evasion) was above the median. See main text (Section 4.1) and Table 1 for the construction of the conditional poll-tax evasion variable.

Figure 5: Non-Parametric Estimates of Council-Tax Evasion by Conditional Poll-Tax Evasion



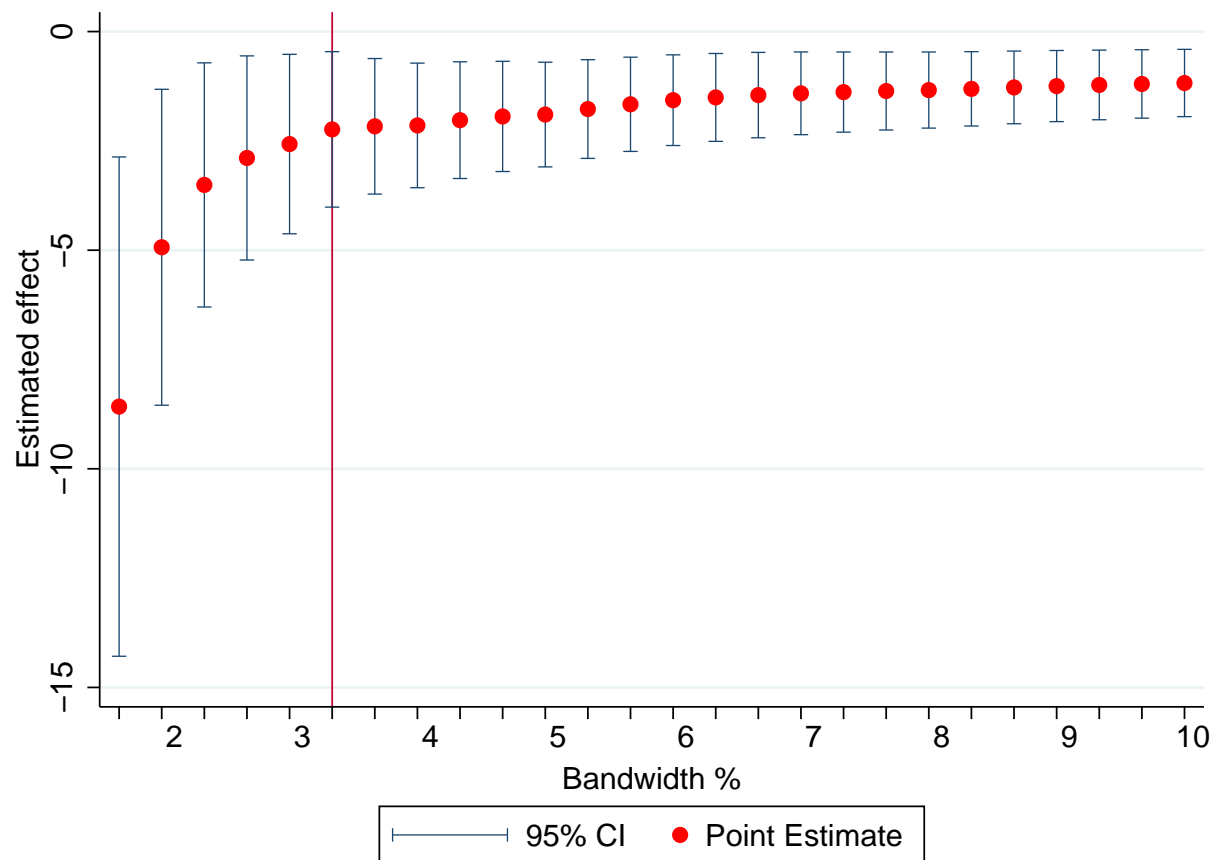
Notes: This graph plots the  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$  coefficients from a regression of council-tax evasion on a set of year dummies, year-dummies interacted with a dummy for high conditional poll-tax evasion, and council fixed effects. 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  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$ . Full regression output is given in column 1 of Appendix Table 1. See the main text (Section 4.1) for details on construction of  $\mathbf{1}(\text{Conditional Poll-Tax-Evasion} \geq \text{Median})$ .

Figure 6: Domestic-Rates Evasion by Conditional Poll-Tax Evasion



Notes: This graph plots the  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$  coefficients from a regression of domestic-rates evasion on a set of year dummies, year-dummies interacted with a dummy for high conditional poll-tax evasion, 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  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$ . The underlying regression model is the same as that in the Notes to Appendix Table 1.

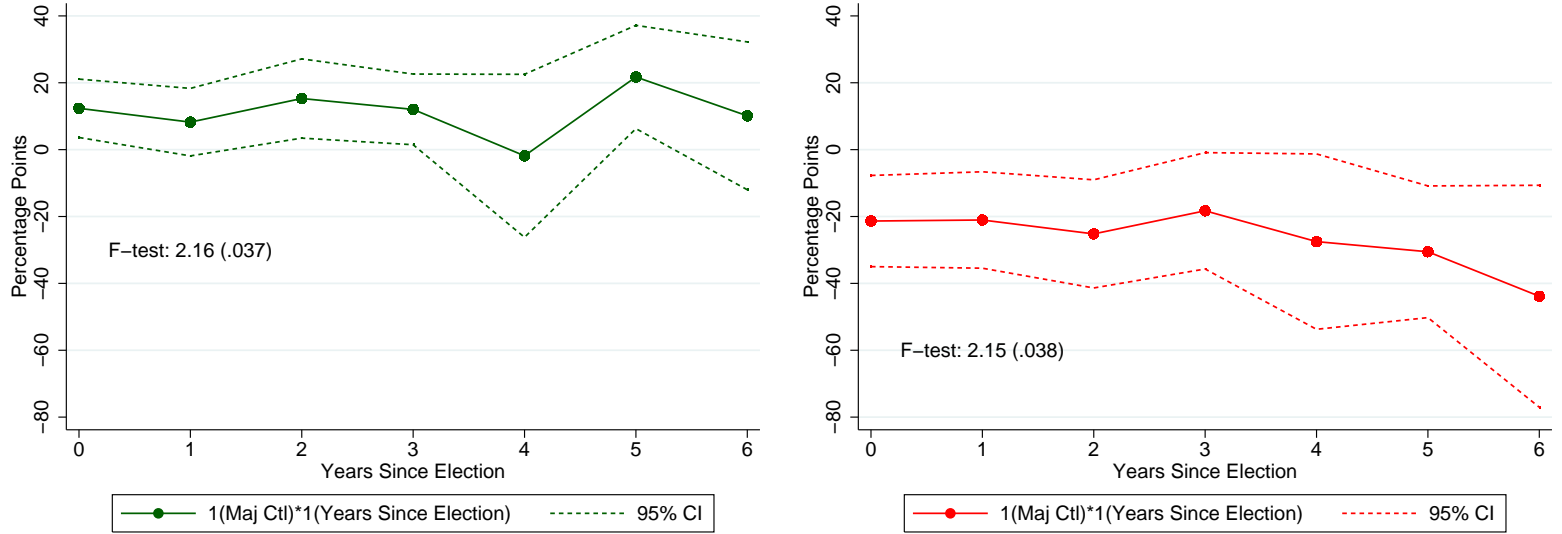
Figure 7: Single-Majority Impact Effect on Tax Evasion by Estimation Bandwidth



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 – 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 the top left corner of Panel A, Table 2.

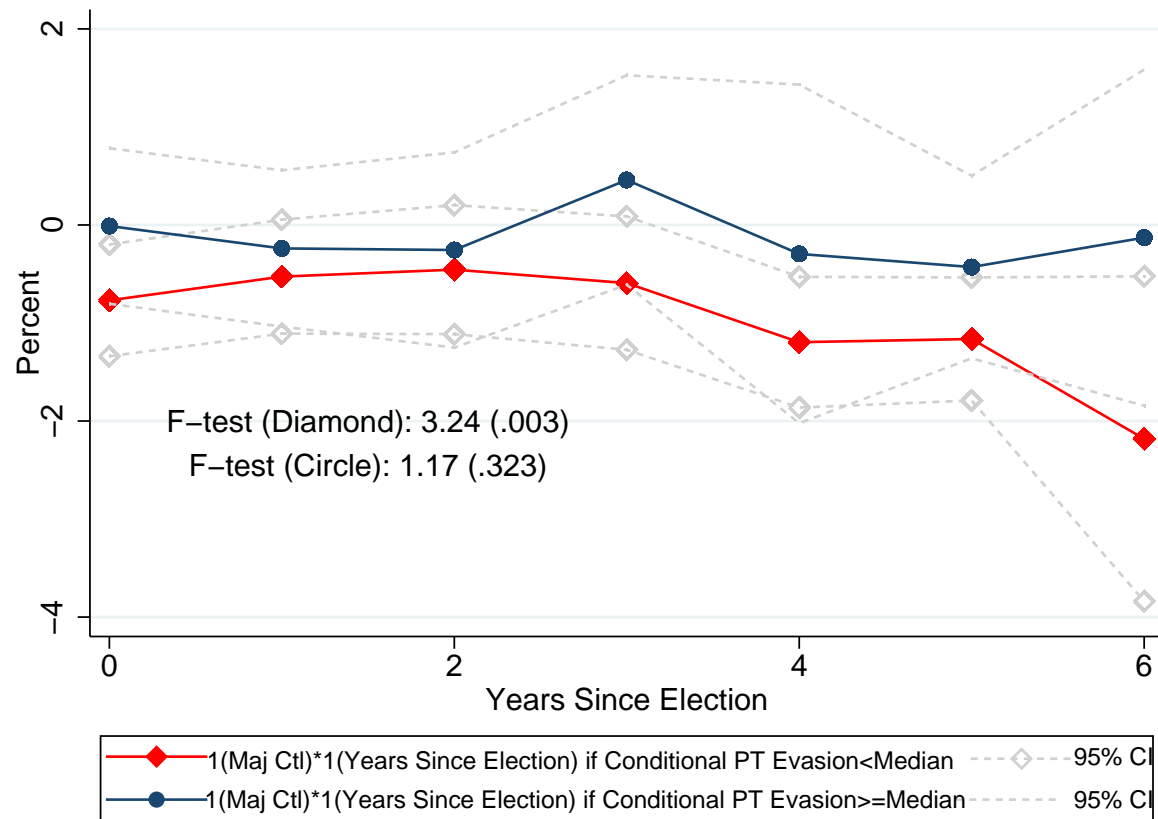


Figure 8: Dynamic Impact of Single-Party Majority on Enforcement and on Tax Evasion



Notes: The right-hand side (left-hand side) graph plots the  $1(\text{Majority Control}) * 1(\text{Years since election})$  coefficients from a regression of our enforcement measure (tax evasion measure) on the indicator for switch into majority,  $1(\text{Majority Control})$ , seven years-since-election dummies,  $1(\text{Years since election})$ , their interactions, lagged council-specific tax evasion, and a quadratic control function in the largest political seat-share. The enforcement measure is the ratio  $[\# \text{Summons}] / [\# \text{Reminders}]$ . The sample period is 1993-2009, which corresponds to the council-tax period. Dashed lines denote the 95% confidence interval on the interaction term. The F-test (and its p-value) refers to the joint significance of the (seven) interaction terms. The underlying regression model is in the Notes of Appendix Table 4. See the text (Section 4.2) for further details.

Figure 9: Dynamic Impact on Council-Tax Evasion by Conditional Poll-Tax Evasion



Notes: This graph plots the  $1(\text{Majority Control}) * 1(\text{Years Since Election})$  coefficients from a regression of our measure of tax evasion on the indicator for switch into majority,  $1(\text{Majority Control})$ , seven years-since-election dummies,  $1(\text{Years Since Election})$ , 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 conditional poll-tax evasion below the median conditional poll-tax evasion, while the blue line with circles shows the same estimates for the councils with above median conditional 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 Appendix Table 5. The model estimated is in notes of Appendix Table 5, conditioning the sample on the high conditional poll-tax evasion dummy. See the text (Sections 4.1 and 4.2) for further details and the construction of the high and low conditional poll-tax evasion subsamples. The sample runs from 1993 to 2009.

Table 1: Determinants of Poll-Tax Evasion

	(1)	(2)	(3)	(4)	(5)
	Poll Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]				
Poll Tax Liability	.032*** (.006)	.028*** (.006)	.029*** (.006)	.023*** (.006)	.025*** (.006)
Lg(per capita income)		-28.470*** (3.764)	-29.917*** (4.070)	-21.988*** (4.605)	-23.863** (5.210)
Log(population)			-1.193* (.636)	-1.499** (.601)	-1.443** (.731)
Cons Seat Share				-.021 (.021)	-.027 (.021)
Cons Control				-1.908 (.872)	-.441 (.024)
Labour Seat Share				-.026 (.022)	-.018 (.024)
Labour Control				3.239*** (.702)	4.328*** (.823)
(Top Band Houses)/(Bottom Band Houses)					-.247*** (.081)
Share households renting from private					37.108*** (7.838)
Share households renting from Council					-.939 (5.088)
Year Dummies	Y	Y	Y	Y	Y
Observations	684	684	684	684	624

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 the 10%, 5%, and 1% level respectively. Conditional poll-tax evasion in the main text is defined as the residual component of poll-tax evasion based on the model in Column 5. Sample years: 1990-1992, which correspond to the years where the poll tax was in place.

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

Panel A												
LHS: Tax Evasion= $[\text{Net Collectable} - \text{Net Collected}]/[\text{Net Collectable}]$												
Bandwidth	1.66	3.32	6.64	1.66	3.32	6.64	1.66	3.32	6.64	1.66	3.32	6.64
1(Maj Ctl)	-8.57*** (2.91)	-2.23** (.90)	-1.45*** (.49)	-8.53*** (2.85)	-2.24** (.90)	-1.45*** (.49)	-8.39*** (3.04)	-1.82** (.89)	-1.12** (.47)	-8.57*** (3.05)	-1.98** (.88)	-1.06** (.47)
Controls	None			Council FE			Council Fe, Year FE			Council FE, Year FE, ctls		
Observations	708	1533	2804	708	1533	2804	708	1533	2804	708	1533	2804
Mean LHS	4.152	4.031	3.828	4.152	4.031	3.828	4.152	4.031	3.828	4.152	4.031	3.828
Panel B												
LHS Enforcement= $[\text{Summons}]/[\text{Reminders}]$												
Bandwidth	1.061	2.123	4.246	1.061	2.123	4.246	1.061	2.123	4.246	1.061	2.123	4.246
1(Maj Ctl)	.042 (.105)	.062* (.035)	.044* (.024)	.004 (.113)	.059* (.035)	.044* (.024)	.027 (.176)	.060 (.039)	.020 (.024)	.199 (.195)	.055 (.040)	.017 (.024)
Controls	None			Council FE			Council FE, Year FE			Council FE, Year FE, ctls		
Observations	393	859	1662	393	859	1662	393	859	1662	393	859	1662
Mean LHS	.302	.295	.303	.302	.295	.302	.302	.295	.303	.302	.295	.303

Notes: This table presents RDD estimates of the impact effects of a random switch into single-party majority. Panel A shows estimates for tax evasion while Panel B shows estimates for enforcement, defined as the ratio of summons to reminders. All estimations are based on a local linear regression. Each panel 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 within the given bandwidth, and the sample mean of the dependent variable. See the main text (Section 4.2) for further details. Use of Stata rd-package. Standard errors in parenthesis. \*, \*\*, \*\*\* denote significance at the 10%, 5%, 1% level, respectively.

Table 3: Alternative RDD Specifications and Bandwidths

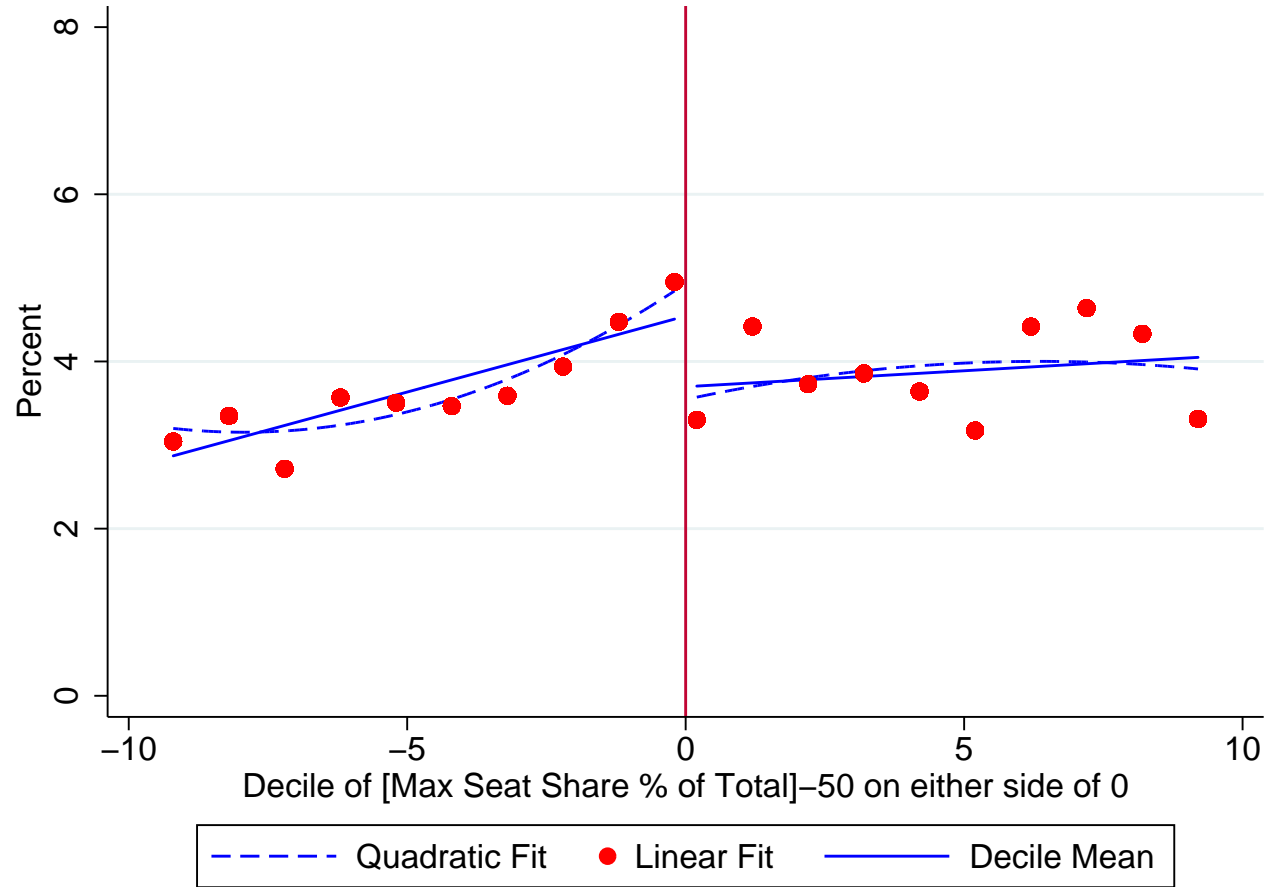
Panel A									
LHS: Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]									
Bandwidth	1.5		3		5		10		
Control Function	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	
1(Maj Ctl)									
w/o controls	-10.595*** (3.385)	-50.292*** (16.052)	-2.565** (1.043)	-7.614** (3.147)	-1.895*** (.609)	-3.086** (1.343)	-1.174*** (.392)	-2.333*** (.651)	
Observations	664		1384		2287		3933		
Panel B									
LHS: Enforcement=[Summons]/[Reminders]									
Bandwidth	1.5		3		5		10		
Control Function	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	Linear	Quadratic	
1(Maj Ctl)									
w/o controls	.027 (.055)	-.021 (.028)	.042 (.205)	.078 (.064)	.040 (.022)	.047 (.039)	-.049 (.060)	.040 (.028)	
w controls	.203** (.203)	.557** (.274)	.069** (.032)	.177** (.073)	.050** (.023)	.091** (.042)	-.045 (.058)	.077** (.039)	
Observations	574		1185		1948		3327		

Notes: this table presents RDD estimates of the impact effects of a random majority switch on tax evasion and enforcement. Panel A shows estimates for tax evasion, while Panel B shows estimates for our enforcement measure, the ratio of summons to reminders. Each panel shows RDD estimates from two specifications with a bandwidth of (left to right): (i) 1.5%, (ii) 3%, (iii) 5%, (iv) 10%. In each specification, we present point estimates with linear and quadratic control functions in the running variable, i.e. the difference between the seat share of the largest party and 50%. Panel B shows results without controls, and with council-specific controls: log per capita income, tax liability, and log population. The number of observations used are reported below each specification. Use of Stata-rd package. Standard errors in parenthesis. \*, \*\*, \*\*\* denote significance at the 10%, 5%, 1% level respectively. See main text (Section 4.2) for further details.

**(Web) Appendix Figures and Tables for  
NORMS, ENFORCEMENT AND TAX EVASION**

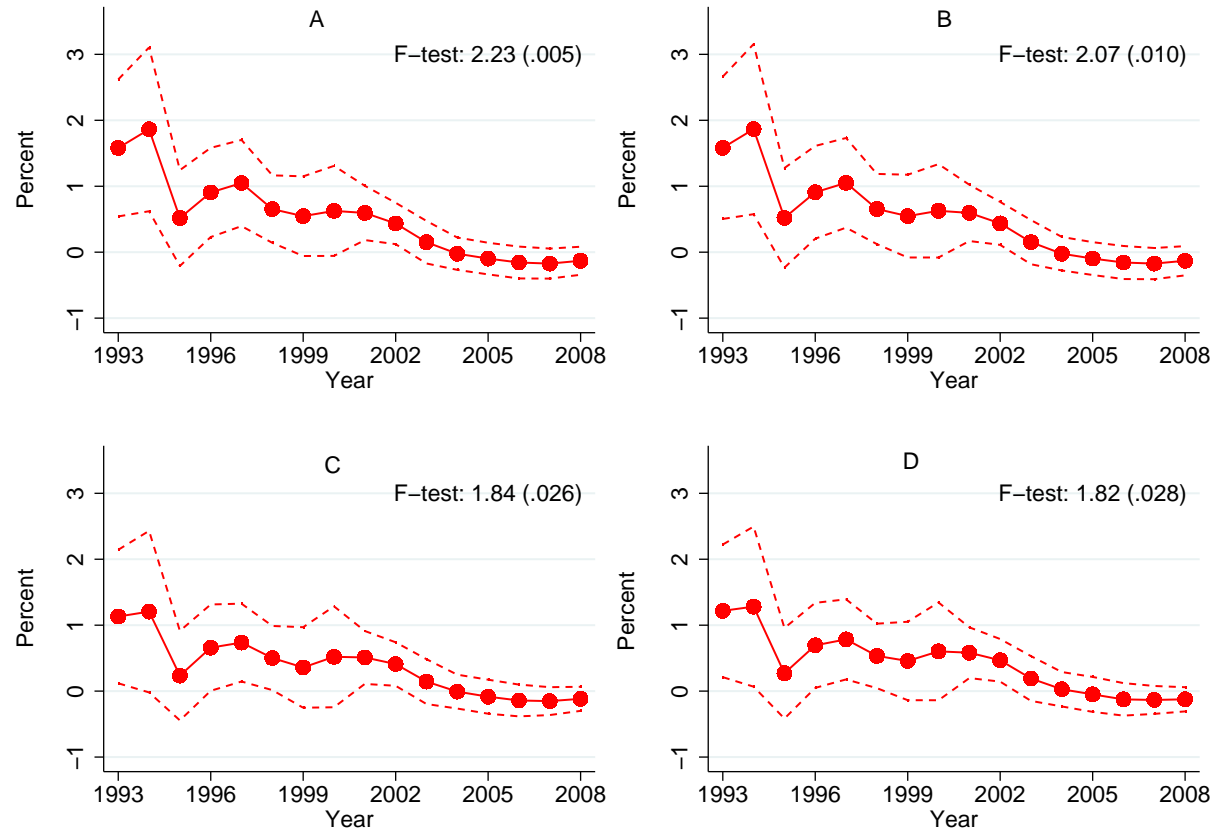
by Tim Besley, Anders Jensen, Torsten Persson

Figure A1: Single-Party Majority and Tax Evasion: Robustness



Notes: In this graph, separate decile-distributions were computed on either side of the single-party majority cut-off of 0, when the running variable is the difference between the largest party and 50% in a given council-year. Each dot represents average tax evasion in a decile of the sample between 0% and 10% (or 0% and -10%) for the running variable. The vertical line is the single-party majority cut-off at 0. Dashed (solid) lines are quadratic (linear) fits, separately estimated on each side of the cut-off and on the underlying council-level data. Sample: 1980-2009.

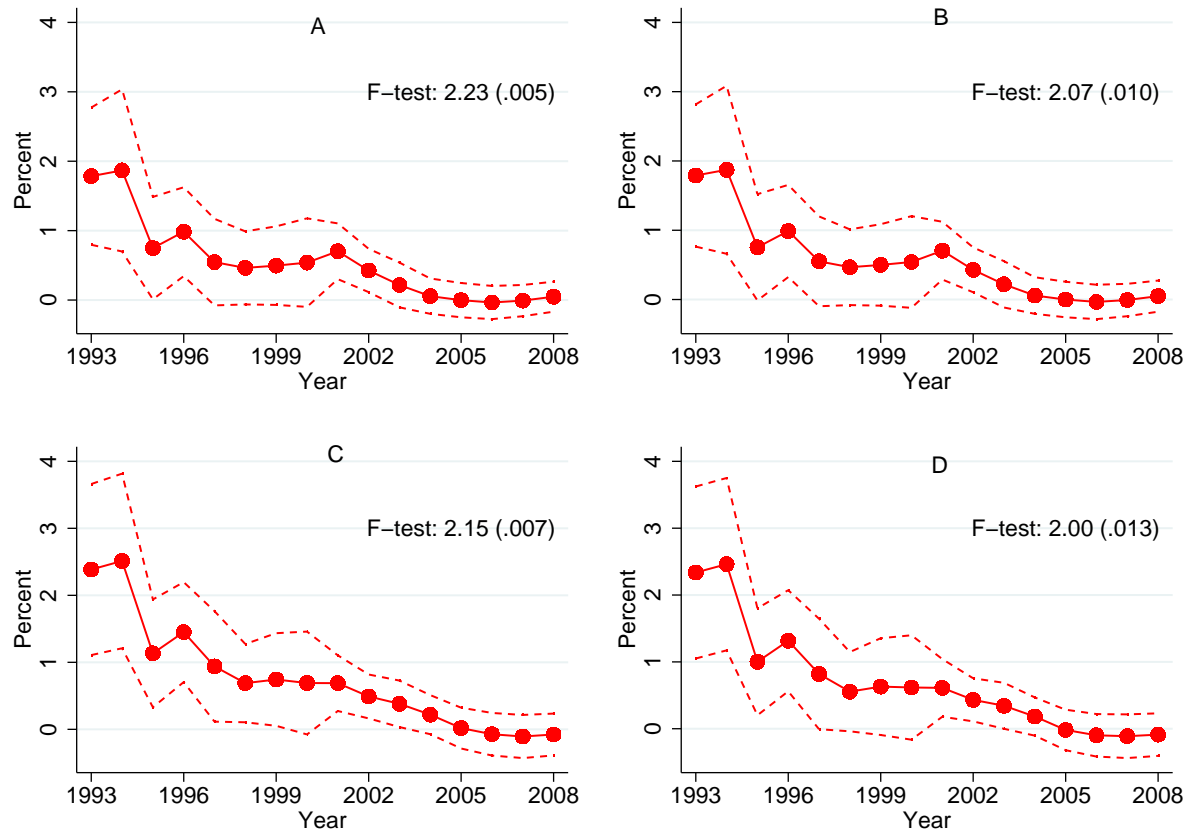
Figure A2: Council-Tax Evasion by Conditional Poll-Tax Evasion: Robustness



Notes: Panel A plots the  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$  coefficients from a regression of council-tax evasion on a set of year dummies, year-dummies interacted with a high conditional poll-tax evasion dummy, and council fixed effects. Panel B plots the coefficients when the Panel A regression model is augmented by a council-specific linear-trend. Panel C reports the coefficients of Panel A model augmented with a full set of  $\mathbf{1}[\text{Region}] * \mathbf{1}[\text{Year}]$  dummies. Panel D reports the coefficients of Panel A model augmented with a full set of  $\mathbf{1}[\text{Region}] * \mathbf{1}[\text{Year}]$  dummies and the interactive quadratic control function in max-seat share. Full regression output for the respective panels is given in Columns (1), (2), (3) and (4) of Appendix Table 1. 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  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$ . See the main text (Section 4.1) for details on construction of  $\mathbf{1}(\text{Conditional Poll-Tax Evasion} \geq \text{Median})$ .

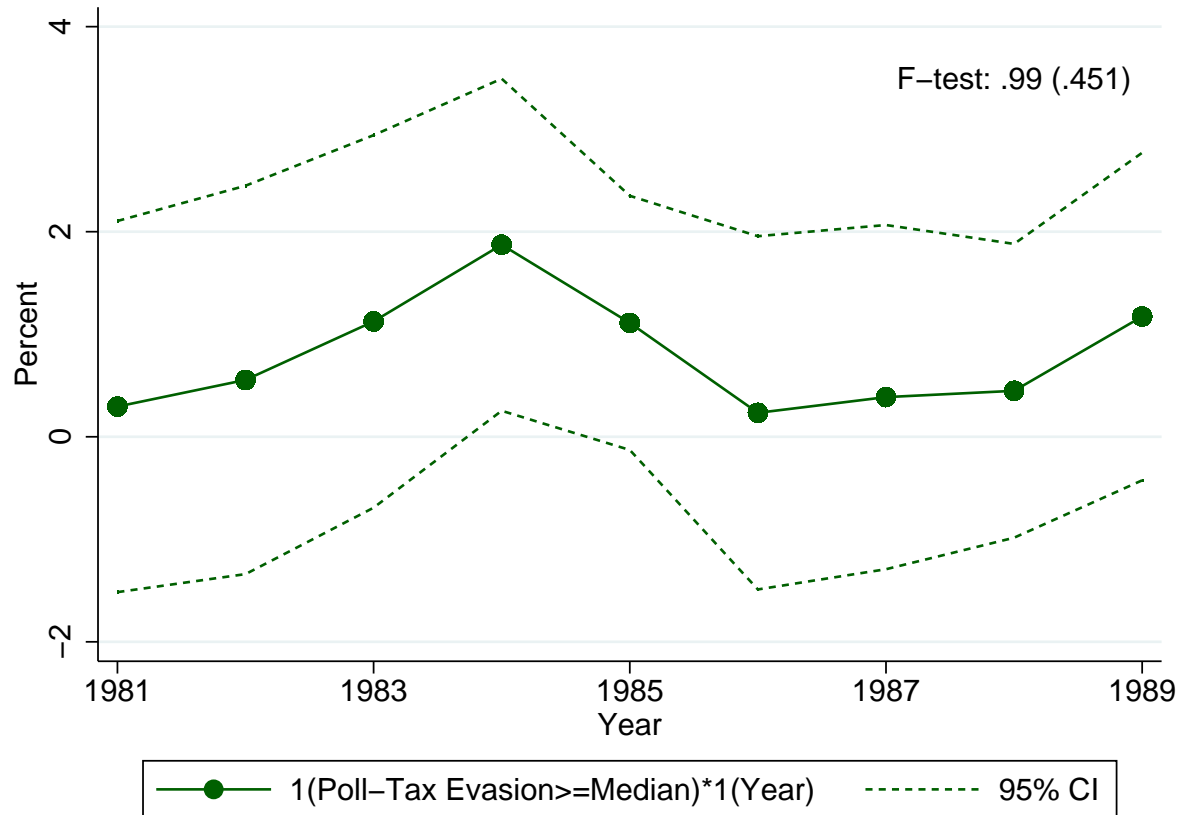


Figure A3: Council-Tax Evasion by Poll-Tax Evasion: Robustness



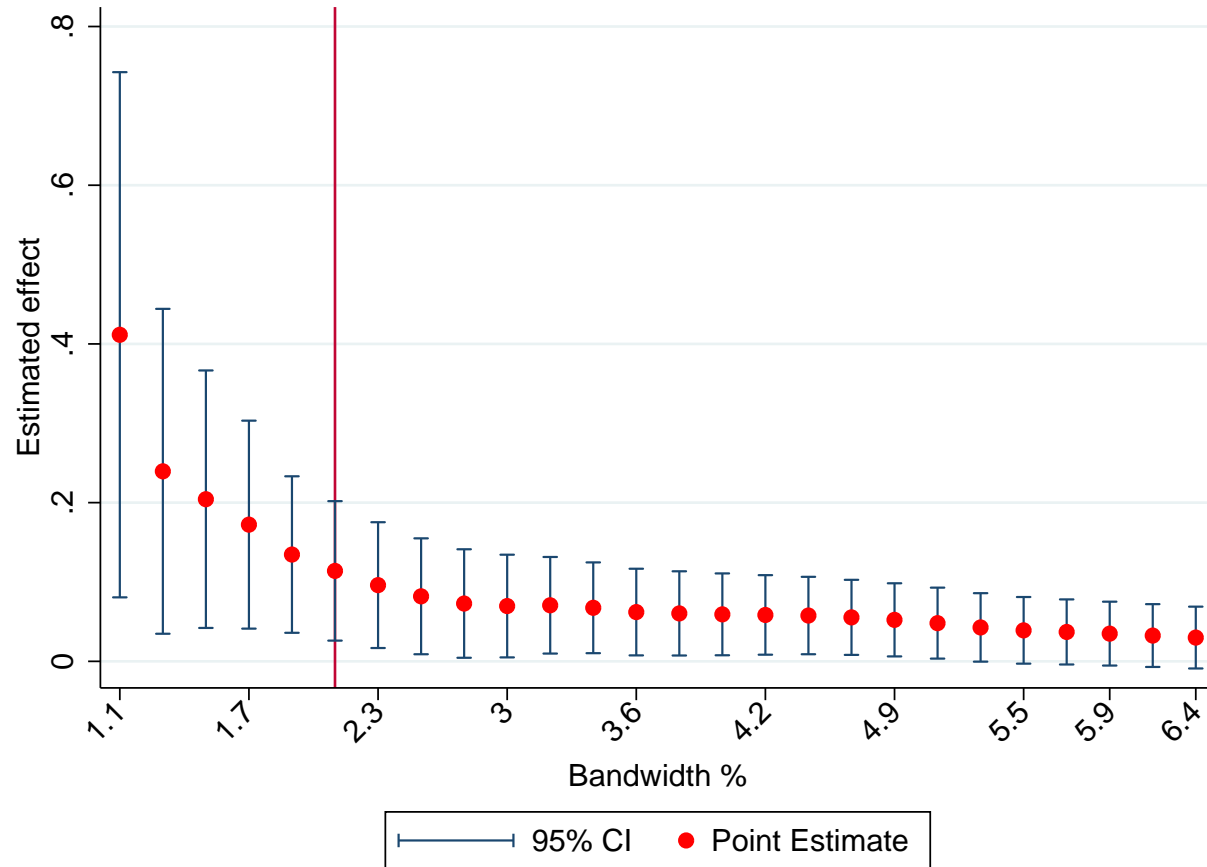
Notes: Panel A plots the  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Poll-Tax Evasion} \geq \text{Median})$  coefficients from a regression of council-tax evasion on a set of year dummies, year-dummies interacted with a high poll-tax evasion dummy, and council fixed effects. Panel B plots the coefficients when the Panel A regression model is augmented by a council-specific linear-trend. Panel C reports the coefficients of Panel A model augmented with a full set of  $\mathbf{1}[\text{Region}] * \mathbf{1}[\text{Year}]$  dummies. Panel D reports the coefficients of Panel A model augmented with a full set of  $\mathbf{1}[\text{Region}] * \mathbf{1}[\text{Year}]$  dummies and the interactive quadratic control function in max-seat share. Full regression output for the respective panels is given in Columns (1), (2), (3) and (4) of Appendix Table 2. 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  $\mathbf{1}(\text{Year}) * \mathbf{1}(\text{Poll-Tax Evasion} \geq \text{Median})$ . See the main text (Section 4.1) for details on construction of  $\mathbf{1}(\text{Poll-Tax Evasion} \geq \text{Median})$ .

Figure A4: Domestic-Rates Evasion by Poll-Tax Evasion



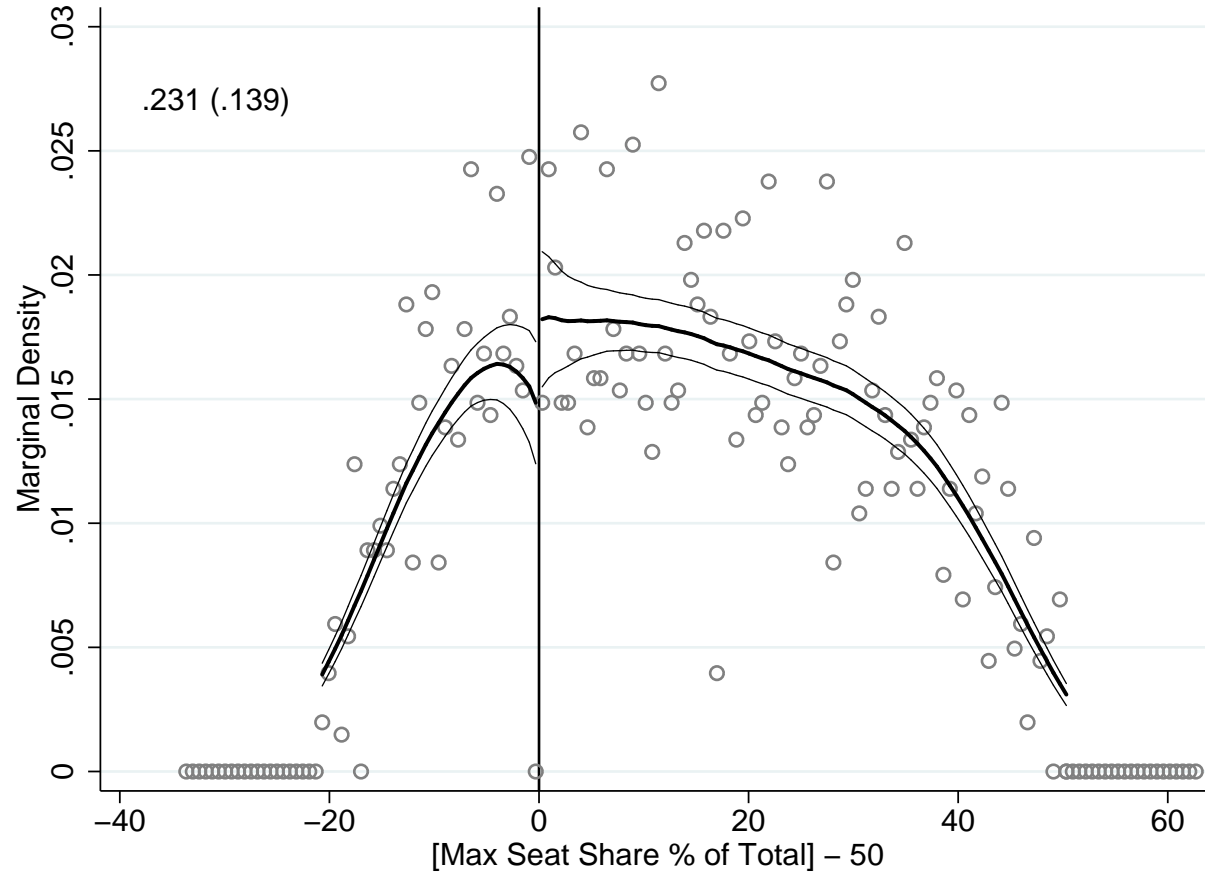
Notes: This graph plots the  $1(\text{Year}) * 1(\text{Poll-Tax Evasion} \geq \text{Median})$  coefficients from a regression of domestic-rates evasion on a set of year dummies, year-dummies interacted with a high poll-tax evasion dummy, and council fixed effects. The sample period is 1980-89, which 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  $1(\text{Year}) * 1(\text{Poll-Tax Evasion}_j = \text{Median})$ . The underlying regression model is the same as that in the Notes to Appendix Table 2.

Figure A5: Single-Majority Impact Effect on Tax Enforcement by Estimation Bandwidth



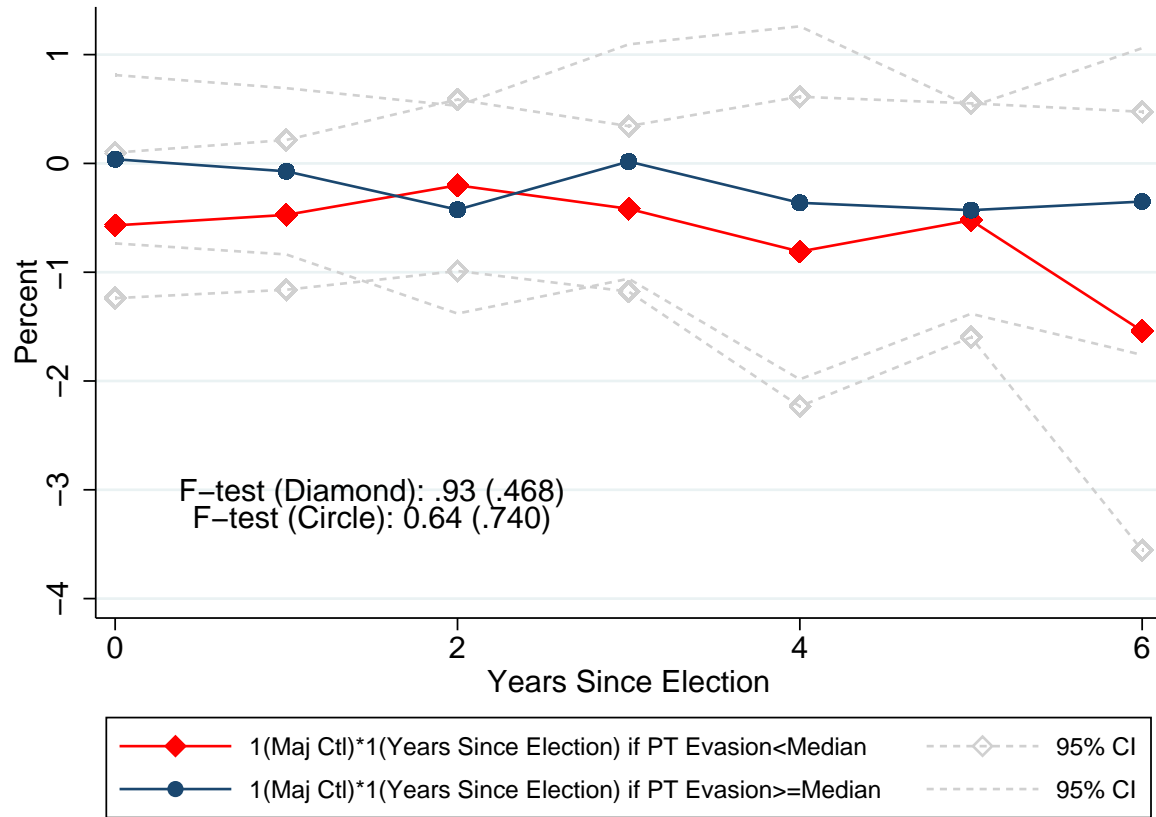
Notes: This graph plots the point estimates from an RDD for the impact effect on tax enforcement of a switch into single-party majority. The vertical line at 2.12% shows the optimal bandwidth for the running variable determined by the Imbens and Kalyanaraman (2009) algorithm – here, the difference between 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 1.1%) to 3 times (at 6.4%) this optimum. Log population, tax liability per dwelling and log per capita income are included as controls. Vertical blue lines denote the 95% confidence intervals for the point estimates.

Figure A6: McCrary Test around Majority Threshold



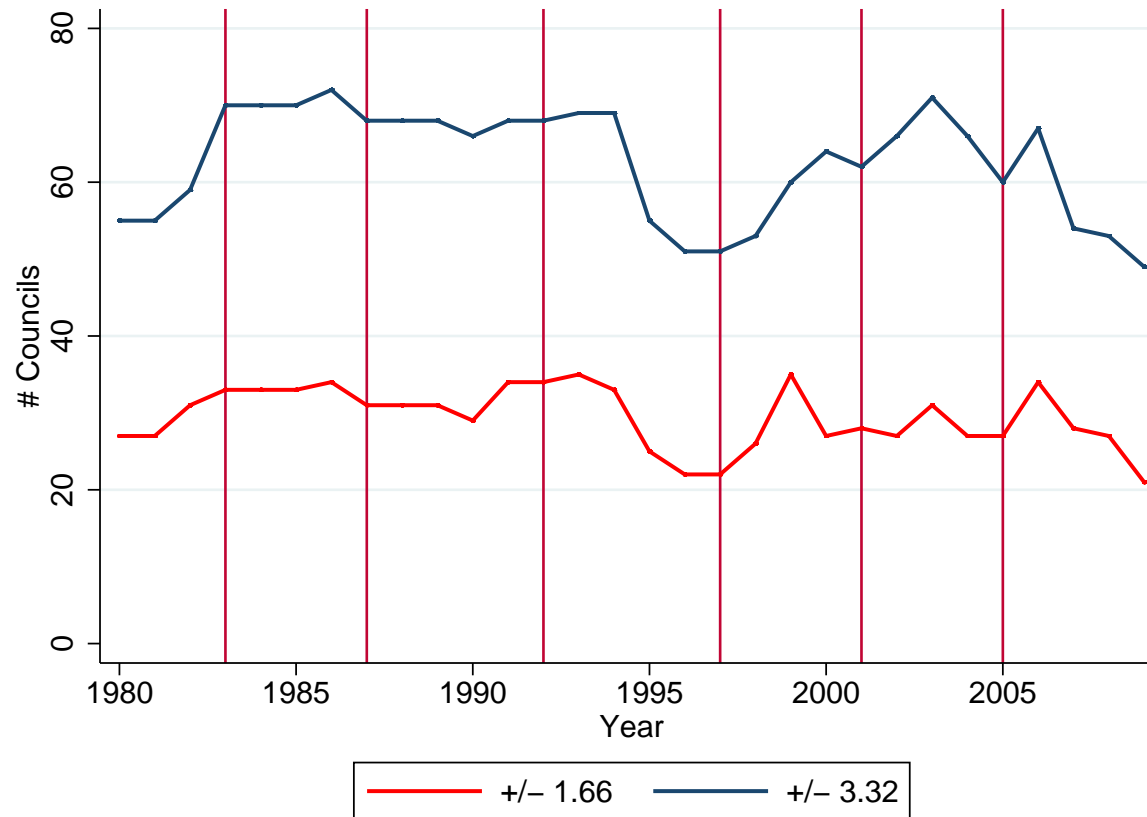
Notes: This graph displays the result of the McCrary (2008) test for continuity in the running variable, i.e. the difference between the largest seat-share on the council and 50%. The vertical line denotes the threshold value of 0. The bandwidth is optimally selected. The test employs a local-linear 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 A7: Dynamic Impact on Council-Tax Evasion by Poll-Tax Evasion



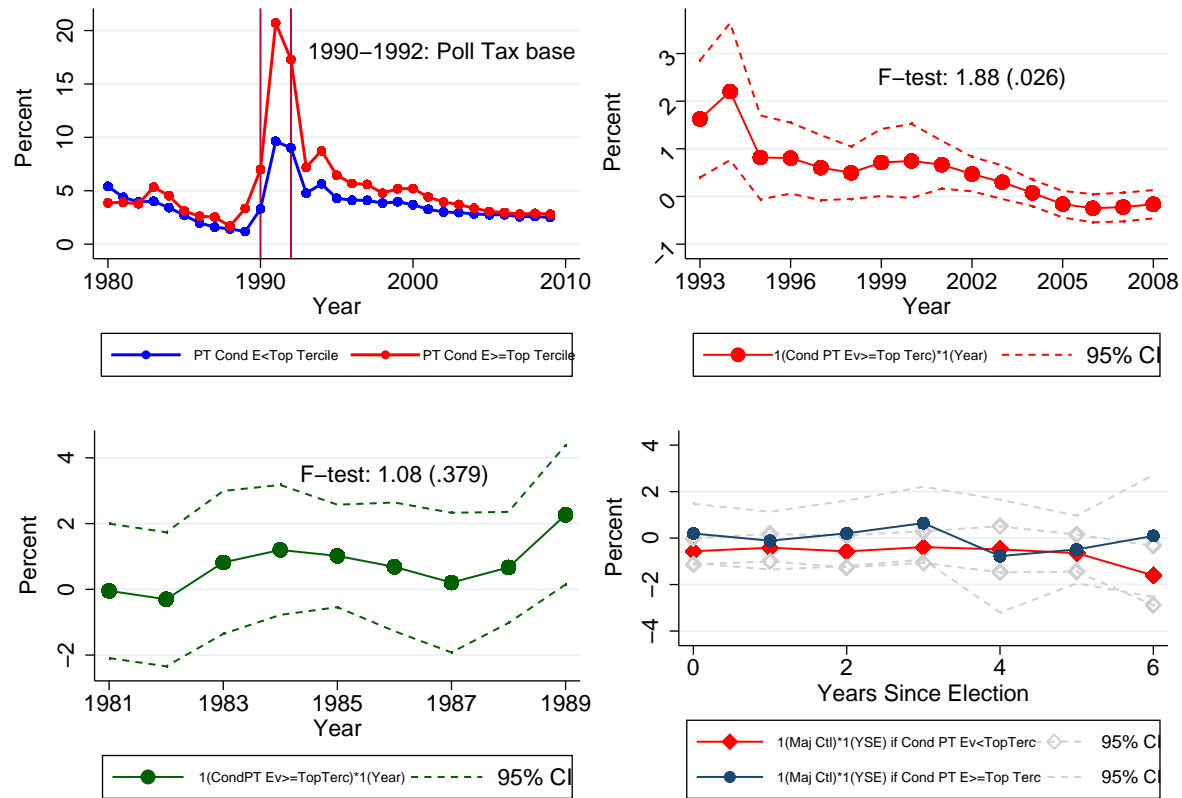
Notes: This graph plots the  $1(\text{Majority Control}) \cdot 1(\text{Years Since Election})$  coefficients from a regression of our measure of tax evasion on the indicator for switch into majority,  $1(\text{Majority Control})$ , seven years-since-election dummies,  $1(\text{Years Since Election})$ , 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 poll tax evasion, while the blue 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 Appendix 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 A8: Number of Close Elections over Time



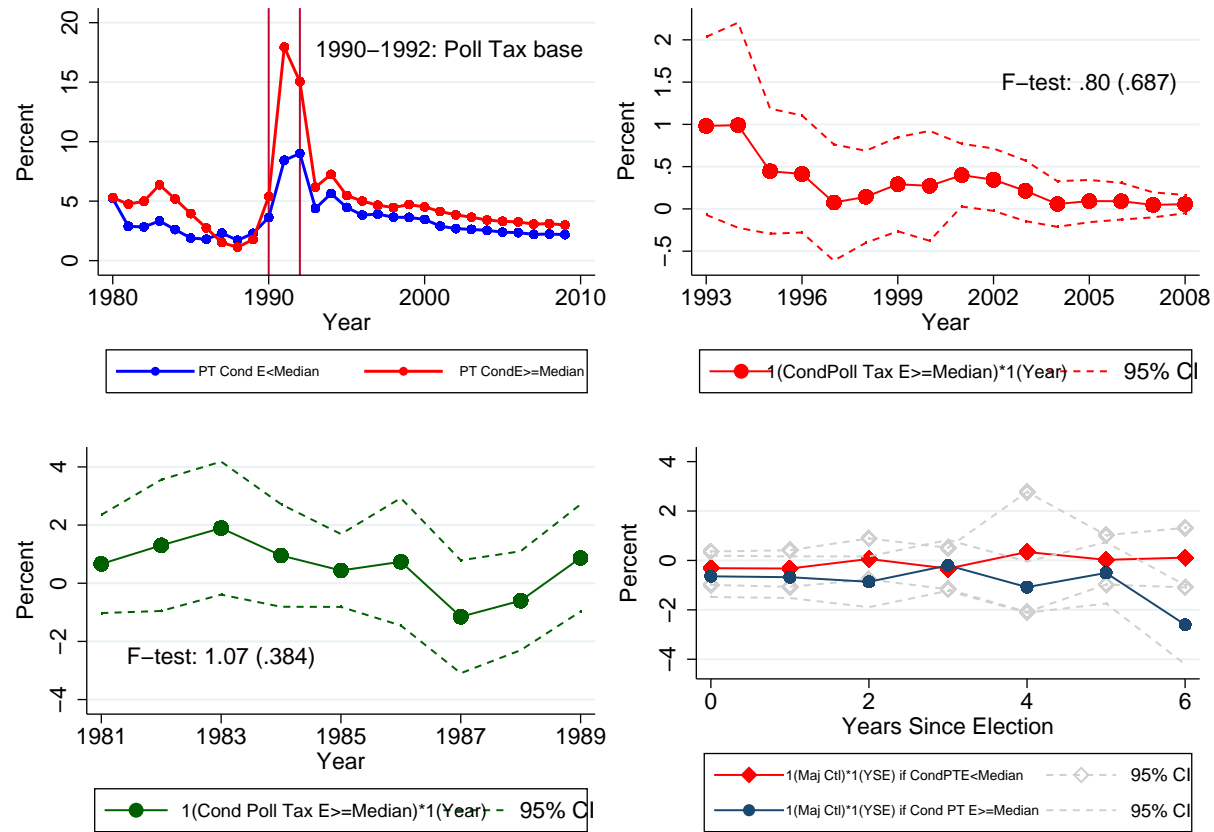
Notes: This graph shows the number of council-specific close elections in each year between 1980 and 2009 for different definitions of 'close'. The blue line defines 'close' as the optimal bandwidth for RDD proposed by Imbens and Kalanyaramanan (2012) applied to tax evasion, and is equal to 3.32 percentage points. The red line corresponds to half this optimum bandwidth, 1.66 percentage points. Vertical red lines denote years of UK general elections.

Figure A9: Core Results by Top Tercile Conditional Poll-Tax Evasion



Notes: In these panels, councils are classified according to whether their average conditional Poll-Tax evasion lied above or below the top tercile value of the Poll-Tax conditional evasion distribution. Conditional Poll-Tax is the residual component of poll-tax evasion based on the model in Column 5 of Table 1. Using this new treatment dummy, Panels A, B, C, and D display results using the same empirical setting as underlying respectively Figs.4, 5, 6, and 9.

Figure A10: Core Results by Conditional Poll-Tax Evasion: Robustness



Notes: In these panels, councils are classified according to whether their average conditional Poll-Tax evasion lied above or below the median value of the conditional Poll-Tax evasion distribution. Conditional Poll-Tax is the residual component of Poll-Tax evasion based on the model in Column 5 of Table 1, augmented with an estimated measure of the difference in household tax-liability between the last year of Domestic Rates and the first year of the Poll Tax. Using this new treatment dummy, Panels A, B, C, and D display results using the same empirical setting as underlying respectively Figs.4, 5, 6, and 9. The measure is not available for all councils in the required years, and leads to a 30 percent decrease in sample-size relative to the sample used in the results of Figs.1-9.



Table A1: Council-Tax Evasion by Conditional Poll-Tax Evasion: Robustness

LHS: Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]				
1(PT Conditional Evasion>Median)	(1)	(2)	(3)	(4)
*1(Year==1993)	1.581*** (.532)	1.582*** (.533)	1.131*** (.519)	1.217** (.515)
*1(Year==1994)	1.863*** (.636)	1.866*** (.661)	1.206* (.628)	1.281** (.622)
*1(Year==1995)	.518 (.372)	.520 (.387)	.235 (.348)	.270 (.352)
*1(Year==1996)	.906*** (.346)	.908** (.360)	.659** (.335)	.694** (.330)
1(Year==1997)	1.049*** (.335)	1.052*** (.348)	.736** (.302)	.785** (.311)
1(Year==1998)	.653** (.262)	.655** (.272)	.502** (.249)	.534** (.250)
1(Year==1999)	.546* (.309)	.547* (.321)	.358 (.313)	.457 (.304)
1(Year==2000)	.626* (.350)	.627* (.363)	.520 (.392)	.603 (.380)
*1(Year==2001)	.595*** (.210)	.596*** (.218)	.511** (.205)	.582** (.197)
*1(Year==2002)	.435*** (.160)	.436*** (.166)	.411** (.169)	.467** (.165)
1(Year==2003)	.151 (.165)	.152 (.171)	.144 (.174)	.191 (.174)
1(Year==2004)	-.022 (.125)	-.022 (.130)	-.006 (.131)	.028 (.133)
1(Year==2005)	-.096 (.123)	-.096 (.127)	-.084 (.132)	-.049 (.135)
1(Year==2006)	-.156 (.123)	-.156 (.128)	-.141 (.123)	-.124 (.126)
1(Year==2007)	-.172 (.116)	-.172 (.121)	-.151 (.108)	-.133 (.108)
1(Year==2008)	-.129 (.109)	-.129 (.113)	-.116 (.093)	-.123 (.094)
F-test	2.23 (.004)	2.07 (.009)	1.84 (.026)	1.82 (.028)
Council FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Council linear time trend	N	Y	N	N
1(Region)*1(Year) FE	N	N	Y	Y
Max Seat Share Quadratic Control	N	N	N	Y
Observations	3828	3828	3828	3818
Mean LHS	3.725	3.725	3.725	3.725

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

$$e_{it} = \alpha + \beta_t [1(\text{Conditional PT Evasion} > \text{Median})_i \cdot \delta_t] + \delta_t + \mu_i + \varepsilon_{it};$$

where  $e_{it}$  is the council-year measure of tax evasion,  $1(\text{Conditional PT Evasion} > \text{Median})_i$  is a council-specific dummy equal to 1 if the council had average conditional Poll-Tax evasion above median conditional Poll-Tax evasion. 2009 is the omitted year category. Reported F-test value is from a F-test on the joint significance on the set of all  $\beta_t$  coefficients being equal to zero.

Table A2: Council-Tax Evasion by Poll-Tax Evasion: Robustness

LHS: Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]				
	(1)	(2)	(3)	(4)
1(PT Conditional Evasion>Median)				
*1(Year==1993)	1.784*** (.503)	1.790*** (.526)	2.385*** (.654)	2.337*** (.659)
*1(Year==1994)	1.867*** (.598)	1.872*** (.621)	2.513*** (.668)	2.462*** (.661)
*1(Year==1995)	.748** (.378)	.753* (.393)	1.134*** (.412)	1.002* (.410)
*1(Year==1996)	.984*** (.328)	.989*** (.341)	1.451** (.382)	1.316*** (.387)
1(Year==1997)	.546* (.319)	.551* (.332)	.939** (.422)	.818* (.423)
1(Year==1998)	.463* (.269)	.466* (.280)	.689** (.299)	.554* (.304)
1(Year==1999)	.496* (.290)	.499* (.301)	.744** (.354)	.630* (.371)
1(Year==2000)	.539* (.327)	.542 (.339)	.691 (.393)	.617 (.400)
*1(Year==2001)	.702*** (.206)	.705*** (.213)	.689*** (.213)	.611*** (.220)
*1(Year==2002)	.426*** (.159)	.428*** (.165)	.491** (.168)	.432*** (.165)
1(Year==2003)	.217 (.165)	.219 (.171)	.381** (.177)	.343* (.176)
1(Year==2004)	.056 (.130)	.057 (.135)	.219 (.149)	.183 (.146)
1(Year==2005)	-.001 (.126)	-.000 (.131)	.018 (.156)	-.017 (.155)
1(Year==2006)	-.035 (.122)	-.034 (.127)	-.072 (.162)	-.097 (.162)
1(Year==2007)	-.007 (.115)	-.006 (.119)	-.106 (.165)	-.111 (.163)
1(Year==2008)	.048 (.110)	.049 (.115)	-.076 (.159)	-.087 (.163)
F-test	2.23 (.004)	2.07 (.009)	2.15 (.006)	2.00 (.013)
Council FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Council linear time trend	N	Y	N	N
1(Region)*1(Year) FE	N	N	Y	Y
Max Seat Share Quadratic Control	N	N	N	Y
Observations	4223	4223	4223	4223
Mean LHS	3.725	3.725	3.725	3.725

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

$$e_{it} = \alpha + \beta_t [1(\text{PT Evasion} > \text{Median})_i \cdot \delta_t] + \delta_t + \mu_i + \varepsilon_{it};$$

where  $e_{it}$  is the council-year measure of tax evasion,  $1(\text{PT Evasion} > \text{Median})_i$  is a council-specific dummy equal to 1 if the council had average Poll-Tax evasion above median Poll-Tax evasion. 2009 is the omitted year category. Reported F-test value is from a F-test on the joint significance on the set of all  $\beta_t$  coefficients being equal to zero.

Table A3: Placebo RDD on Tax Liability and Log Per-Capita Income

Panel A												
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(Maj Ctl)	42.41 (37.33)	29.09 (24.84)	38.09 (25.44)	42.70 (37.34)	29.03 (24.84)	37.08 (25.06)	-3.92 (10.34)	9.99 (6.57)	26.58 (18.48)	-14.15 (9.58)	-.802 (6.10)	21.093 (21.79)
Controls	None			Council FE			Council Fe, Year FE			Council FE, Year FE, ctls		
Observations	2375	4189	6686	2375	4189	6686	2375	4189	6686	2375	4189	6686
Mean LHS	566.80	569.95	581.52	566.80	569.95	581.52	566.80	569.95	581.52	566.80	569.95	581.52

Panel B												
LHS Log(per Capita Income)												
Bandwidth	.851	1.703	3.406	.851	1.703	3.406	.851	1.703	3.406	.851	1.703	3.406
1(Maj Ctl)	-2.421 (1.609)	.102 (.268)	.170* (.090)	-2.453 (1.628)	.095 (.268)	.169* (.090)	.197 (.327)	-.089 (.061)	.026 (.020)	-.191 (.334)	.017 (.061)	.048** (.048)
Controls	None			Council FE			Council FE, Year FE			Council FE, Year FE, ctls		
Observations	400	959	2045	400	959	2045	400	959	2045	400	959	2045
Mean LHS	9.130	9.093	9.103	9.130	9.093	9.103	9.130	9.093	9.103	9.130	9.093	9.103

Notes: This table presents RDD estimates of the impact effects of a random switch into single-party majority. Panel A shows estimates for local household tax liability, while Panel B shows estimates for log per capita income. All estimates are based on a local linear regression. Each panel 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 log population and log per capita income (log population and tax liability in Panel B). 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, and the sample mean of the dependent variable. Standard errors in parenthesis. \*, \*\*, \*\*\* denote significance at the 10%, 5%, 1% level respectively. Stata rd-package. See the main text (Section 4.2) for further details.

Table A4: Impulse-Response Results

LHS: Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]		
	(1)	(2)
1(Maj Control)		
*1(Year Since Election=0)	-0.857*** (.280)	-0.415* (.238)
*1(Year Since Election=1)	-0.844*** (.296)	-0.395 (.250)
*1(Year Since Election=2)	-1.012*** (.333)	-0.560** (.285)
*1(Year Since Election=3)	-0.734** (.358)	-0.259 (.305)
*1(Year Since Election=4)	-1.104** (.540)	-0.531 (.498)
*1(Year Since Election=5)	-1.226*** (.405)	-0.583* (.350)
*1(Year Since Election=6)	-1.761*** (.683)	-1.104* (.616)
F-test	2.15 (.038)	1.00 (.427)
Council FE	Y	Y
6-year FE	Y	Y
Council Controls	N	Y
Observations	4308	4243
Mean LHS	3.725	3.724

Notes: The estimated model is

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

where  $\tau_{ij}$  is a council-specific years-since-election dummy,  $1(\text{MajCtl})_{ij}$  is a dummy for single-party majority in the council-year,  $f(\text{max-share})_{it}$  is a second-order control function in the largest seat-share on the council, and  $\delta_t$  are six-year-period dummies. Council controls are log per capita income, tax liability per dwelling, log population, Conservative seat-share and dummy for majority control, Labour seat-share and dummy for majority control. Standard errors are clustered at the council level. \*, \*\*, \*\*\* denote significance at the 10%, 5% and 1% level respectively. Sample: 1993 to 2009.

Table A5: Heterogeneous Impulse Responses by Conditional Poll-Tax Evasion

LHS: Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]				
Sample restriction	PT Cond Evasion<Median		PT Cond Evasion>=Median	
	(1)	(2)	(3)	(4)
1(Maj Control)				
*1(Year Since Election=0)	-.769*** (.292)	-.706*** (.267)	-.010 (.406)	.037 (.425)
*1(Year Since Election=1)	-.526* (.298)	-.488* (.266)	-.239 (.408)	-.214 (.426)
*1(Year Since Election=2)	-.455 (.337)	-.440 (.314)	-.255 (.510)	-.267 (.525)
*1(Year Since Election=3)	-.592* (.348)	-.534 (.329)	.458 (.547)	.552 (.576)
*1(Year Since Election=4)	-1.195*** (.341)	-.920*** (.313)	-.295 (.885)	-.476 (.945)
*1(Year Since Election=5)	-1.163*** (.321)	-.795** (.307)	-.429 (.477)	-.580 (.487)
*1(Year Since Election=6)	-2.181** (.849)	-1.953** (.824)	-.129 (.879)	-.177 (.865)
F-test	3.24 (.003)	2.17 (.040)	1.17 (.323)	1.50 (.172)
Council FE	Y	Y	Y	Y
6-year FEs	Y	Y	Y	Y
Council Controls	N	Y	N	Y
Observations	1892	1773	1709	1690
Mean LHS	3.153	3.153	4.247	4.247

Notes: The estimated model is exactly the same as in the notes to Appendix Table 4, but where the sample is conditioned on whether the council has low (Cols.1-2) or high (Cols.3-4) conditional Poll-Tax evasion. See the text (Sections 4.1 and 4.2) for further details and for the construction of the high and low poll-tax conditional evasion subsamples.

Table A6: Heterogeneous Impulse Responses by Poll-Tax Evasion

LHS: Tax Evasion=[Net Collectable - Net Collected]/[Net Collectable]				
Sample restriction	PT Evasion<Median		PT Evasion>=Median	
	(1)	(2)	(3)	(4)
1(Maj Control)				
*1(Year Since Election=0)	-0.569* (.342)	-.499 (.332)	.038 (.396)	.017 (.368)
*1(Year Since Election=1)	-.472 (.353)	-.427 (.342)	-.072 (.391)	-.076 (.362)
*1(Year Since Election=2)	-.200 (.403)	-.164 (.394)	-.425 (.489)	-.454 (.458)
*1(Year Since Election=3)	-.417 (.389)	-.339 (.384)	.017 (.552)	.101 (.537)
*1(Year Since Election=4)	-.809 (.729)	-.687 (.692)	-.362 (.831)	-.487 (.911)
*1(Year Since Election=5)	-.522 (.551)	-.374 (.456)	-.429 (.488)	-.551 (.481)
*1(Year Since Election=6)	-1.540 (1.033)	-1.267 (1.000)	-.350 (.722)	-.363 (.709)
F-test	0.93 (.486)	0.77 (.615)	0.62 (.740)	0.80 (.585)
Council FE	Y	Y	Y	Y
6-year FEs	Y	Y	Y	Y
Council Controls	N	Y	N	Y
Observations	1972	1939	1886	1863
Mean LHS	3.153	3.153	4.245	4.245

Notes: The estimated model is exactly the same as in the notes to Appendix Table 4, but where the sample is conditioned on whether the council has low (Cols.1-2) or high (Cols.3-4) Poll-Tax evasion. See the text (Sections 4.1 and 4.2) for further details and for the construction of the high and low Poll-Tax evasion subsamples.