The Flypaper Effect Revisited

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Abstract

This paper argues that there is nothing anomalous about the flypaper effect. I develop a simple median voter model of government spending with costly tax collection that predicts the flypaper effect and provide a quantifiable measure of its magnitude. Using the model insights and previous estimates, I show that a tax rate between 8% to 16% would account for the flypaper effect observed in U.S. sub-national governments.

Keywords: flypaper effect, intergovernmental transfers, public finance, fiscal decentralization.

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1 Introduction

One of the most documented empirical regularities in the fiscal federalism literature is the so-called flypaper effect (Hines and Thaler, 1995; Gamkhar and Shah, 2007). This effect refers to the observed greater stimulatory effect of unconditional grants on local government spending than increases of the community income.

However in the traditional grants-in-aid theoretical framework, these findings are puzzling (Oates, 1999). The standard approach, formalized by Bradford and Oates (1971), predicts that grants to local governments are equivalent to increments of community income. The reasons is that money is fungible and thus a local government should have the same propensity to spend out of individual income or lump-sum grants[1]. This result is know as the *veil hypothesis* because it suggests that intergovernmental transfers are simply a veil for central government's tax rebates (Oates, 1999).

Given the evident conflict between theory predictions and empirical observations, the flypaper effect has been treated as an anomaly inconsistent with economic theory (Hines and Thaler, 1995). Not surprisingly, until now documenting and understanding this apparently paradox has dominated the debate on the impact of intergovernmental transfers in academic and professional's circles (Rosen, 2005; Shah, 2007; Smart, 2007).

Most explanation focus on identifying flaws in the empirical strategy such as functional miss-specification (Becker, 1996), omitted variables (Hamilton, 1983), reverse causality (Knight, 2002) or mistakes in classifying conditional transfers as lump sum grants (Moffitt, 1984). Overall, this literature casts doubts on the existence of the flypaper effect and suggests empirical studies may be overestimating it[2].

On the other hand, there is also a literature that try to fix the standard model to account for the flypaper effect. Most explanations do so by creating a divergence between the local government policies and the median voter preferences. The sources of political bias include imperfect information (Courant et al., 1979; Oates, 1979), uncertainty (Turnbull, 1998) or the ac-

[1] A similar argument is found in the aid literature. In this case, we could expect that a recipients' spending do not increase as a response of external aid. See Van de Walle and Mu (2007) for a recent survey of the literature.

[2] For a detailed survey of the literature see Hines and Thaler (1995), Bailey and Connolly (1998) or Gamkhar and Shah (2007).

tion of agenda setting budget-maximizing bureaucrats (Filimon et al., 1982). However, these explanations provide only a partial account and fail to predict a flypaper effect with the magnitude observed empirically (Hines and Thaler, 1995; Bailey and Connolly, 1998).

More recently, Roemer and Silvestre (2002) depart from the median voter approach and develop a model of party competition in a multidimensional policy space. They are unable to determine, in general, the sign or magnitude of the flypaper effect. However numerical calibrations of the computed equilibria yield values similar to the observed flypaper effect.

In this paper I argue that there is nothing anomalous about the flypaper effect. I develop a simple median voter model of local government spending with costly tax collection and show that in general it predicts the flypaper effect. In contrast to previous explanations, this model does not require any political bias nor multidimensional policy spaces to generate different propensities to spend out of income and grants.

More importantly, the model provides a simple and quantifiable measure of the flypaper effect as a function of the tax rate and tax collection costs. This result has not been obtained before and it is important since the flypaper paradox is mainly an empirical issue.

Using this insight, I evaluate numerically how well the model explain the observed flypaper effect in U.S. sub-national governments. Previous estimates of the effect of US federal grants suggest that the marginal propensity to spend out of grants is in average 0.64 while the propensity to spend out of local income is between 0.05-0.10. In order to explain this difference the model requires a tax rate between 8% to 16%. This is a very plausible figure considering that estimates of the state-local tax rate in U.S. are between 10-11% (Dubay, 2007a).

In order to motivate costly tax collection I focus on compliance and administrative costs. These costs are not negligible and in some cases may be as important as the distortionary costs of taxation (Slemrod, 1990). For example, estimates of the compliance and administrative costs of operating the income tax system in the U.S. range from 5% to 10% of total revenue (Slemrod and Sorum, 1984; Blumenthal and Slemrod, 1992; Slemrod and Yitzhaki, 2002). At local level, Wicks and Killwort (1967) estimate the cost of collecting property taxes as 9.5% of the total tax collection.

This paper relates to the work of Hamilton (1986). He develops a median

voter model with distortionary taxation. Similar to this paper, his model predicts greater responsiveness of local spending to lump-sum grants than to community income. However, he is unable to predict the magnitude of the difference and thus to evaluate how well the model account for the flypaper effect.

The rest of the paper proceeds as follows. Section 2 develops the model and shows the results with and without costly tax collection. Section 3 applies the model insights to explain the observed flypaper effect in U.S. sub-national governments. Section 4 concludes.

2 The model

Consider a community populated by a continuum of citizens of mass one with heterogenous income y_i. In order to abstract from the effect of income inequality, I restrict attention to symmetric distributions such that both the average and median income are equal.

There a two tiers of government: a central and a local government. Both provide public goods, collect taxes and their representatives are elected in general elections. In addition, the central government provides financial support as lump-sum grants to the local government. For the model, I focus on the policy decisions of the local government and take the central government's policies as given.

Citizens derive utility from private consumption c_i and a homogenous public good g provided by the local government. Preferences are defined by a quasilinear utility function

$$V_i = c_i + H(g) \tag{1}$$

where the utility from the public good $H(g)$ is an increasing and concave function.

The local government funds the provision of the public good from two revenues sources: a local income tax and a grant from the central government. The local income tax is proportional and cannot be targeted to any particular group so there is a common tax rate $\tau \in (0, 1)$. The local government sets the tax rate and collects the tax revenues. In contrast, the decisions on grant's funding and allocation are made by the central government.

Tax collection is costly due to compliance and administrative costs[3]. Compliance costs refers to the value of the time spent by the taxpayer filling tax returns as well as any expenditure on goods and services for the same purpose. Administrative costs refers to the resources used by the tax authority to operate the tax system. It includes, among others, the cost of processing tax returns, monitoring tax evasion and the required legal proceeds. The most relevant difference between both costs is that compliance costs are borne by the taxpayers while administrative costs are borne by the tax authority (Slemrod and Yitzhaki, 2002).

These costs are not negligible but in some cases[4] are as relevant as the distortionary costs of taxation (Slemrod, 1990, p. 169). For example, in the U.S. the compliance and administrative costs of the federal and state income tax may account for 5-10% of total tax revenue (Slemrod and Sorum, 1984; Slemrod, 1996). In the case of local governments, Wicks and Killwort (1967) find that administrative and compliance costs of real property taxes represent 9.5% of tax revenue.

I model tax compliance and administrative costs as proportional to the tax base and increasing on the tax rate[5]. In particular, for citizen i the compliance cost is a fraction $C_c(\tau)$ of her income while for the tax authority the administrative cost represents a proportion $C_a(\tau)$ of the tax base[6]. Both $C_c(\tau)$ and $C_a(\tau)$ are increasing and convex functions and adopt values strictly between 0 and τ[7].

Given the previous assumptions, we can write the indirect utility of citizen i as

$$V_i = y_i \left[1 - \tau - C_c(\tau)\right] + H(g) \tag{2}$$

[3]Since the local government cannot affect the size of grants, whether they are or not costly does not affect the tax rate nor the level of expenditure.

[4]For an empirical survey of compliance and administrative costs see Sandford (1995).

[5]A rationale for this specification is that higher tax rates may increase the benefits of tax evasion or elusion. In this case, taxpayer would spent more time and effort trying to reduce their tax bills while the administration would require more monitoring and tax enforcement actions to increase tax revenues. In terms of the model this implies a more costly tax collection.

[6]Modeling collection costs as a proportion of the tax base facilitates comparison of the model results with empirical estimates. In most cases these estimates are calculated as a proportion of the tax revenue.

[7]This condition avoids a corner solution with zero taxation.

while the local government's budget constraint is

$$g = y\left[\tau - C_a(\tau)\right] + a \tag{3}$$

where y is the average income and a is the lump-sum grant per capita received from the central government. Note that compliance costs reduce citizen's consumption while administrative costs reduce the resources available for government spending. Moreover, expression $y\left[\tau - C_a(\tau)\right]$ represents the net tax revenue after deducting administrative costs

Assumption 1: $C_a' < 1$ This assumption guarantees that the net tax revenue is an increasing and monotonic function of the tax rate.

The political process to define the local tax rate and public spending is one of Downsian electoral competition. There are two office-seeking politicians running for local office, electoral promises are enforceable and the winning candidate is defined by simple majority rule. The timing of events is as follows. Firstly, candidates simultaneously announce their policies τ and g. Secondly, local elections are held. Finally, the appointed politician implements her announced policy platform.

This setup is relatively standard in the political economy literature and has been widely used by Persson and Tabellini (2000) in their analysis of public spending and redistributive politics. The only differences are the introduction of grants a as an additional source of revenue and costly tax collection.

Equilibrium policy Rearranging the budget constraint (3), we can express τ as a function of g:

$$F(\tau) \equiv \tau - C_a(\tau) = \frac{g-a}{y} \tag{4}$$

where $F' > 0$, $F'' > 0$ by assumption 1 and convexity of $C_a(\tau)$. Since F is a monotonic function, we can write the tax rate as

$$\tau = f\left(\frac{g-a}{y}\right) \tag{5}$$

where $f(\cdot) = F^{-1}(\cdot)$.

The citizen's utility (2) satisfies single-crossing property and allow us

to apply the median voter theorem[8]. Thus, in equilibrium the government spending is

$$g^* = \arg\max \; y\left[1 - \tau - C_c(\tau)\right] + H(g) \tag{6}$$

Solving (6) we obtain the equilibrium policy:

$$g^* = h\left(\left(1 + C_c'\right) f'\right) \tag{7}$$

where $h(\cdot)$ is the inverse function of $H'(\cdot)$.

2.1 Costless tax collection

Let us first study as a benchmark the case of costless tax collection. In this scenario, expression (7) simplifies to $g^* = h(1)$ and it is easy to note that the effect of intergovernmental transfers and local income on g^* are both identical and equal to zero[9].

When tax collection is costless, the model predicts that grants from the central government do not affect spending but instead are fully translated to citizens as tax rebates. Moreover, the mechanism to transfer resources becomes irrelevant because both grants and local income are equivalent in terms of their effect on local government spending and taxation.

This result replicates the veil hypothesis which has provided the theoretical basis for the flypaper paradox (Oates, 1999, p. 1129). According to this hypothesis, when the local authority is representative of the median voter and taxation is costless, both intergovernmental grants and local income have similar effect on local spending. In this approach, the local government acts only as a *veil* and does not distort the final allocation of resources.

2.2 Costly tax collection

Let us now relax the assumption of costless taxation. We can calculate the marginal propensities to spend from expression (7) to obtain:

[8] To see this note that $\frac{\partial^2 V}{\partial g \partial y_i} = \frac{g-a}{y^2}\left[\left(1 + C_c'\right) f'' + C_c'' f' f'\right] > 0$

[9] This result is extreme due to the quasi-linearity assumption which eliminates the income effect.

$$\frac{dg^*}{dy} = -\frac{h'}{y}\left[\left(1+C_c'\right)f'' + C_c''f'f'\right]\frac{g^*-a}{y} \tag{8}$$

$$\frac{dg^*}{da} = -\frac{h'}{y}\left[\left(1+C_c'\right)f'' + C_c''f'f'\right] \tag{9}$$

These propensities to spend are positive since $h' < 0$, $f'' > 0$ and $C_c'' > 0$. Thus, in contrast to the benchmark case, the model predicts a positive relation between local spending and both community income and lump-sum grants. The reason is that grants reduce the tax rate required to fund a given level of spending. In turn, this lowers tax collection costs and reduces the marginal cost of public spending.

Expressions (8) and (9) provide a way to link both marginal propensities to spend and evaluate the magnitude of the flypaper effect. Using both results and definition (4) we obtain the following relation[10]:

$$\frac{dg^*}{dy} = \frac{dg^*}{da}\left[\tau^* - C_a(\tau^*)\right] \tag{10}$$

where τ^* is the equilibrium tax rate and $C_a(\tau^*)$ is the administrative cost as a proportion of the tax base.

Note that $\tau^* - C_a(\tau^*) < 1$ since $C_a(\tau^*) \in (0, \tau^*)$ and $\tau^* < 1$. This result implies that the marginal propensity to spend out of central government's grants is *greater* than the marginal propensity to spend out of community income[11]. This prediction is consistent with the observed flypaper effect and, contrary to the veil hypothesis, suggests that local income and lump-sum grants are not equivalent.

This non-equivalence result is due to the different costs of public funds faced by the local government. In particular, from the point of view of the local government collecting taxes is more costly than using grants. However, this cost difference arises because the local government does not to internalize the cost of funding the transfer scheme[12]. Thus, this result points out a potential source of inefficiency in fiscal decentralization processes with

[10] The result in expression (10) does not require the inclusion of both administrative and compliance costs. When we consider only administrative costs the result is identical. When, we include only compliance costs the expression simplifies to $\frac{dg^*}{dy} = \frac{dg^*}{da}\tau^*$.

[11] Moreover, finding similar marginal propensities would be rare since it requires very high tax rates and negligible compliance costs.

[12] In the model the failure occurs because the central and local governments' policies are chosen in separated political processes.

overspending at local level.

In contrast to previous explanations, this model provides a quantifiable measure of the flypaper effect. Recall that the flypaper effect is the observed difference between the marginal propensities to spend out of income and grants. In the model this difference can be measured by the ratio of both marginal propensities to spend $\tau^* - C_a(\tau^*)$. In most application this ratio is quantifiable since both the tax rate and administrative costs are observable. Moreover, it can be used to compare the model predictions to estimates of the flypaper effect[13].

This model relates to Hamilton (1986). He develops a median voter model with distortionary taxation to explain the flypaper effect. Similar to my model, Hamilton finds that a local government spend more when receiving grants than when the local income increases. However, he is unable to predict the magnitude of the flypaper effect and hence to contrast the model predictions with empirical estimates. The main difference is that Hamilton uses a general utility function while I assume a quasilinear specification[14].

3 Explaining the flypaper effect in U.S. subnational governments

This section evaluates whether the observed flypaper effect in U.S. subnational governments could be predicted by the model using previous estimates of propensities to spend and tax rate. This exercise does not attempt to be a formal empirical proof of the model but instead a back of the envelope calculation to check whether it can provide a plausible explanation.

I focus on estimates of the flypaper effect from studies surveyed by Hines and Thaler (1995). The studies in the sample are some of the most commonly cited in the flypaper literature and use data from U.S. state and local governments.

Table 1 presents the estimates of $\frac{dg^*}{da}$ from each study. In average, the estimated effect of grants is around 0.64. In contrast, suggested estimates of $\frac{dg^*}{dy}$ are much smaller ranging from 0.05 to 0.10 (Hines and Thaler, 1995, p. 218). This difference cannot be reconciled in the standard grants-in-aid

[13] In the next section I use this insight to evaluate numerically how well the model accounts for the observed flypaper effect in the case of U.S. sub-national governments.

[14] As previously mentioned, this assumption is commonly used in political economy models of public spending and redistribution (Persson and Tabellini, 2000)

theory and illustrates the flypaper paradox. The last two columns show the ratio of both propensities to spend calculated for different values of $\frac{dg^*}{dy}$. This ratio corresponds to the empirical magnitude of the flypaper effect and, for the average case, ranges between 8-16%.

Estimates of administrative costs of state and local governments in U.S. are between 0.5%-1.5% of the tax collections[15]. In terms of the tax base, this cost is very small and we can safely omit it from the calculation. In this case, the model predicts that the magnitude of the flypaper effect is equal to the tax rate τ.

As a proxy for the tax rate, I use the state-local tax burden. The state-local tax burden is calculated dividing the national per capita state-local taxes by the national per capita income (Dubay, 2007b). Previous estimates suggest that since mid 1980s the state-local burden in U.S. has been between 10-11% (Dubay, 2007a).

Note that the predicted flypaper effect lies within the range of the estimated one. The similarity is higher when the effect of grants is relatively large, situation in which the flypaper effect is stronger. While not conclusive, this evidence suggest that the proposed model may be a plausible explanation of the flypaper effect.

[15]See Mikesell (1998, p. 175) for a brief survey of administrative costs in U.S.

Table 1: Estimates of flypaper in U.S. sub-national governments

Author	Case studied	Effect of grants	Estimated flypaper effect	
		$\frac{dg}{da}$	$\frac{dg}{da} = 0.05$	$\frac{dg}{da} = 0.10$
Gramlich and Galper (1973)	Federal and state aid to 10 large urban governments	0.25	0.20	0.40
Gramlich and Galper (1973)	Federal grants to local and state governments	0.43	0.12	0.23
Feldstein (1975)	State grants to Massachusetts towns	0.60	0.08	0.17
Case, Hines and Rosen (1993)	Federal grants to 48 states, 1970-1985	0.65	0.08	0.15
Weicher (1972)	State aid to 106 municipal governments	0.90	0.06	0.11
Inman (1971)	Panel study of 41 city budgets	1.00	0.05	0.10
	Average	0.64	0.08	0.16

Source: Hines and Thaler (1995, p. 219)

4 Conclusion

This paper presents an alternative explanation for the flypaper effect. I extend a standard median voter of public spending with costly tax collections and intergovernmental transfers. The model does not need to introduce imperfect information or any political bias to generate predictions consistent with the empirical regularities.

Using the analytical framework, I replicate the veil hypothesis result as a particular case with costless taxation. By relaxing this assumption, which may be to stringent in this application, the comparative statics become consistent with the observed flypaper effect.

The model has the additional advantage to provide a measure of the difference between marginal propensities to spent out of grants and out of local income. This insight not only provides a simple way to evaluate the validity of the model but also suggests that not observing a flypaper effect would be puzzling, because it would imply very high effective tax rates.

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