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THE FLYPAPER EFFECT

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### **ABSTRACT**

The flypaper effect results when a dollar of exogenous grants-in-aid leads to significantly greater public spending than an equivalent dollar of citizen income: Money sticks where it hits. Viewing governments as agents for a representative citizen voter, this empirical result is an anomaly. Four alternative explanations have been offered. First, it's a data problem; matching grants have been mis-classified as exogenous aid. Second, it's an econometric problem; exogenous aid is correlated with omitted variables leading to a downward bias in estimates of income's effects and an upward bias in estimates of aid's effects. Third, it's a specification problem: the representative citizen either fails to observe lump-sum aid, or sees aid but mis-perceives its impact as an average price effect, or finally, sees and understands aid's budgetary effects but allocates "public" and "private" monies through separate "mental accounts." The empirical evidence suggests none of these explanations is sufficient. A fourth explanation seems most promising: It's politics. Rather than an anomaly, the flypaper effect is best seen as an outcome of political institutions and the associated incentives of elected officials.

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## The Flypaper Effect

by

Robert P. Inman

In the late 1960's James Henderson (1968) and Edward Gramlich (1969) changed the direction of empirical research on how local governments tax and spend. While all prior work detailed the demographic and economic correlates with government budgets, Henderson and Gramlich sought an explanation for those correlations. As economists, the answer was clear. Citizens demand services from their elected officials, and elected officials respond subject to the availability of government resources. Resources came from citizen incomes and from fiscal transfers given by the central government as grants-in-aid. From this perspective, Henderson and Gramlich specified and estimated demand equations based on the maximization of a representative citizen's utility subject to that citizen's "full income" constraint specified as the sum of personal income and the citizen's share of his government's unconstrained fiscal transfers. So specified, personal income and the citizen's share of fiscal transfers should impact spending identically – money is money.

The empirical analyses of Henderson and Gramlich revealed something unexpected, however. An extra dollar of personal income increased government spending on the order of \$.02 to \$.05 but an equivalent extra dollar of grants-in-aid increased government spending by \$.30 to often as much as a full dollar. When Gramlich first presented his results, his colleague Arthur Okun called this larger effect of lump-sum aid on government spending a "flypaper effect" noting that "money seems to stick where it hits." The label stuck too, as has the puzzle of why intergovernmental transfers are so stimulative. Over 3,500 research papers have now been written documenting and seeking to explain

*the flypaper effect.*<sup>1</sup>

Why do we care about this apparent anomaly? For two reasons. First, as a matter of policy, understanding *how* recipient governments spend intergovernmental transfers is essential for the design of efficient fiscal policy in federal economies. Second, as a matter of science, understanding *why* governments spend citizens' incomes as they do provides valuable insights as to how citizen preferences are represented in government policies. The taxation of citizen incomes and the allocation of grants-in-aid provide two "tracers" as to the inner workings of political decision-making, one (taxes) that is directly observed and controlled by citizens and the other (grants) perhaps only imperfectly so.

The benchmark for both the policy and political economy literatures is how a politically decisive citizen would like to see government resources allocated, specified by the maximization of that representative citizen's welfare over private (x) and public (g) goods, indexed by  $U(x, g)$ , subject to a current period budget constraint specified as:

$$Y = \{I + h \cdot z\} = x + p_g \cdot g$$

where I is the citizen's private income (or tax base), h is the citizen's share of *unconstrained or lump-sum* intergovernmental transfers per capita (z) specified as  $h = I/\bar{I}$  with  $\bar{I}$  equal to the average income (or tax base) in the citizen's political jurisdiction, and  $p_g$  is the "tax price" for government services (g) equal to  $c \cdot (1 - m) \cdot h$  where c is the per unit production cost of g and m is the matching rate for

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<sup>1</sup> From a Google search under the heading "flypaper effect." From the initial list of citations, I deducted the 100 or so papers in entomology that really do study the effects of flypaper on insect populations and the five papers in physics that study the effects of surface tension in attracting unwanted particles.

open-ended matching federal aid. Private goods cost \$1.<sup>2</sup> Y is called the citizen's "full income." The citizen's preferred allocations will be  $x = x(1, p_g, Y)$  and  $g = g(1, p_g, Y)$ , where:

$$\Delta g_i = (\delta g / \delta Y) \cdot (\delta Y / \delta I) \cdot \Delta I = (\delta g / \delta Y) \cdot (\Delta I = \$1),$$

for an extra dollar of personal income and:

$$\Delta g_z = (\delta g / \delta Y) \cdot (\delta Y / \delta z) \cdot \Delta z = (\delta g / \delta Y) \cdot h \cdot (\Delta z = \$1)$$

for an extra dollar of aid, implying that estimated marginal effects of aid to income should be related as  $\Delta g_z / \Delta g_i = h$ . In most political jurisdictions the representative citizen has a tax base (often specified as the median tax base) less than the average tax base; thus,  $h = I/\bar{I} < 1$  in most cases. If our representative citizen has had her way, then we should expect  $\Delta g_z / \Delta g_i = h < 1$ . The overwhelming empirical evidence summarized by Gramlich (1977), Inman (1979), Fisher (1982), and Hines and Thaler (1995) shows just the opposite, however;  $\Delta g_i$  ranges from \$.02 to \$.05 while the companion estimates of  $\Delta g_z$  typically fall between \$.30 to \$1.00. Income to the citizen stays with the citizen; grants to the government stay with the government. Money sticks where it hits. Why?

Four explanations have been offered. First, the answer is in the data. Researchers mis-measure intergovernmental aid by confusing matching grants that lower the marginal price of public services ( $p_g$ ) with lump-sum aid ( $z$ ) that shifts outward the representative citizen's budget constraint. Matching aid has a price effect, lump-sum aid an income effect. For local politics controlled by a representative citizen, consumer theory predicts a matching grant's price effect will stimulate more government services than an equivalent dollar of lump-sum aid. If the dollar transfer received from

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<sup>2</sup> This specification assumes taxes are imposed at a proportional tax rate,  $r$ , specified as:  $r = [c \cdot (1 - m) \cdot g - z] / \bar{I}$ . The citizen's after-tax income for expenditure on the private good will then be  $x = I - r \cdot I$ . The budget constraint above follows directly, where  $p_g = c \cdot (1 - m) \cdot h$ . More elaborate specifications of this constraint allowing for interactions of price effects up to a limit – a variant of categorical grants – should also be considered; see Lankford (1987).

matching aid is erroneously classified as lump-sum aid, then  $\Delta g_z > \Delta g_l$  will result; see Moffitt (1984), Megdal (1987), and Baker, Payne, and Smart (1999). Even after correctly classifying aid programs and measuring  $p_g$  and  $z$  appropriately, however, the flypaper effect remains; see for example, Wyckoff (1991).

The second explanation sees the anomaly as an econometric problem. Researchers may have omitted important determinants of government spending likely to be correlated with citizen income or intergovernmental aid leading to biased estimates of  $\Delta g_l$  and  $\Delta g_z$ . Bruce Hamilton (1983) and Jonathan Hamilton (1986) attribute the flypaper effect to mis-specifications of the technology or costs of providing local services. Bruce Hamilton argues estimated demand equations omit important variables such as the citizen's talents or willingness to volunteer that are positively correlated with citizen income and also contribute to the provision of government services. If these omitted effects are substitutes for (negatively correlated with) purchased government inputs, then the estimated coefficient for income will be biased downward and perhaps sufficiently so that  $\Delta g_z > \Delta g_l$ . Jonathan Hamilton suggests the misspecification arises from a failure to correctly account for residential exit from high tax jurisdictions leading to a loss of tax base when specifying the price of government services. Local taxes are inefficient and the correctly specified price of local services must reflect this fact. If citizens tend to reside in localities of comparable income and higher income residents are more mobile, then the representative citizen's income will be positively correlated with the correct price which is negatively correlated with government services. Again, there is a downward bias in the estimated income effect with  $\Delta g_z > \Delta g_l$  as a possible result.

Neither of the Hamiltons' biases are likely to fully explain estimated flypaper effects, however. A plausible upper estimate for  $\Delta g_l$  can be obtained as  $\Delta g_l = (\delta g / \delta Y) = \epsilon_{g,Y} \cdot (g/Y)$ , where  $\epsilon_{g,Y}$  is the

income elasticity of demand for government services and  $g/Y$  is the average rate of spending by recipient governments. This ratio for the U.S. state and local government sectors combined from 1970 to 2008 – the period used for most all studies – is at most .15. Since most state and local services are arguably necessities,  $\epsilon_{g,Y} \leq 1$  seems reasonable. If so, then  $\Delta g_l \leq (g/Y) = .15$  bounds an unbiased income effect. Since most estimates of  $\Delta g_z$  exceed .15, the flypaper effect remains.

Perhaps then the explanation lies in an upward bias in the estimates of  $\Delta g_z$ ? Here the results of four recent studies are particularly instructive. Each takes advantage of a plausibly exogenous, or “natural experiment,” change in lump-sum national aid to state or local governments. Gordon (2004) uses federal legislation’s required changes in Title I education aid caused by state-level (exogenous to the local budget) demographic changes before and after census years as her measure of exogenous aid. She finds strong evidence of a flypaper effect for local school districts in the first year after the change in Title I aid –  $\Delta g_z = 1.00$  – but that this effect evaporates after three years with most of the new aid returned to voters as lower local tax revenues. In contrast, Ladd (1993) and Singhal (2008) find evidence for a significant and quantitatively large flypaper effect for U.S. state governments as does Dahlberg, et. al. (2008) in their study of national aid to municipalities in Sweden. Ladd uses windfall tax revenues to state governments following the Tax Reform Act of 1986 as her exogenous measure of aid, and estimates  $\Delta g_z = .40 > \Delta g_l = .03$ . Singhal (2008) uses outside revenues received by state governments from a recent legal settlement with the tobacco industry as her measure of  $z$  and finds  $\Delta g_z = .20$  for spending on tobacco control programs compared to an estimate of  $\Delta g_l \approx 0$  for income’s effects on the same programs. Dahlberg, et. al. (2008) exploit a discontinuity in the national aid formula that gives significant additional assistance to communities that experience more than 2 percent out-migration over the previous ten years; communities just below the threshold

receive no additional aid, those just above do. The analysis includes community and time fixed effects – there is no direct estimate of  $\Delta g_l$  – and they find  $\Delta g_z = 1.00$  and no local tax relief. Ladd’s, Singhal’s, and Dahlberg’s estimated flypaper effects remain over time.

The flypaper effect appears to be a real phenomenon. As a third explanation then, perhaps our model of citizen fiscal choice is misspecified. First, voters may not understand the complexity of grant programs. Both Courant, Gramlich and Rubinfeld (1979) and Oates (1979) conjecture the representative citizen misperceives lump-sum aid’s income effect as an average price effect. They conjecture that the voter uses taxes paid per unit of services received –  $(p_g \cdot g - z)/g$  or  $p_g - (z/g)$  – as their estimate of the true marginal tax cost of government services,  $p_g$ . If so, lump-sum aid ( $z$ ) will impact spending as a price subsidy, and the estimated effect aid on spending will imply  $\Delta g_z > \Delta g_l$ . Wyckoff (1991) and Turnbull (1998) test this hypothesis by including both  $p_g$  and  $[p_g - (z/g)]$  as competing explanators of local spending. They find plausible (negative) marginal price effects but implausible (positive) effects of the mis-perceived average price. Estimated flypaper effects are comparable to those of previous studies. From this evidence, it is unlikely price misperception provides the explanation for the flypaper effect.

Filimon, Romer and Rosenthal (1982) and Hines and Thaler (1995) provide alternative versions of the voter ignorance hypothesis. For Filimon, Romer, and Rosenthal the representative voter fails to see through the veil of government budgets; he does not know the level of aid received by the local government. For Hines and Thaler, the representative voter sees through the veil but budgets using mental accounts; there is a “public budget” that is the responsibility of government officials and a “private budget” that is the citizen’s responsibility. Both hypotheses need a theory of public budgets to explain  $\Delta g_z$ . Hines and Thaler leave this an open question, but Filimon, Romer, and

Rosenthal are quite explicit: Public officials are budget maximizers and therefore  $\Delta g_z = 1$ . They test their theory for a sample of Oregon school districts and cannot reject the null hypothesis that  $\Delta g_z = 1$  for state education aid. In Romer, Rosenthal, and Munley (1992) the authors' replicate their analysis for a sample of New York school districts and here the conclusion varies by the size of the school district. Large districts ( $> 20,000$  students) show budget maximizing behavior and a full flypaper effect:  $\Delta g_z = 1$ . In smaller districts, however, the estimated aid and income effects are about equal:  $\Delta g_z \approx h \cdot \Delta g_l$ . These results parallel those from Ladd and Singhal for larger state governments and from Gordon for local school districts. Together, this evidence is sufficient to reject a strict version of the mental accounting explanation. It leaves open, however, the question of why the flypaper effect remains for larger governments.

Here a fourth explanation for the flypaper effect seems the most promising: It's politics. This approach assumes voters are informed and rational, but they do conceal their preferences when it is strategically useful to do so. Such strategic behaviors require the use of less than efficient institutions for preference revelation such as majority rule or representative legislatures. From this perspective, the flypaper effect is a consequence of an inability of citizens to write complete "political contracts" with their elected officials. Consistent with the results of Ladd, Singhal, and Romer, Rosenthal, and Munley, one might expect these contracting problems to be greater, and the flypaper effect more likely, for large governments.

Chernick (1979) and Knight (2002) offer specifications of a political contract between a donor central government and recipient local governments as a way to understand the flypaper effect. Chernick (1979) specifies donor-recipient contracting as an auction. Assuming an exogenous level of federal aid, local governments bid for the right to provide aided services by offering to share the

costs of provision. Beginning with the highest offer price, the central government selects recipient local governments until its grants budget is exhausted. The resulting allocation will equalize the marginal contribution of each local government to the incremental benefits from the provision of the local service. Local governments with the highest valuations will provide more services and receive more aid. Chernick offers evidence in support of this prediction from the federal Water and Sewer Grant program. Importantly, any reduced form estimate of  $\Delta g_z$  for this program that did not account for the auction that sets aid would be biased upward and imply a strong flypaper effect.

Knight (2002) specifies and estimates a model of political contracting for grants policy that sets both the aggregate size of the aid budget and its allocation. The budget is chosen to ensure its passage and to maximize local constituent net benefits for the central government's agenda-setter. Again, the allocation process is an auction. Legislators bid to be part of the winning coalition by offering to vote for the grants budget in return for intergovernmental aid. The agenda-setter picks the smallest 51 percent of the bids. He then sets his own grant award to maximize the net benefits to his own constituents. Those legislators whose state or local governments value the aided local service most highly make the winning offers. The result is again a positive correlation between grants awarded and local spending. Failure to control for this correlation will lead to an upward bias in the estimate of  $\Delta g_z$ . For a statistically consistent estimate of  $\Delta g_z$  one needs instruments that both predict grants ( $z$ ) and are independent of constituents' demand for the aided service. Legislative institutions that select agenda-setters independent of constituent preferences will serve this purpose. Knight uses the legislators' tenures and majority party memberships as his instruments in his empirical study of highway grants and state highway spending. Least squares estimation of grants' effect on spending shows  $\Delta g_z = 1$ ; instrumental variables estimation rejects that extreme flypaper result but cannot reject

a partial effect ( $1 > \Delta g_z > h \cdot \Delta g_l$ ). In a companion piece, Knight (2004) estimates that this agenda-setting process for highway grants imposes an allocative inefficiency of \$.40 per dollar of aid.<sup>3</sup>

Over the past decade, the devolution of economic responsibilities to lower tier governments has become increasingly important, not only in formally federal states but in unitary states as well. Central governments typically grant fiscal assistance to these local governments for the provision of those services. Knowing *how* grants will be spent is important for the appropriate design of central government transfer policies. Credible estimates of aid's effects on local spending requires good instrumental variables to predict aid, or ideally "natural experiments" providing truly exogenous measures of central government assistance. Knowing how money is spent as it is helps us to understand allocative performance of intergovernmental transfers, given federal and local political institutions. Knowing *why* grant money is spent as it is just as important. Here the specification and estimation of structural models of central government transfer spending and local government allocations of transfer incomes are essential. This information provides a basis for reforming these important institutions.<sup>4</sup>

Once viewed as an anomaly, the flypaper effect should now be seen as a reality of fiscal politics, and its study as an opportunity to fashion central government transfer policies and

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<sup>3</sup> Knight's (2004) own estimates of the inefficiency of highway aid is \$.96 per dollar, but he includes in this estimate the inefficiency of under-providing assistance to the many states excluded from the majority winning coalition. Implicit in that calculation is an assumption that the excluded states cannot provide highway services on their own. The estimate above assumes efficient local provision in states not receiving aid.

<sup>4</sup> There is perhaps no more striking example of the benefits of such structural analyses of the aid process than the work of Reinikka and Svensson (2003, 2004) on the allocation of Ugandan central government aid to local schools. Initially, only \$.15 of each centrally allocated school aid dollar found its way into the local schools; \$.85 was "captured" by the district bureaucracy for its own use. The problem was inadequate information and weak local political organizations. Reforms publicized aid allocations and empowered village councils to monitor that spending. The end results was to reduce district capture to \$.15 per aid dollar – a plausible administrative cost – and to increase local school resources by \$.85 per aid dollar.

intergovernmental fiscal institutions that better reflect citizen preferences for local public goods.

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