A Predictive Index for the Flypaper Effect

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Abstract

It is well established that lump-sum public grants boost local government spending more than an equivalent increase in private income, the flypaper effect. One shortcoming of the related literature is that it presumes all communities have an identical propensity to consume from an intergovernmental grant. This paper is one attempt to allow for a heterogeneous response. The working conjecture is that government expenditure on administrative overhead is a gauge of voter control over fiscal decisions. High overhead spending implies a lower provision of public services and a stronger role for revenue-maximizing forces in the budget-setting process. As such, the flypaper effect should be more marked in high overhead communities. An overhead index is applied to a sample of Pennsylvania communities in the Philadelphia metropolitan area. It is difficult to understand these governments' spending propensities from various windfall revenues without the help of the overhead index, supportive evidence for this approach. Because overhead data is widely available, the technique here can be used to address important policy questions such as predicting variations in state government responses to the recently created lump-sum welfare grants.

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1 Introduction

The recent creation of lump-sum welfare grants has renewed interest in the effects of intergovernmental aid on state and local spending. One of the more consistent findings in the empirical literature is that lump-sum aid boosts public expenditure more than an equivalent increase in private income. This is referred to as the "flypaper effect" because grant money sticks where it hits (Gramlich-Galper [17]). Recent surveys which document the pervasiveness of the flypaper effect are Hines-Thaler [19] and Wycoff [25] while Fisher [14] reviews the earlier literature.

Determining the theoretical roots and the extent of the flypaper are essential to understanding the nature of local decision-making and predicting the effect of shifting responsibilities away from the central government. In the neoclassical model of local government, a fully informed electorate and political competition result in the implementation of the decisive voter's policy preference. In this framework, exogenous private income (wages) and public income (grants) are perfect substitutes, so there is no way to explain the flypaper effect. Alternatively, suppose voters suffer from imperfect information about the nature of the social budget constraint. If they are unaware of the existence of grant money, then they may underestimate the price of public services and demand a high level of government spending (Oates [20]); even underestimation of the level of aid will allow budget-maximizing officials to set expenditure beyond the socially preferred level (Filimon-Romer-Rosenthal [13]). In either case, voter misperceptions lead governments to spend a disproportionate share of public windfalls.[1] In reality, we would expect heterogeneity across communities in the degree of voter information and hence the extent of the flypaper effect. Presumably, an index which measures how closely the electorate follows their government would also predict the seriousness of the flypaper effect.

In this paper I use the level of government spending devoted to administrative overhead (correcting for possible returns to scale) as such a measure. The level of overhead is deter-

[1]Other mechanisms, such as interest group lobbying (Dougan-Kenyon [11]) or the deadweight loss of taxation (Hamilton [18]), have been proposed as explanations for the flypaper effect. However, there has been no empirical support for these or other theories which do not rely on voter illusion.

mined by a variety of factors: the degree of politician rent-seeking, the strength of public sector unions and bureaucrats, or the level of voter monitoring. But no matter the source, consistently high levels of overhead mean that voters are getting fewer public services for their tax dollars, an indicator they have limited control over fiscal decisions. And more importantly for this paper, it suggests that high overhead communities will have a more marked flypaper effect.

As an empirical application, I consider the the fiscal response of suburban Philadelphia communities to various public windfalls. These governments appear to have a much higher spending elasticity from state highway grants than from a windfall which accompanies an earned income tax levy.[2] The overhead index helps explain these different rates of public consumption. I find that higher overhead levels are associated with greater rates of spending out of windfall revenues. Since governments which levy an earned income tax almost always have a low level of overhead, the observed spending propensity from these revenues is not extraordinary. State highway aid, however, is given to all communities, so the average spending elasticity from this source will be higher. These results are further evidence that voter misperceptions play an important role in explaining the flypaper effect.

The road-map for the remainder of the paper is as follows. The next section elaborates on the windfall revenues and addresses a potential concern about endogenous earned income taxes. Section 3 presents a simple model of community decision-making when there is politician rent-seeking and partial voter control. This motivates the estimation strategy. Section 4 comments on the data with particular focus on how government overhead is used to measure the extent of voter control. Section 5 contains the empirical estimates. The overhead index successfully predicts which communities devote a larger portion of revenue windfalls to new expenditure. The results are robust to removal of outliers and to different forms of the index. Section 6 concludes and discusses avenues for future research.

[2]Enacting the earned income tax yields a windfall from non-residents and captures taxes which residents previously paid at their workplace.

2 Windfall Revenues for Pennsylvania Municipalities

This section briefly describes the central institutions of this paper. The Pennsylvania earned income ("wage") tax results in a revenue windfall from non-residents. This provides an excellent crucible for examining the flypaper effect: there is no complicated grant formula and the monies are unconditional lump-sums. The concluding subsection presents a leading form of state aid, revenue-sharing from gasoline taxes.

2.1 The Earned Income Tax (EIT)

Municipalities in Pennsylvania have the option of levying an earned income tax with a rate limit of one percent.[3] There is no double taxation and residence has priority: citizens from a taxing community pay only to their home government.[4] Alternatively, individuals whose home does not levy are liable for any wage taxes imposed at their workplace. It is collections from in-commuting non-residents which is the basis for the EIT "windfall."

EIT collections comprise over half of the tax revenue for levying communities in the Philadelphia suburbs. The solid line in Figure 1 shows the average wage tax contribution as a function of years from the initial levy: after rising sharply between the first and second year,[5] the fraction slowly tapers off. The explanation for the decline is that as more neighboring communities decide to levy, fewer in-commuters pay taxes at work. The dashed line in Figure 1 plots the proportion of wage tax revenues collected from non-residents against years from the enactment. These windfall collections are quite significant, composing over one-eighth of total tax revenues during the five years immediately following a levy. However, these collections decline steadily over time. In contrast, collections from residents remain roughly steady over time due to the home priority rule. This variation between resident and non-resident collections will allow me to measure the separate effect of each source on government

[3]In practice, the tax is almost always set at the full 1% cap. A detailed description of the Pennsylvania wage tax is presented in my earlier paper, Strumpf [24].

[4]Philadelphia alone has a special taxing privilege: its wage tax takes precedence over home levies. Also, those who commute to another state or have no wages (the retired) will be exempt from any home levies.

[5]The initial increase is undoubtedly due to a learning curve for collection procedures and a divergence between the fiscal and calendar year (some communities enacted the wage tax in the middle of a calendar year, so first year collection figures do not cover a full twelve months).

spending.

2.2 Endogenous EIT Levies?

In principle, the decision to levy a wage tax is completely internal, based only on the tastes of community members. In this case the timing of the EIT levy may reflect budgetary or economic circumstances, so it would be invalid to make the assumption (needed to test for the flypaper effect) that collections are an exogenous lump-sum.

However, in practice communities tend not to actively seek out a wage tax but rather have it foisted upon them by tax hemorrhages to neighboring jurisdictions. Prior to a levy, residents are liable for any wage taxes at their workplace. A home enactment is costless to these citizens since they simply transfer their tax payments to the home government. In the spirit of the political economy approach, it is natural to think that communities implement the EIT only when it does not increase the tax burden of the median individual; that is, for the majority of citizens the wage tax is a free source of funds. For communities in the Philadelphia suburbs, only 2 of the 146 EIT levies between 1960 and 1992 increased the wage tax burden for over half of the voters.[6] Formally, the null "a *necessary* condition for a home levy is that the median voter[7] does not owe additional wage taxes" cannot be rejected at even the 95% confidence level.[8] Alternatively, the hypothesis that the enactment decision is completely unrelated to the median's tax burden can be rejected at the 99.5% confidence level.[9] This evidence suggests that EIT implementation is an exogenous decision to the extent that neighboring governments determine whether one even *considers* the levy.[10] However,

[6]In addition to voters already paying the EIT at work, those working in another state or those without current or future earned income, chiefly senior citizens, will not see a wage tax increase (see note 4).

[7]In defining the median voter, I restrict the electorate to resident workers and senior citizens (there is no double counting since presumably the elderly do not work).

[8]Let p be the probability that a levy increases the median resident's tax burden. To test the null H_0: $p = \widetilde{p}$ given an empirical frequency $\widehat{p}$ from N independent levies, calculate the test statistic $Z = (\widehat{p} - \widetilde{p})/\sigma_p$ where $\sigma_p \equiv \sqrt{\widetilde{p}(1-\widetilde{p})/N}$ is the standard deviation under the null. The null is rejected when Z exceeds the relevant t-distribution value (at N degrees of freedom and some level of confidence). In evaluating the null $p = \widetilde{p} \equiv 0$ the standard deviation from the empirical rather than assumed probability was used to avoid a zero variance. Here the empirical frequency is $\widehat{p} = 2/146 \equiv 0.014$ and $N = 146$, so the calculated test statistic is 1.424 which is within the expected bounds at 95% confidence.

[9]Following the previous footnote, I test H_0: $p = 0.5$. Again using $\widehat{p} = 2/146$ and $N = 146$, the calculated test statistic is $Z = 50.552$, so the null can be rejected at even 99.5% confidence.

[10]This presumes commuting decisions are unaffected by wage taxes. With the exception of the Philadelphia

I will show in Section 4.1 that only governments meeting certain additional conditions will actually enact the levy.

Before closing, we must consider one particularly important source of endogeneity. Liquidity constrained communities may be predisposed to enact a levy and then spend a disproportionate share of any new revenues. This would bias estimates in favor of finding a flypaper effect. There are two responses to this critique. First, in the sample described in Section 4.2, neither revenue need (as measured by deficit spending) nor the potential size of non-resident wage tax payments has a significant influence on the propensity to levy a wage tax,[11]

$$\begin{array}{rcccccc} \Pr(levy_{it}) & = & 0.007 \times \%Deficit_{it} & - & 0.019 \times Windfall_{it} & + & \beta \times Controls \\ & & (0.87) & & (-0.95) & & \end{array} \quad (1)$$

where t-statistics are in parentheses, $\Pr(levy_{it})$ is the probability that community i levies for the first time in period t, $\%Deficit$ is the government budget shortfall as a percentage of expenditure, $Windfall$ is the expected first year wage tax collections from non-residents divided by government expenditure, and $Controls$ is a matrix of control variables. Second, if this objection were correct, then all revenue-starved communities should spend excessive amounts of the EIT revenue. I will show in Section 5 that lagged deficits have little predictive power over the rate of public consumption from wage tax collections.

2.3 State Highway Aid

I will also estimate the propensity to spend out of a more familiar source of funds for local governments, state revenue-sharing grants. In particular I consider the State Liquid Fuels Highway Aid Fund, which apportions state gasoline taxes to municipalities based on a weighted average of population and local road miles. As with the wage tax this is a significant source of funds, providing on average 19.5% of community tax revenue.

This variable will serve as a check on the results from wage tax collections. First, the

levy, this seems true (regressions omitted).

[11] I use a proportional hazards functional form and a Cox partial likelihood to estimate (1). This approach includes a non-parametric estimation of time effects and so effectively accounts for regional shocks or business cycles. Details of this estimate are presented in Strumpf [24].

monies are more obviously exogenous grants as they are based on factors beyond the government's control.[12] Second, this is the kind of intergovernmental program studied in most other work on the flypaper effect and so makes the regressions here more readily comparable to the literature. And finally, as we will see in Section 5, the universal nature of this grant provides an important contrast to the selective take-up of the earned income tax.

3 Theoretical Framework

This section considers the choice of government spending given a private and community budget constraint and various assumptions about the degree of electorate information. I will show that a surplus-maximizing politician is able to spend more of a public windfall when he has a larger informational advantage.[13] This model has testable implications regarding the proportion of lump sum grants– such as intergovernmental aid or wage tax revenues– which are devoted to public spending.

Consider a community where individuals are identical in tastes, income and property ownership but exogenously work at home or "abroad"; non-residents own no property but may work here. The government provides a single local public good[14] which it funds with intergovernmental aid, a variable-rate property tax and (possibly) a fixed-rate earned income tax. Wages and property are exogenous, meaning taxation is non-distortionary.[15] Recall that a residential wage tax has priority, so when the community implements an EIT it gains a windfall from all in-commuters whose home does not yet tax; alternatively, prior to the levy, home citizens are liable for any taxes in their workplace abroad.

Information asymmetries between the government and the electorate drive the results.

[12]Technically local governments could increase spending on road construction to obtain additional state highway aid. However, in the sample here the relative size of each community's highway grant (PDCA [21]) and transportation-related land area (DVRPC [10]) remained roughly constant over time. In addition several township commissioners told me that they rarely engaged in new road construction (most local infrastructure spending is devoted to maintenance).

[13]While the central feature of the model is heterogeneity in voter information, the qualitative predictions are unchanged if instead voter activism is costly or political competition is limited.

[14]A local public good is a non-rival, non-exclusive output which benefits only those members of a given community (there are no spillovers).

[15]In formal regressions (omitted) neither the earned income tax nor property millage had a significant effect on labor or capital flows. Considering the low rates involved this is hardly surprising.

There is a single politician who is assigned agenda control over all fiscal decisions,[16] in particular the level of public spending, subject to maintaining some level of voter satisfaction. This constraint arises due to the possibility that the incumbent politician will not be re-elected if he selects policies too far removed from his constituents' preferences. Voters are imperfectly informed about the level of public revenues and hence the "efficiency" of their government. In particular, voters know their own income, tax burden and the level of government *services*, but only have partial information about the size of any public windfall as well as total government *spending*. One interpretation of this assumption is that it is costless for citizens to learn the value of any variable which directly impacts them, but it is costly to monitor the community finance restraint. In the tradition of Leviathan models of government (Brennan-Buchanan [2]), the completely informed politician prefers "wasteful" public spending which provides him with rent-seeking opportunities but does not benefit voters. Voters are unaware of this surplus expenditure to the extent it is not reflected in their individual tax bills. This imperfect information provides the slack which allows inefficient public expenditure.

The politician's problem at any time is:

$$\begin{array}{ll} \max & S \\ \text{st} & X + \tau_P P = [1 - \mathcal{I}(EIT)\overline{\tau_Y}]\, y \\ & p_G G + S = A + \sum_{i=1}^{N} \tau_P P + \mathcal{I}(EIT)(\overline{\tau_Y} \sum_{i=1}^{N} y + W) \\ & U(X, G) \geq \overline{U}(c) \end{array} \tag{2}$$

where S is wasteful government spending, G the level of useful public services, X the composite private good (whose price serves as numeraire), P the assessed value of an individual's property, τ_P the property tax rate, and y the level of private income. A is the intergovernmental aid the community receives, $\mathcal{I}(EIT)$ an indicator whether a wage tax has been levied, $\overline{\tau_Y}$ the (fixed rate) wage tax, N the number of home citizens, W the (windfall) wage tax collections from in-commuters who do not face a home wage tax,[17] and p_G the price of public

[16] In Pennsylvania, politicians write the municipal budgets which are not subject to direct voter approval such as the referenda required in several states.

[17] The windfall equals the aggregate income of eligible in-commuters times the tax rate, $\overline{\tau_Y}$.

services. $U(\cdot)$ is a utility function which represents the preferences of home residents and c measures the degree of fiscal illusion (see below).

In words (2) means the politician is a surplus maximizer subject to the private and public budget as well as a voter individual rationality condition. The first constraint is a voter's spending frontier: private consumption plus property taxes must equal disposable income, wages minus any earned income taxes. The second constraint states that government spending equals revenues– intergovernmental aid, property taxes and (if levied) wage taxes. These constraints can be combined,

$$\frac{p_G G + S}{N} + X = y + \mathcal{I}(EIT)\frac{W}{N} + \frac{A}{N} \tag{3}$$

There are three points to notice about (3). First, both tax rates have disappeared, set implicitly by the level of public spending. Second, personal income (y) and lump-sum public income ($\frac{W}{N}$ and $\frac{A}{N}$) are perfectly substitutable, a manifestation of Bradford-Oates' [1] equivalence theorem. Finally, an EIT enriches the community since taxes are no longer "wasted" abroad and a windfall is generated from taxing in-commuters.

The final equation in (2) captures voters' imperfect information about the public budget. Based on the prior discussion, I presume they are familiar with the level of any tax which they pay or public service which they enjoy. However, they are only partially informed about any windfall revenues– wage taxes and intergovernmental aid– and are completely unaware of the level of politician rent-seeking.[18] Citizens' *perceived* budget is,

$$\frac{p_G G + S}{N} + X = \left[1 - \mathcal{I}(EIT)\overline{\tau_Y}\right] y + (1 - c)\left[\mathcal{I}(EIT)\left(\overline{\tau_Y} y + \frac{W}{N}\right) + \frac{A}{N}\right] \tag{4}$$

where $c \in [0, 1]$ indicates the degree of fiscal illusion regarding the windfall revenues. $c \to 1$ means voters are completely uninformed while $c \to 0$ indicates full information, i.e. (4) reduces to (3). The final constraint in (2) states that fiscal policies must ensure voters' their first-best utility under the perceived budget,

$$\overline{U}(c) \equiv \max_{X,G} U(X, G) \text{ st } (4) \tag{5}$$

[18] Voters correctly infer the aggregate level of property tax collections as they are more familiar with this long-standing revenue source.

It is easiest to understand this last condition by considering an initial state in which voters are fully aware of all revenues, and so the politician must provide an efficient level of the public good. What happens if the government then receives a windfall, shifting out the budget frontier (3)? If voters are completely informed ($c = 0$), they will not allow any wasteful spending and government spending increases by the same amount as from an equivalent spike in private income. Under complete fiscal illusion ($c = 1$), however, voters will be unaware of the windfall, and the politician is free to divert all of the new revenues to wasteful expenditures. Under the second informational regime, windfall grants are more stimulative than direct aid to voters and so there will be a flypaper effect (presuming the private good is normal). It should be clear that an intermediate level of information results in public spending somewhere between these two values.

Proposition 1 *When the electorate is incompletely informed, there is a rent-seeking agenda setter, and demand for a composite private good is normal, then the marginal propensity to spend out of government windfalls exceeds that from private windfalls. The less informed are voters, the greater is the level of excessive spending.*

PROOF: Omitted.

The implicit solution to (2) and the proposition motivate a log-linearized form for total government expenditure, $E \equiv p_G G + S$,

$$\begin{aligned} \widetilde{E}_{it} &= \beta_1 y_{it} + \beta_2 \widetilde{p_G}_{it} + \gamma X_{it} + \left[\left(\theta_1 \widetilde{A}_{it} + \theta_2\right) c_{it} + \theta_3 \widetilde{A}_{it}\right] \\ &\quad + \mathcal{I}(EIT)\left[\left(\theta_4 \widetilde{W}_{it} + \theta_5 \widetilde{R}_{it}\right) c_{it} + \theta_6 \widetilde{W}_{it} + \theta_7 \widetilde{R}_{it}\right] + a_i + b_t + u_{it} \end{aligned} \tag{6}$$

where all non-indicators are in natural logarithms, the tilde indicates per-capita terms, and (following Case-Rosen-Hines [8]) there are community (a_i) and year (b_t) effects. This formula says that government expenditure ($\widetilde{E}$) in community i at time t is determined by median household income (y), the price of public spending ($\widetilde{p_G}$), and a matrix of supplemental factors (X). In addition, some of the intergovernmental aid ($\widetilde{A}$) will go to public spending with the amount potentially depending upon the level of voter information (c).[19] If a wage tax is

[19]While it does not follow from the theory, I allow spending out of general revenues to vary with the level of voter information (the θ_2 term in (6)). This is done simply for generality and the term turns out to be insignificant in the estimates.

	Parameter Restrictions	
Hypothesis	**Voter Information**	**Flypaper**
H1: Voter Control	$\theta_i = 0$	$\theta_j + \theta_{j+2} = \beta_1 \times F/y$
H2: Intermediate Control	$\theta_i > 0$	$\theta_j + \theta_{j+2} > \beta_1 \times F/y$
H3: Politician Control	$\theta_i = 0$	$\theta_j + \theta_{j+2} > \beta_1 \times F/y$

Table 1: Leading Hypotheses and Their Restrictions on (6)
Voter Information: $i = 1, 4, 5$. Flypaper: $j = 1\,(F = A)$, $4\,(F = W)$, $5\,(F = R)$.

levied,[20] there are analogous terms for collections from commuters ($\widetilde{W}$) and home residents ($\widetilde{R}$). The innovation relative to previous research on government spending is the interaction between public revenues and the level of voter information. θ_1, θ_4, and θ_5 measure the extent to which increased voter information reins in excessive spending out of each of the three revenue sources.[21]

The traditional assumptions about government behavior are embedded in (6) as special cases. Under complete voter control of social decisions (Hypothesis H1), there is no information asymmetry, the politician implements citizens' desired spending level and there will be no flypaper effect. This is the neoclassical model. At the other extreme, complete fiscal illusion/politician control (Hypothesis H3), voters are always perfectly ignorant of the public windfall. Here the level of the c index is irrelevant and all communities will exhibit excessive spending out of revenue windfalls. This is the implicit assumption in previous papers studying the flypaper effect. The general case, highlighted in the model, is partial politician control (Hypothesis H2). In this scenario flypaper consumption only occurs when voter monitoring is lax, i.e. high c communities. For reference, each theory's parameter restrictions are summarized in Table 1. The first column involves the expected importance of the voter information index, c, while the second considers whether there should be a flypaper effect when there is significant fiscal illusion, $c \to 1$.[22]

[20] The wage tax rate $\overline{\tau_Y}$ does not appear since it is by assumption constant.

[21] The model presumes there is an identical spending response to the three revenue sources. However, I will discuss various reasons for different spending propensities in Section 5.

[22] The flypaper effect is defined in terms of *marginal propensities* (Fisher [14]) whereas the parameters in (6) are elasticities. Therefore the second column in Table 1 includes a correction for the relative size of public revenues.

4 Empirical Specification and Data

4.1 Index of Voter Activism: Government Overhead

The crucial element of both the framework of the last section and the empirical implementation to come is a gauge for voter activism. I will construct a measure based on government spending on administrative overhead. In Pennsylvania, overhead– which includes spending on legal staffs, personnel administration, and planning– is the only local government expenditure category which is not associated with a well-defined output (such as street maintenance or trash removal). As such, I would expect that most wasteful spending would be labeled as overhead rather than some more transparent expenditure group. My working conjecture is that high overhead levels are indicative of limited voter control over fiscal decisions. Consistent with this interpretation, Figlio [12] finds that services but not overhead is reduced following the implementation of property tax limits.

I need to modify the raw data to ensure comparability across communities. Since overhead expenditure increases with the size of government and is a component of total spending, a returns to scale correction is applied. For the sample discussed in the next subsection, I compute the regression,

$$\begin{array}{lcccc} \ln Overhead & = & 0.419 & + & 0.812 \ln Expenditure \\ & & (8.12) & & (215.03) \\ N = 7742, \quad R^2 = 0.86 & & & & \end{array} \tag{7}$$

which allows for fixed costs and scale effects (t-statistics in parentheses). I will refer to the residual from this equation as "wasteful overhead" since it represents spending beyond what an average community would need for administration (and would be purged of any state mandated overhead spending).[23] Notice that unlike the model of Section 3, the index is free to take on any value, but higher numbers are still indicative of minimal voter control. As a robustness check, I will also consider three other overhead indices: (i) ln(*overhead*) divided by ln(*expenditure*); (ii) ln(*overhead per capita*); and (iii) the residual from (7) when

[23] I also estimated (7) including as explanatory variables the following demographic characteristics: ln(population), population growth, ln(median household income), % senior citizens, owner/renter occupied housing, and indicators for cities and boroughs. These variables did little to improve the fit ($R^2 = 0.88$) and only income and the city indicator were significant. More importantly, none of the qualitative results in Section 5 are changed when I use as my information index the residuals from this augmented specification.

I allow for time fixed effects. By construction the residual from (7) is uncorrelated with contemporaneous expenditure, so it cannot possibly help predict the propensity to spend out of public windfalls. To avoid this problem, I use the *lag* of wasteful overhead.[24] The lagged residual is an appropriate indicator of voter control since spending decisions are typically made one year in advance.

It is important to test whether the overhead index reflects the level of public information about government. One suggestive piece of evidence involves an exogenous drop in voters' monitoring costs. In 1986 Pennsylvania passed the Sunshine Act which ensured the public's right to be present at all municipal government meetings. This law made it easier for voters to learn about their government and to lobby against excessive spending. Thus we would predict a drop in overhead expenditure when the Sunshine Act came into effect. Figure 2 plots the median value of the overhead index for the sample of communities described in the next subsection. As predicted, there is a sharp fall when the law went into effect. While this is somewhat circumstantial evidence, it is supportive of the information interpretation of the index.

Before turning to the data, I must point out overhead's dissimilar relationship with state highway aid and local wage taxes. In a previous paper (Strumpf [24]), I found that voters blocked a wage tax when they doubted their government's promise to use the new revenue for property tax relief. Voters take high overhead as a signal that their government is non-credible: there is a significant negative relationship in (1) between the level of overhead and the probability of levying an EIT. As Figure 3 shows, virtually every community which levies a wage tax has a low overhead level;[25] my conjecture is that the few high overhead communities which do levy the EIT have a particularly inattentive electorate (and hence will exhibit a more extreme flypaper effect). However, the same selection bias will not apply to state highway aid since all communities receive these monies. As we shall see in Section 5,

[24] If $\hat{\epsilon}_t$ is the OLS residual from (7), then its lag need need not be orthogonal to $\ln Expenditure_t$. Formally, if Y_t is log overhead, X_t is log expenditure and β its parameter from the returns to scale equation, then $X_t'\hat{\epsilon}_{t-1} \equiv X_t'Y_{t-1} - X_t'X_{t-1}\beta - X_t'X_{t-1}(X_t'X_t)X_t'\epsilon_t \neq 0$.

[25] While this means wage tax collections cannot be considered exogenous grants (Section 2.2), the objective of this paper is to consider how governments respond *after* the levy. So long as politicians do not strategically set overhead spending in order to gain an an EIT, the wage tax revenues can still be considered exogenous.

this difference has important implications for the spending regression and serves as a useful check on the estimates.

4.2 Data

The data used to estimate (6) are annual observations from 1960-1992 for the 237 Pennsylvania minor civil divisions (MCDs) in the Philadelphia suburbs. All dollar variables are considered on a per capita[26] basis and deflated to 1992 dollars using the consumer price index. A set of summary statistics for all included variables is presented in Table 2.

Several variables are drawn from the Pennsylvania Department of Community Affairs archives [21]: the dependent variable– per capita government spending ($\widetilde{E}$); overhead spending (see below); the per capita assessed value of property ($\widetilde{P}$); the previous period's operational deficit as a percentage of total spending ($deficit$); state highway aid ($\widetilde{A}$); and earned income tax collections. To partition the latter into collections from residents and non-residents, I first needed MCD-to-MCD commuting flows which are based on data from the Census [3] and the Department of Transportation [7] (see Strumpf [24] for details).[27] Then separately for residents and non-residents, I multiplied the Census [3] median household income[28] by the number of eligible workers from the commuting data. Finally, I took the ratio of these terms and multiplied by the actual level of wage tax revenue to yield an estimate of wage tax collections from residents (R) and non-residents (W).[29]

[26]Following the discussion in Section 2.2, I will use the *voting* population, defined as the total number of workers plus senior citizens, as the norm for per capita calculations. As a check I re-ran all the regressions in Section 5 using total population or number of homes as the per capita norm. There were no qualitative changes in the results though the parameters of interest were smaller when the homes norm was used.

[27]While these are quite accurate records for workers from the Philadelphia standard metropolitan statistical area (SMSA), workers who commute from outside the SMSA into the Philadelphia suburbs are not included in the data. This means I underestimate the size of non-residential collections from a home levy, imparting an upwards bias on the parameters θ_4 and θ_6 in the spending regression (6). In reality this underestimation is small. There are no collections from inter-state commuters as they are effectively exempted from local Pennsylvania taxes. This only leaves Pennsylvanians from outside the SMSA who commute to a Philadelphia suburb *and* do not face a home levy. As most communities on the cusp of the metropolitan area had their own levy before 1970, there should be few such individuals. In addition, the commuting inflows which I use compare quite closely to the (known) employment level within each suburb.

[28]For non-resident income, I average the median income of each community weighted by their proportion of commuters. Also, by using income I have implicitly assumed that the ratio of earned to unearned income is constant across communities, since the EIT only applies to wages.

[29]To check this procedure, I generated an expected wage tax collection based on the income and commuting

The crucial overhead index (c) follows the construction from Section 4.1. As a robustness check, I consider three modifications of the index: the log ratio of overhead to total expenditure (c'); the log of overhead spending per capita (c''); and the residual from (7) when I allow for year effects (c'''). As stated before, one year lags of these indices will be used.

For the per capita price of public expenditure ($\widetilde{p_G}$) I follow the literature and use the median voter's tax share. When there is no home EIT, this is the ratio of median to mean property value (the former comes from Census [3] records). When there is a wage tax, I average the property ratio with the median's relative income, median to mean income (again from the Census [3]).[30] The Census warns that the mean income is likely to be inaccurate due to small sample sizes, so I assumed the median's relative income equals unity.[31]

Finally I need to specify the elements of the control matrix, X. I include the fraction of voters who pay local wage taxes at home or abroad ($payEIT$), since this may influence perceptions of whether EIT revenue is considered net wealth. The fraction of land devoted to residential ($residential$) and commercial (biz) use is included for 1970-1992 (based on aerial photographs [10]) because firms may have a special weight in the political process.[32] When not using municipality fixed effects, I include dummies for counties[33] – to control for non-municipal provision of local services and heterogeneity in assessment timing[34] – and for government form.[35] Several other variables are included to make the results comparable to estimates in the literature: population growth ($popg$); the retired, which I proxy with the percentage of the total population older than 65 ($\%Senior$);[36] the home tenure rate, the ratio

data, an assumption that three-quarters of income is from wages, and the known EIT rate (usually one percent). After taking into account independently governed school districts– which split wage tax revenue with coterminous municipalities– the constructed revenue variable explains over 80% of the actual level of collections.

[30]In fact property and wages are differentially taxed. Still, since we have seen that the EIT generally contributes half of total tax collections (and property tax the remainder), this is a rough approximation.

[31]Over the sample period, average income rarely exceeded the median by more than ten percent.

[32]Two data notes: earlier observations are unavailable while the omitted category is undeveloped or transportation-related property.

[33]There are four suburban counties in the Philadelphia metropolitan area: Bucks, Chester, Delaware and Montgomery.

[34]In Pennsylvania, all property assessment is centralized at the county-level. There is no maximum period between assessments, so counties vary in the timing of each reassessment.

[35]There are three possible political structures: cities, boroughs and townships. In general, politician power and the size of bureaucracy are greatest in cities and least in townships. The omitted group will be townships.

[36]I do not control for the proportion of youth population since this would mainly influence the demand

of owner to renter occupied dwellings (*owner*); and the ratio of employment to population ($\widetilde{jobs}$). The first three of these variables are from the Census [3] while the jobs data come from two business surveys [9] and [22].

5 Results

Table 3 contains the estimates of the government spending function, (6).[37] The parameters for the benchmark specification– when the overhead index is omitted– are listed in columns one (OLS) and three (municipality fixed effects). The first three variables have comparable coefficients with those in the literature (see Fisher [15]). Government spending has an income elasticity of 0.2–0.4 though a correlated term, per capita property value, has an elasticity about 0.6. The tax price has the expected negative effect with an elasticity in the range commonly found. The insignificant interactions between deficit levels and EIT collections show that cash-starved communities tend not to spend significantly higher portions of wage tax revenues; this rules out a possible endogeneity problem discussed in Section 2.2. And parameters on the control variables, such as population growth and the percentage of senior citizens, compare favorably with other local expenditure studies and will not be discussed further here.

More important to this study are the effects on spending of wage tax revenue and state highway aid, the bold regressors at the bottom of the table. A one percent increase in resident wage tax collections per capita raises spending by roughly 0.2% while for non-resident collections the analogous value is 0.4%. Neither of these figures is significantly different from the estimated elasticity of private income. State highway aid, however, has a noticeably higher spending elasticity, roughly 0.55. These estimates are consistent with the flypaper effect, since there is a higher *marginal propensity* to spend out of wage tax collections

for educational services which are set by a separately governed school district. Also, presuming the age structure is time invariant, any youth effect will be captured by municipality fixed effects.

[37] Land use variables, *residential* and *biz*, are not included in the list of regressors since they are only available going back to 1970. These factors have insignificant parameters when included in a truncated sample regression.

and highway aid than from private income.[38] However, it is puzzling that highway aid has a significantly larger elasticity and marginal propensity of public consumption than the wage tax collections.

But these results change dramatically when I include the overhead index and the interaction terms, columns two and four.[39] The estimates show that the elasticity of public consumption will vary depending on the level of overhead. The direct terms, which represent the elasticity of public consumption for the average community ($c \approx 0$, see Table 2 or Figure 3),[40] have changed rank from the original specification. The coefficient on non-resident collections is now largest, followed by state highway aid, and collections from residents is smallest (and is statistically indistinguishable from the elasticity of private income). Alternatively, the interaction terms represent the divergence in spending between high and low overhead communities. The positive coefficients on the interaction terms are ranked identically to the direct terms: non-resident collections, then state highway aid, then resident collections (all are statistically different from zero). These estimates show that the inter-community variation in flypaper consumption is different for each revenue source. For non-resident wage tax collections, a high overhead community ($c \approx 1$, again see Table 2) has an elasticity which exceeds unity while for low overhead communities ($c \approx -1$) the elasticity is below 0.3. In contrast, for resident collections the range of elasticities for high and low overhead communities is much smaller, 0.1 to 0.3.

The informational interpretation is consistent with the common ranking of the direct and interaction parameters across the three sources of public revenues. Under this view, the coefficient on the interaction term measures the extent to which more informed voters

[38] Strictly speaking the flypaper effect is defined in terms of marginal spending rather than elasticity, see footnote 22. The comparable elasticity estimates mean the marginal propensity of consumption is higher for the public revenues than for private income (since the latter is larger, see Table 2). In the remainder of this section I will restrict the discussion to elasticities.

[39] Confirming an assumption of the model in Section 3, the overhead index has little *direct* effect on spending. That is, voter illusion does not result in higher spending independently of its interaction with public monies, state aid and wage taxes.

[40] The percentage change in government spending when non-resident wage taxes increase by one percent is,

$$\frac{\partial \ln(\widetilde{E})}{\partial \ln(\widetilde{W})} = \theta_{\ln(\widetilde{W})} + \theta_{c\times\ln(\widetilde{W})} c + \beta_{deficit\times\ln(\widetilde{W})} deficit$$

The term for resident collections and highway aid is analogous. Because the deficit parameters are insignificant, when $c = 0$ the first term alone approximates the spending elasticity.

are able to constrain excessive spending. The coefficient on the direct term represents the spending elasticity for a community whose voters have the average level of information. The particular nature of each revenue source suggests a common ranking of these effects. Even politically inattentive voters are typically aware of a home wage tax and should be able to make a reasonable guess about the size of residential collections.[41] As such, there is a limited scope for excessive spending out of these revenues. However, based on an extensive review of all suburban town-meetings from 1981-1992 covered in the *The Philadelphia Inquirer* [23], I found that few voters are aware their government collects taxes from non-residents and fewer still are likely to be able to estimate the level of these collections.[42] This suggests that for non-residential wage taxes the level of voter monitoring will play a much more important role in reining in excessive spending but that typically there will be a higher elasticity of public consumption. Finally, the accuracy of the typical voter's estimate of state highway aid is likely to fall between that for the two wage tax revenues. Most voters are likely aware of the aid– due to the program's long existence– but only reasonably informed voters would know its actual dollar level.[43] Thus it seems reasonable that both the average consumption and the spread between high and low overhead communities is intermediate for state highway aid.

The contrast between the spending elasticities found here and those in the benchmark specification, which does not include the overhead index, can be attributed to sample selection. The benchmark specification only captures the *average* rate of public consumption for all communities in the sample. Since it is predominantly low overhead governments which levy a wage tax (Section 4.1), the average rate of public spending from these revenues is not too large. It is not until the second set of estimates, where high and low overhead

[41]Prior to a home levy municipal officials typically release an estimate of residential wage tax collections. In addition, most voters should be aware of the necessary data– the number of workers and the mean income within the community– needed to estimate residential tax collections.

[42]To calculate non-residential wage tax collections one needs to know both the number of in-commuters whose home does not already have an EIT and these workers' income level. Only highly informed residents are likely to be aware of these figures. Also, I have not been able to find even one example of municipal officials making an estimate of non-resident collections (as opposed to resident collections, see note 41).

[43]Because the highway revenue sharing program has existed since the 1940s and has a simple allotment formula, voters who monitor their government will eventually learn their community's level of aid. Alternatively, non-resident wage tax collections are largest in the first years after the levy (Figure 1) when voters are likely to be least informed about its level.

governments are distinguished, that clearly excessive spending is detected. Alternatively, all communities receive state highway aid so even the average rate of spending from it will be large. This explains why the elasticity for state highway aid was so much higher than for wage tax collections in the benchmark specification.

It is important to check whether large outliers drive the estimates. Visual inspection did not reveal any extreme residuals (plots omitted). A more formal robustness check, deleting observations whose residual is more than two standard deviations from zero and re-estimating, did not alter the main qualitative conclusions under either specification (regressions omitted).[44] Similarly, when I deleted observations where the wage tax was in place for less than five years I still found the elasticity of spending was significantly larger for high overhead communities (regressions omitted).[45]

Other forms of the overhead index are considered in Table 4. The first and fourth columns use the ratio of log overhead to log expenditure. Considering its close relationship to the original index, it is not surprising the estimates are not very different: the parameters on the direct and interaction terms are positive and have a common rank across the three sources of public revenues. The results for the second index, the log of per capita overhead, are reported in columns two and five. Dividing by population is an incomplete correction for scale effects, but I would expect this index to roughly capture the size of wasteful administrative expenditure. I again find different elasticities of consumption for high and low overhead communities (though non-resident wage tax collections and state highway aid seem to have comparable interaction and direct terms). Finally, columns three and six contain results using the third index, the residual from (7) when I also include year dummies. This index will correct for any changes over time in required administrative spending, say due to various state mandates. Again I find significant positive interaction terms which are comparable to

[44]Only positive residuals are excluded from the full specification since the alternative null is that there is a negative (or no) relationship between the index and spending. A false rejection of this hypothesis would have to be due to positive outliers.

[45]The non-resident wage tax collection interaction had a noticeably smaller parameter than in Table 3 (though it is still larger than those on the other interaction terms). This is consistent with my earlier conjecture that voters learn about public revenues over time and then limit the degree of excessive spending (note 43).

those found when using the original index.[46]

These results taken together support the intermediate voter control hypothesis (H2) and reject the notion that the flypaper effect is constant across communities.[47] As only supposition H2 predicts, high overhead correlates with the propensity to use windfall revenues for public spending. While the evidence for the informational interpretation of these results is indirect, any competing model must be able to explain why low overhead communities are fiscally conservative in response to windfalls. Such an alternative theory is difficult to envision.

6 Conclusion

Most explanations for the flypaper effect rely on imperfect voter information. Due to differences in institutions and tastes, voter awareness and hence the level of government consumption out of windfall revenues should vary across communities. In this paper I propose an index based on administrative expenditure which proxies for the level of voter information and helps explain the diversity of flypaper consumption. High overhead is indicative of an inattentive electorate, so only in such communities will there be extraordinary consumption of a windfall. The index helps explain why a sample of suburban Philadelphia municipalities seem to partake in higher consumption rates from one source of public revenues, state revenue-sharing grants, than from another, earned income tax collections. Predominantly low overhead governments enact the wage tax, so the average elasticity of public consumption from these monies is not too large; regressions omitting the index only capture this mean effect and so will not register evidence of excessive spending. Alternatively, all communities receive state grants, so even the average elasticity of public consumption is large. While other settings may not exhibit such extreme selection issues, in this application at least the

[46] One explanation for the similar numerical estimates is that the specifications reported in Tables 3 and 4 both include year dummies which capture much of the difference between the two measures. That is, if overhead and thus total spending are increased for all communities in a particular year, than the indices will diverge but part of the difference will be removed by the year dummies.

[47] More formally, I can reject the parameter restrictions listed in Table 1 from the alternative theories, H1 and H3, using an F-test.

overhead index is instrumental in understanding the government reaction function.

This paper should be viewed as an incremental step towards a bigger project involving a national sample of state or local governments. Since the Census tracks overhead spending across these units ([4], [5] and [6]), the techniques developed here can be used to address a variety of questions relating to fiscal decentralization policies. For example, it would be interesting to estimate how particular states will react to the new lump-sum funding mechanism for welfare. To properly run such simulations we must first estimate the response of sub-national governments to previous grant programs. I am currently examining the General Revenue Sharing Program which provided over $6 billion per year of unconditional funds for states (from 1972-1984) and local governments (from 1972-1987); while the grants were in part based on general tax effort, the matching rate was low enough and special exemptions numerous enough to make the grant size effectively exogenous to recipient governments. At the very least, the research program outlined here should encourage local public economists to go beyond simply documenting the existence of the flypaper effect and toward understanding how it varies between governments.

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VARIABLES		Mean	Std Dev	Max	Min
PC government spending	$\ln(\widetilde{E})$	5.884	0.625	8.665	2.901
Median household income ($\times 10^2$)	$\ln(y)$	5.960	0.258	7.047	4.687
PC price government spending	$\ln(\widetilde{p_G})$	-0.713	0.377	0.231	-2.172
PC property tax base ($\times 10^2$)	$\ln(\widetilde{P})$	4.894	0.584	7.468	2.958
Government deficit (% expenditure)	$deficit$	-9.98	29.17	38.71	-306.57
Fraction pay wage tax	$payEIT$	0.433	0.296	0.959	0.000
Fraction residential land	$residential$	0.263	0.178	0.923	0.006
Fraction commercial land	biz	0.310	0.192	0.812	0.000
Population growth	$popg$	1.435	2.222	13.889	-6.422
Jobs/population	$\ln(\widetilde{jobs})$	-0.404	0.655	2.187	-14.171
Owner/renter homes	$\ln(owner)$	1.179	0.635	3.233	-0.968
% Seniors	$\%Senior$	10.213	3.965	32.100	1.800
PC wage tax revenue: residents	$\ln(\widetilde{R})$	4.964	0.292	5.713	3.781
PC wage tax revenue: non-residents	$\ln(\widetilde{W})$	3.309	2.053	7.209	-2.087
PC highway aid	$\ln(\widetilde{A})$	3.213	1.444	6.517	-15.555
Overhead index when levy	c_{EIT}	-0.981	0.201	1.397	-2.365
Overhead index when no levy	$c_{No\ EIT}$	0.051	0.456	1.610	-2.461
$\frac{\ln(\text{overhead})}{\ln(\text{expenditure})}$ when levy	c'_{EIT}	0.705	0.026	0.879	0.619
$\frac{\ln(\text{overhead})}{\ln(\text{expenditure})}$ when no levy	$c'_{No\ EIT}$	0.869	0.044	0.973	0.673
ln(PC overhead) when levy	c''_{EIT}	2.867	0.431	5.046	1.457
ln(PC overhead) when no levy	$c''_{No\ EIT}$	3.678	0.592	6.121	1.282
Overhead index (time dummies) when levy	c'''_{EIT}	-0.897	0.258	1.492	-2.502
Overhead index (time dummies) when no levy	$c'''_{No\ EIT}$	0.032	0.396	1.588	-2.419

Table 2: Descriptive Statistics

Notes:

Sample: 1960-1992, 237 Philadelphia SMSA MCDs. Sources: See Section 4.2. "PC" = per capita.

	Dependent variable: $\ln(\widetilde{E})$			
	(OLS)	(OLS)	(FE)	(FE)
REGRESSORS	**No Index**	**Index**	**No Index**	**Index**
constant	-2.194	-2.673	—	—
	(-7.34)	(-8.65)		
$\ln(y)$	0.236	0.292	0.425	0.409
	(8.29)	(9.85)	(14.32)	(12.64)
$\ln(\widetilde{P})$	0.584	0.574	0.595	0.597
	(45.02)	(44.25)	(48.66)	(47.96)
$\ln(\widetilde{p_G})$	-0.351	-0.253	-0.311	-0.203
	(-12.29)	(-10.10)	(-12.55)	(-9.45)
$deficit \times \ln(\widetilde{R})$	0.006	0.004	0.008	0.006
	(0.82)	(0.62)	(0.95)	(1.01)
$deficit \times \ln(\widetilde{W})$	0.001	0.002	0.002	0.004
	(0.37)	(0.69)	(0.68)	(1.33)
$payEIT$	0.396	0.501	0.488	0.543
	(8.01)	(10.06)	(11.74)	(12.50)
$popg$	-0.052	-0.049	-0.017	-0.017
	(-18.21)	(-17.39)	(-6.51)	(-6.53)
$\ln(\widetilde{jobs})$	0.072	0.081	0.180	0.171
	(6.96)	(8.01)	(16.03)	(15.06)
$\ln(owner)$	-0.247	-0.225	-0.293	-0.249
	(-20.03)	(-18.40)	(-19.78)	(-15.78)
$\%Senior$	0.012	0.010	0.031	0.032
	(7.63)	(6.52)	(17.02)	(17.37)
$\mathcal{I}(city)$	0.596	0.760	—	—
	(9.64)	(11.64)		
$\mathcal{I}(borough)$	0.262	0.215	—	—
	(16.73)	(13.82)		
$\mathbf{ln}(\widetilde{\mathbf{R}})$	0.225	0.212	0.191	0.241
	(36.06)	(33.12)	(33.30)	(39.55)
$\mathbf{ln}(\widetilde{\mathbf{W}})$	0.385	0.643	0.404	0.599
	(37.03)	(88.31)	(45.04)	(82.93)
$\mathbf{ln}(\widetilde{\mathbf{A}})$	0.532	0.450	0.574	0.491
	(40.00)	(37.00)	(43.36)	(49.01)
$\mathbf{c} \times \mathbf{ln}(\widetilde{\mathbf{R}})$	—	0.112	—	0.101
		(4.66)		(7.87)
$\mathbf{c} \times \mathbf{ln}(\widetilde{\mathbf{W}})$	—	0.380	—	0.322
		(41.17)		(38.09)
$\mathbf{c} \times \mathbf{ln}(\widetilde{\mathbf{A}})$	—	0.203	—	0.169
		(19.06)		(31.19)
$\mathbf{c_{EIT}}$	—	0.222	—	0.031
		(1.44)		(0.12)
$\mathbf{c_{No\ EIT}}$	—	-0.186	—	-0.039
		(-1.36)		(-0.85)
$\mathcal{I}(county)$?	Yes	Yes	No	No
Municipality Fixed Effect?	No	No	Yes	Yes
Period Fixed Effect?	Yes	Yes	Yes	Yes
N	7561	7276	7561	7276
R^2	0.721	0.853	0.805	0.905

Table 3: Government Expenditure Function: Equation (6)

Notes:
(t-statistics). Sample: 1960-1992, 237 Philadelphia SMSA MCDs. FE = Municipality fixed effects regression. Key regressors are in bold. c = lagged residual from overhead equation, (7). $\ln(\widetilde{R})$ and $\ln(\widetilde{W})$ only for observations with levy in place.

	Dependent variable: $\ln(\widetilde{E})$					
	(OLS)	(OLS)	(OLS)	(FE)	(FE)	(FE)
REGRESSORS	**Index′**	**Index″**	**Index‴**	**Index′**	**Index″**	**Index‴**
constant	1.882	-0.079	-2.143	—	—	—
	(4.29)	(-0.25)	(-7.11)			
$\ln(y)$	0.360	0.120	0.341	0.462	0.275	0.378
	(11.41)	(4.00)	(8.37)	(13.73)	(8.87)	(11.89)
$\ln(\widetilde{P})$	0.565	0.339	0.581	0.594	0.398	0.604
	(43.80)	(24.01)	(45.43)	(47.79)	(31.60)	(48.93)
$\ln(\widetilde{p_G})$	-0.252	-0.336	-0.207	-0.303	-0.199	-0.257
	(-7.11)	(-4.11)	(-3.94)	(-10.78)	(-3.01)	(-9.85)
$deficit \times \ln(\widetilde{R})$	0.010	0.032	0.008	0.004	0.030	0.010
	(1.11)	(0.97)	(0.77)	(0.22)	(0.44)	(1.21)
$deficit \times \ln(\widetilde{W})$	0.004	0.001	-0.002	0.006	0.002	0.003
	(0.59)	(0.03)	(-0.42)	(0.44)	(0.43)	(1.03)
$payEIT$	0.506	-0.011	0.427	0.533	0.158	0.536
	(10.29)	(-0.23)	(8.76)	(12.29)	(3.94)	(12.66)
$popg$	-0.046	-0.041	-0.047	-0.018	-0.012	-0.016
	(-16.63)	(-15.23)	(-16.92)	(-6.75)	(-5.16)	(-6.26)
$\ln(\widetilde{jobs})$	0.083	0.061	0.081	0.168	0.147	0.166
	(8.25)	(6.24)	(8.10)	(14.83)	(14.00)	(14.71)
$\ln(owner)$	-0.219	-0.199	-0.220	-0.241	-0.224	-0.232
	(-18.08)	(-16.89)	(-18.07)	(-15.35)	(-15.63)	(-14.85)
$\%Senior$	0.009	0.010	0.008	0.031	0.023	0.029
	(5.44)	(6.23)	(4.74)	(16.47)	(13.32)	(15.49)
$\mathcal{I}(city)$	0.673	0.318	0.800	—	—	—
	(10.44)	(5.02)	(12.19)			
$\mathcal{I}(borough)$	0.222	0.156	0.209	—	—	—
	(14.46)	(10.28)	(13.48)			
$\mathbf{ln}(\widetilde{\mathbf{R}})$	0.033	0.030	0.180	0.025	0.029	0.177
	(5.63)	(12.21)	(28.94)	(4.17)	(11.97)	(31.07)
$\mathbf{ln}(\widetilde{\mathbf{W}})$	0.056	0.056	0.555	0.041	0.040	0.560
	(8.11)	(16.98)	(92.06)	(5.43)	(14.30)	(87.45)
$\mathbf{ln}(\widetilde{\mathbf{A}})$	0.045	0.048	0.423	0.038	0.058	0.493
	(5.71)	(7.86)	(32.49)	(4.94)	(14.89)	(36.27)
$\mathbf{c} \times \mathbf{ln}(\widetilde{\mathbf{R}})$	0.207	0.072	0.155	0.222	0.059	0.115
	(3.13)	(6.87)	(4.34)	(2.82)	(6.77)	(3.42)
$\mathbf{c} \times \mathbf{ln}(\widetilde{\mathbf{W}})$	0.603	0.131	0.344	0.506	0.156	0.347
	(4.76)	(19.68)	(34.64)	(3.64)	(25.83)	(46.13)
$\mathbf{c} \times \mathbf{ln}(\widetilde{\mathbf{A}})$	0.375	0.257	0.214	0.294	0.117	0.141
	(4.76)	(12.49)	(26.56)	(4.75)	(10.29)	(25.07)
$\mathbf{c_{EIT}}$	0.789	0.217	0.344	0.184	0.150	0.014
	(1.59)	(2.41)	(1.93)	(0.52)	(1.09)	(0.18)
$\mathbf{c_{No\ EIT}}$	-1.152	0.136	-0.227	-0.889	0.098	-0.081
	(-1.15)	(1.98)	(-1.53)	(-1.01)	(2.48)	(-0.29)
$\mathcal{I}(county)$?	Yes	Yes	Yes	No	No	No
Municipality Fixed Effect?	No	No	No	Yes	Yes	Yes
Period Fixed Effect?	Yes	Yes	Yes	Yes	Yes	Yes
N	7276	7276	7276	7276	7276	7276
R^2	0.758	0.806	0.790	0.848	0.915	0.883

Table 4: Government Expenditure Function: Modified Overhead Indices

Notes:

Index′: $c = \ln(\text{overhead})/\ln(\text{expenditure})$. Index″: $c = \ln(\text{overhead per capita})$. Index‴: c = residual from (7) when year dummies are included. All indices are lagged one year. See Table 3 for additional comments.