Nonprofits, Crowd-Out, and Credit Constraints

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Abstract

We model an infinitely-lived nonprofit (NP) firm facing donor crowd-out by government grants with and without credit constraints. We show that the response of fund-raising expenditures to grants hinges on the timing of the grants, credit market access, and the effect of grants on the productivity of fund-raising. Our results provide an alternative explanation for why NP fund-raising expenditures fall with increases in government grants. When NPs face borrowing constraints, increases in grants lead to reductions in fund-raising despite the higher productivity because firms reallocate resources over time. In theories of nonprofit behavior where government grants crowd-out private donations, the results hinge on the assumption that the marginal productivity of fund-raising expenditures decreases with government grants. New to the empirical literature, we estimate this relationship directly for US social service organizations and find that increases in government grants decrease the *level* of fund-raising expenditures but *increase* the marginal productivity. Moreover, the data provide robust evidence of intertemporal resource allocation and credit constraints affecting fund-raising decisions.

Keywords: nonprofit, crowd-out, fund-raising, government grants, credit constraints

JEL Classification: L31, L2, H0

1 Introduction

The public goods nature of nonprofit organizations (NPs) and their growing importance makes understanding NP behavior an important area for research. In the US, for 1997-2001, employment growth in the nonprofit sector averaged 2.5%, outpacing both the business (1.8%) and the government sectors (1.6%) (Moore, 2004). The number of NPs registered with the IRS increased by over 30% over a ten year span ending in 2006 and by employment is now larger than the construction and wholesale sectors.

Many NPs are funded by both private donations and government grants. However, if government grants "crowd-out" contributions because donors view donations and transfers via taxes as substitutes, that raises questions about the efficient use of public funds. Much of the previous empirical work on crowd-out examines the response of *donors* to changes in government grants (e.g. Kingma, 1989; Payne, 1998; Khanna and Sandler, 2000; Okten and Weisbrod, 2000; and Ribar and Wilhelm, 2002). Our paper examines the response of NP *firms* to changes in government grants through an infinite horizon model of crowd-out and credit constraints.[1] Our work is therefore most closely related to Andreoni and Payne (2003) and Rose-Ackerman (1987).

We make two contributions to the literature on NP firms. First, we provide robust empirical evidence that fund-raising productivity rises with grants. This finding contradicts the key assumption of previous theories' explanation for why fund-raising expenditures fall with grants. Second, we provide a more intuitive explanation, consistent with empirical evidence, for the observed behavior based on the presence of credit constraints.

In our model, when NPs are unconstrained in the credit market, fund-raising efforts fall if grants reduce the marginal product of fund-raising expenditures through crowd-out (i.e the cross-derivative of donations with respect to fund-raising expenditures and grants is negative). This result partially explains why donations might fall with increases

[1]Gruber and Hungerman (2007) and Hungerman (2009) also use NP firms, specifically churches, as their unit of analysis but their focus is on the role of the church as a donor.

in grants and is identical to previous theories (e.g. Andreoni and Payne (2003) and Rose-Ackerman (1987)). However, a credit-constrained NP may also reduce its current fund-raising expenditures when grants rise to achieve inter-temporal efficiency, regardless of whether crowd-out is present. We therefore find two potential (non-mutually exclusive) explanations for why fund-raising efforts might fall with grants: 1) a decrease in the marginal productivity of fund-raising; and/or 2) credit constraints which lead to reallocation of resources over time.

Our empirical work first investigates the timing of government grants and credit market access on fund-raising expenditures by NP social service organizations. In addition, we estimate the marginal effect of grants and fund-raising expenditures on donations and directly measure the effect of government grants on the *marginal productivity* of fund-raising. To our knowledge, this is the first paper to estimate this cross-derivative. An econometric complication arises because estimation requires jointly instrumenting for endogenous linear and interaction terms. Failure to correct for this issue produces severely biased estimates. We correct for this bias by accounting for the joint endogeneity and computing the asymptotic standard errors.

We find that the timing of government grants matters and increases in contemporaneous grants increase fund-raising expenditures while increases in future government grants decrease fund-raising expenditures. In addition, credit constrained firms respond more to changes in grants than unconstrained firms. Our theory demonstrates that these results cannot be explained by appealing to crowd-out effects alone, but require consideration of the inter-temporal choices NPs face. Andreoni and Payne (2003, 2009) also find evidence of reduced fund-raising expenditures with increases in government grants although they do not examine the timing. Their theoretical explanation relies on the assumption of a negative cross-derivative and NPs being averse to fund-raising such that they pay a non-pecuniary cost (a source of inefficiency), neither of which are precluded from our model.[2]

[2]Rose-Ackerman (1987) employs a principal-agent framework and also assumes a negative cross-derivative. In her model, managers and donors have different preferences for how a NP should behave.

Contrary to their assumption, we find that the cross-derivative is *positive* and robustly so. However, the direct effect of grants on donations is negative indicating crowd-out. The evidence that the cross-derivative is positive while fund-raising still falls with grants, taken together, is inconsistent with previous theories. In our model, even when grants increase the productivity of fund-raising, NPs respond to larger grants by reallocating resources over time because they face credit constraints. The NP does so optimally, given the constraint, because the cost of fund-raising is foregone current service provision and not a source of inefficiency. The distinction matters, because if NPs inefficiently reduce fund-raising expenditures then policies that tie grants to fund-raising might improve public good provision as suggested by Andreoni and Payne (2003) and emphasized in Andreoni and Payne (2009). On the other hand, if the reduction stems from credit market frictions, policies that tie grants to fund-raising targets may create further inefficiency. Policies aimed at alleviating credit market imperfections may be more effective in promoting social welfare.

Our results may also shed light on contradictory results regarding the impact of grants on donations. Kingma, (1989), Payne (1998) and Okten and Weisbrod (2000) find evidence of crowd-out. However, in a study of UK NPs, Khanna and Sandler (2000) find evidence of increases in donations with grants (i.e. "crowd-in"). Crowd-in may occur if grants provide a positive reputation signal and overcome costs of information gathering for donors. Brooks (2000, 2003) argues that both crowd-in and crowd-out may be present simultaneously. Increases in grants may lower the contributions from existing donors, but induce more people to donate. Our results further suggest that the empirical differences may lie in using lagged versus contemporaneous government grants or in the magnitudes of the productivity effect across different samples.

The remainder of the paper is organized as follows: Section 2 presents a model of a NP with crowd-out and credit constraints. Section 3 details the empirical strategy and the data while Section 4 presents our results. Section 5 concludes.

Larger grants provide managers more freedom and they are able to shift the NP to a less desirable type from the point of view of donors which, in turn, reduces the productivity of fund-raising.

2 The Model

Our theoretical contributions stem from the infinite horizon model developed in Section 2.2. However, we begin with a standard one-period model of a NP firm to illustrate how intertemporal decision making changes the results. Section 2.3 demonstrates the impact of credit constraints on NP decisions.

2.1 One period

A representative NP seeks to maximize a value V that depends on the level of services provided, S, where $V' > 0$ and $V'' < 0$.[3] S could be the level of service, it could be the quality, or something else altogether. The value V, therefore, has a similarly flexible interpretation. Whoever makes the decisions cares that the institution does its best in generating S, whether that be reaching the most people, providing the highest quality, adhering to a particular ideology, or some combination of them.[4]

That brings us to the resource constraint for the NP. For sources of funds, there are many possibilities: Private donations, government grants, revenue received in exchange for services, interest income, etc. On the expense side, funds can obviously be used to provide the service or to generate more funds through deposit in interest bearing assets, fund-raising, applying for government grants, etc. We do assume that our representative NP is not wasteful, it is a net revenue maximizer which appears to fit with the empirical evidence for most NPs (Steinberg, 1986; Khanna, Posnett, and Sandler, 1995).[5]

Initially, we focus on one decision: how much resources to put towards fund-raising. Fund-raising expenditures, f, generate contributions F. We assume that their relationship is strictly concave such that $F_f > 0$ and $F_{ff} < 0$. We also impose a non-negativity

[3] If the V function were convex or linear, managers of NPs would have incentives to provide services in one period and none in other periods when we introduce a time dimension.

[4] We abstract from explicitly modeling the donors' decision-making behavior which may depend on tax policy, information, or altruism and focus on the firm's behavior. We also do not model the pricing decisions of the NP which are scrutinized in the literature using static models (See Holtmann, 1983).

[5] Weisbrod (1988), among others, argues that NPs are satisficers and exhibit a distaste for fund-raising as a necessary evil. We note how this approach can be included in our framework in what follows and discuss this perspective in light of our empirical results in Section 4.

constraint on fund-raising such that $f \geq 0$. In addition, the NP receives exogenous grants from the government, G, which affect fund-raising through crowd-out.[6] The concept of crowd-out implies that as involuntary contributions through taxes to NPs increase, private agents reduce the level of voluntary contributions. Therefore, we assume $F_G < 0$, consistent with existing models of donors (e.g., Roberts (1984), Andreoni (1990), and Duncan (1999)). We further assume $F_G > -1$ such that crowd-out by grants is less than perfect, otherwise a NP would always be better off or no worse if it turned down all grants.

We write the fund-raising production function as $F(f, G)$. We make no *a priori* assumptions about the sign of the cross-derivative, F_{fG}. Existing theories of crowd-out assume that F_{fG} is negative implying a reduction in the productivity of fund-raising associated with increases in government grants (e.g. Rose-Ackerman, 1987, and Andreoni and Payne, 2003). However, no empirical evidence exists on the effect of government grants on the *productivity* of fund-raising. In what follows, the results hinge critically on the sign of F_{fG}. After demonstrating its importance here, we estimate this relationship directly in Section 4.

If $F_{fG} \neq 0$ then government grants have two effects and it is useful to distinguish these carefully. The assumption that $F_G < 0$ implies that government grants immediately lower funds raised and we refer to this effect as the "direct crowd-out effect." A non-zero cross-derivative implies a different effect as it influences the *effectiveness* of fund-raising activities. We refer to this as the "fund-raising productivity effect." The direct crowd-out effect amounts to a parallel downward shift in the production function with respect to f. Government grants reduce the amount of funds generated for any level of fund-raising expenditures, but it does not affect the marginal productivity of fund-raising, i.e. the

[6] The exogeneity of grants here is only a convenience for expositional purposes, but requires two comments. First, in the appendix available upon request we show that the results presented here are largely unchanged when allowing the NP to devote resources towards obtaining more grants. The extension produces interesting results on the trade-off between fund-raising and grant generation, however, they are not central to the argument here. Second, the convenience of the assumption in the model, clearly does not apply empirically. In the empirical section we construct two instruments to account for correlation between our measure of G and the error term.

slope of the function. The fund-raising productivity effect is a proportional shift in the function.

With that discussion in mind, the NP chooses f to maximize $V(S)$ subject to $S = F(f,G) - f + G$ and the first-order condition is:

$$v'\left(F(f,G) - f + G\right)\left[F_f - 1\right] \leq 0. \tag{1}$$

Assuming an interior solution, this expression reduces to $F_f(f,G) = 1$.[7] Fund-raising is optimal where the marginal product of fund-raising equals the value of one unit of services. From the FOC, we find:

$$\frac{df}{dG} = -\frac{F_{fG}}{F_{ff}}. \tag{2}$$

The response of fund-raising with respect to grants depends solely on the sign of F_{fG} since $F_{ff} < 0$. A negative (positive) cross-derivative implies that fund-raising expenditures fall (rise) with government grants. That is, f falls with G if, and only if, grants reduce the productivity of fund-raising.

Proposition 1 *A one-period NP with decreasing returns to fund-raising and crowd-out of private donations by government grants, will decrease (increase) fund-raising, f, with an increase in G if, and only if, $F_{fG} < 0$ ($F_{fG} > 0$).*

Proof. The proof follows directly from (2). ■

The cross-derivative, which shows the effect of grants on the productivity of fund-raising, dictates the response in fund-raising to changes in grants. The result is identical, and central, to the crowd-out theories of Rose-Ackerman (1987) and Andreoni and Payne (2003). That is, fund-raising expenses fall with government grants *because* of the productivity effect, not the direct crowd-out effect (F_G).

[7]As in Andreoni and Payne (2003), it is straightforward to introduce a non-pecuniary cost to fund-raising, i.e. a distaste for fund-raising, by appending a multiplicative parameter $k > 1$ to f in the budget constraint. (1) would become $v'\left(F(f,G) - f + G\right)\left[F_f - k\right] \leq 0$. The subsequent results would not be altered in any substantive manner.

2.2 Infinite Horizon Model with a Credit Market.

In static models, debt or assets play no role by default. While some NPs may not hold assets (or debt), many NPs have endowments and/or incur debt. In order to incorporate a credit market, we need to introduce a time dimension. Let the value of an infinitely-lived organization with time-separable preferences take the following form:

$$V_t = \sum_{u=t}^{\infty} \beta^u v(S_u), 0 < \beta < 1 \tag{3}$$

where β is the discount factor applied to the future values of S.[8] $v(S_u)$ is the one period return to services.

Let m_0 be the initial level of assets (debt), and let m_t be the level of assets (< 0 if in debt) held between periods $t-1$ and t. The return on these assets will be given by the exogenous interest rate $1 + i_t$.[9] The budget constraint in each period resembles that of the one-period model, but now includes the savings decision:

$$F(f_t, G_t, \Phi_t) + G_t + m_t(1 + i_t) = f_t + S_t + m_{t+1}. \tag{4}$$

We define Φ_t as the discounted sum of past fund-raising efforts as follows:

$$\Phi_t = \sum_{w=1}^{\infty} \phi^w f_{t-w}, \text{ where } 0 < \phi < 1. \tag{5}$$

Here we are thinking of fund-raising events and promotions that have effects which persist over time (Rose-Ackerman, 1986). We refer to Φ_t as the cumulative fund-raising effect. The backward looking summation and the discount factor imply that more recent fund-raising efforts have more weight than expenditures in the more distant past. This structure is analogous to models where advertising contributes to intangible capital

[8] We also employed a two-period model with the same key results. Results provided in an Appendix upon request.

[9] We also assume a No-Ponzi-Game condition for the NP.

(e.g., Hirschey, 1982; Friedman, 1983). We also assume a concave relationship such that $F_\Phi > 0$ and $F_{\Phi\Phi} < 0$. The production function retains the other assumptions as before.[10]

Resources allocated to fund-raising f will have effects in the future. If fund-raising only generated donations within the same period (i.e. $\phi = 0$), the one period model would suffice *provided* the NP has perfect access to the credit market. In fact, we show below that the one period model results obtain in this particular case. That is, changes in f with respect to G would depend only on the cross-derivative, F_{fG}. In the one-period model, any effects of previous fund-raising efforts could be included as an exogenous productivity parameter. The intertemporal effect of fund-raising expenditures therefore plays an important role in the model. However, as we shall show, it is the presence of credit constraints that significantly differentiates our results from previous work.

There is no uncertainty here; the NP knows the values of all future exogenous variables.[11] Specifically, the timing is as follows: At the start of the period, the NP receives G_t then chooses how much to allocate to f_t and m_{t+1} which may include borrowing. Fund-raising occurs, any previous debts are paid, and finally the services are provided at the end of the period.

The NP managers' problem can be represented via the following Bellman equation:

$$
\begin{aligned}
V(\Phi_t, G_t, m_t) &= \max_{f_t, m_{t+1}} \{v(S_t) + \beta V(\Phi_{t+1}, G_{t+1}, m_{t+1})\} \qquad (6)\\
\text{s.t. } & F(f_t, G_t, \Phi_t) + G_t + m_t(1 + i_t) = f_t + S_t + m_{t+1}.
\end{aligned}
$$

The three state variables are accumulated fund-raising, current government grants, and the level of savings held entering time period t. Now the NP has two choice variables, fund-raising expenditures and savings (debt). The corresponding first-order conditions are:

$$\frac{\partial V_t}{\partial f_t} = v'(S_t)[F_f(f_t, G_t, \Phi_t) - 1] + \beta\phi V_\Phi(\Phi_{t+1}, G_{t+1}, m_{t+1}) \leq 0 \qquad (7)$$

[10] The assumption that Φ is a positive increasing function of lagged values of f means that the sign of the cross-derivative $F_{\Phi G}(f_t, G_t, \Phi_t)$ is the same as $F_{f_{t-u} G_t}$ for $u \geq 1$.

[11] We continue to assume that grants are exogenous (see footnote 6.)

and

$$\frac{\partial V_t}{\partial m_{t+1}} = -v'(S_t) + \beta V_m(\Phi_{t+1}, G_{t+1}, m_{t+1}) = 0 \tag{8}$$

where the second condition holds with equality as m_{t+1} is not bounded. Applying the envelope theorem to Φ_t and m_t we have respectively:

$$\frac{\partial V_t}{\partial \Phi_t} = v'(S_t)F_\Phi + \beta\phi V_\Phi(\Phi_{t+1}, G_{t+1}, m_{t+1}) \tag{9}$$

$$\frac{\partial V_t}{\partial m_t} = v'(S_t)(1 + i_t). \tag{10}$$

Updating by one-period, substituting into the FOCs assuming an interior solution, and iterating in (7) we have:

$$v'(S_t)[F_f(f_t, G_t, \Phi_t) - 1] + \sum_{u=1}^{\infty}(\beta\phi)^u v'(S_{t+u})F_\Phi(f_{t+u}, G_{t+u}, \Phi_{t+u}) = 0 \tag{11}$$

and

$$-v'(S_t) + \beta v'(S_{t+1})(1 + i_{t+1}) = 0 \tag{12}$$

Note that (12) implies that, at the optimum, the marginal values of service provision across time are equalized accounting for the subjective discount factor and the available interest rate. Thus m serves the role of ensuring *inter-temporal optimality.*

Substituting (12) into (11) to eliminate $v'(S_{t+u})$, we can implicitly define the optimal choice of f:

$$[F_f(f_t, G_t, \Phi_t) - 1] + \sum_{u=1}^{\infty}(\phi)^u \frac{F_\Phi(\bullet|t+u)}{\Pi_{w=0}^{u}(1 + i_{t+1+w})} = 0. \tag{13}$$

Simply stated, fund-raising expenditures maximize lifetime resources for the NP. The overall return to fund-raising is pinned down by the interest rates and the discount factor associated with past fund-raising. Fund-raising expenditures are decreasing in the interest rates available in the future and increasing in ϕ. If ϕ is zero, and there are no cumulative fund-raising effects, then the optimal level of fund-raising sets the marginal product to exactly 1 because that is the marginal cost in terms of one unit of service provision foregone. As ϕ increases, f increases to take advantage of building intangible capital and therefore enhancing future donations.

The effect of government grants in this case of perfect credit access, mirrors our findings in the one-period model:

$$\frac{df_t}{dG_t} = -\frac{F_{fG}}{F_{ff} + \sum_{u=1}^{\infty} \phi^{u+1} \frac{F_{\Phi\Phi}(\bullet|t+u)}{\Pi_{w=0}^{\infty}(1+i_{t+1+w})}}, \tag{14}$$

$$\frac{df_t}{dG_{t+1}} = -\frac{(\phi F_{\Phi G}(\bullet|t+1))/(1+i_{t+1})}{F_{ff} + \sum_{u=1}^{\infty} \phi^{u+1} \frac{F_{\Phi\Phi}(\bullet|t+u)}{\Pi_{w=0}^{\infty}(1+i_{t+1+w})}}. \tag{15}$$

When F_{fG} and $F_{\Phi G}$ are non-zero, in the case of credit market access, the signs of $\frac{df_t}{dG_t}$ and $\frac{df_t}{dG_{t+1}}$ depend entirely on the sign of these productivity effects.

Now take the case of no productivity effects such that $F_{fG} = 0$ and $F_{\Phi G} = 0$. Then $\frac{df_t}{dG_t} = \frac{df_t}{dG_{t+1}} = 0$, i.e. grants have no effect on fund-raising expenditures, because optimality is achieved entirely through the credit market. The result here is that without any effects of G on the productivity of fund-raising, fund-raising expenditures are completely independent of the level of government grants.

When there are no cumulative fund-raising effects, i.e. $\phi = 0$, we get the one-period results as a special case:

$$\frac{df_t}{dG_t} = -\frac{F_{fG}}{F_{ff}} \text{ and } \frac{df_t}{dG_{t+1}} = 0.$$

Thus, the effect of current government grants on fund-raising expenditures still depends directly on the productivity effect. However, without cumulative fund-raising effects, future grants have no impact on current fund-raising expenditures.

Proposition 2 *Assuming a positive level of fund-raising (an interior solution), a NP with decreasing returns to fund-raising, crowd-out of fund-raising, and access to a credit market will decrease (increase) fund-raising expenditures when current government grants* *increase if and only if $F_{fG} < 0$ ($F_{fG} > 0$) and will decrease (increase) fund-raising expenditures when future government grants increase if and only if $F_{\Phi G} < 0$ ($F_{\Phi G} > 0$).*

Proof. The proof follows immediately from (14) and (15). ■

2.3 Credit Constraints

So far, the key to understanding how NPs respond to changes in grants centers on the cross-derivative, regardless of whether we model firm behavior in a static or dynamic context. However, we assumed that either: i) credit markets are irrelevant since NPs exhaust all resources in one period; or ii) that NPs have perfect credit access. Why should credit constraints play a role? Banks may view NPs as a more risky organization type. First, their potential revenue stream is less certain. Unlike for-profits, NPs are legally prevented from issuing equity to generate funds. The consumers of NP services are often not the donors, making the price and demand for the service more difficult to observe (Ben-ner, 1986). In addition, NPs in the US are not subject to involuntary bankruptcy brought about by creditor actions (Bowman, 2002). Thus, the probability of recovering debt due to a default is lower. Finally, managers may be reluctant to incur debt if they believe donors, particularly large institutional funds, consider solvency when making decisions.

When a NP faces borrowing constraints the results change substantially from the preceding sections. This is easiest to see in a model with no credit market, where m is zero at all times in the budget constraints above. We partially relax this constraint later (allowing savings, but not borrowing).

The problem now faced by our NP managers is:

$$
\begin{aligned}
V(\Phi_t, G_t) = \max_{f_t} \{ v(S_t) + \beta V(\Phi_{t+1}, G_{t+1}) \} \\
\text{s.t. } F(f_t, G_t, \Phi_t) + G_t = f_t + S_t.
\end{aligned}
\tag{16}
$$

The state variable representing savings no longer applies and the choice only involves

f_t. Assuming an interior solution, the optimal choice is the f^* that solves the following first order condition:

$$\frac{\partial V_t}{\partial f_t} = v'(S_t)[F_f(f_t, G_t, \Phi_t) - 1] + \beta\phi V'(\Phi_{t+1}, G_{t+1}) = 0 \tag{17}$$

The foregone marginal unit of service provision must equal the marginal benefit of fund-raising which is composed of two factors. First, there is the marginal gain from current fund-raising F_f and second there is the discounted marginal gain in future value, $\beta\phi V'$. Since f is the only instrument, it must balance resource maximization against inter-temporal efficiency. Because $\beta\phi V' > 0$ and $v' > 0$, we must have that $F_f < 1$ for an interior solution. If the marginal gain from f_t is too small for all $f_t > 0$, then the optimal choice is a corner solution and $f_t = 0$. The effects of grants on fund-raising are given by:

$$\frac{df_t}{dG_t} = -\frac{1}{\Delta}\{v''(S_t)[F_f - 1][1 + F_G] + v'(S_t) F_{fG}\} \gtreqless 0 \tag{18}$$

and

$$\frac{df_t}{dG_{t+1}} = -\frac{1}{\Delta}\{\beta\phi V_{\Phi G}(\Phi_{t+1}, G_{t+1})\} \gtreqless 0. \tag{19}$$

where $\Delta = v''(S_t)[F_f - 1]^2 + v'(S_t) F_{ff} + \beta\phi^2 V_{\Phi\Phi}$ which is the negative second-order condition.

Before analyzing the full implications, suppose that grants do not crowd-out donations at all such that $F_G = 0$ and $F_{fG} = 0$. Then,

$$\frac{df_t}{dG_t} = -\frac{1}{\Delta}\{v''(S_t)[F_f - 1]\} > 0. \tag{20}$$

For $\frac{df_t}{dG_{t+1}}$, the sign depends on the cross-derivative of the value function between grants and Φ rather than just within period fund-raising. To see what this entails, apply the envelope theorem to the Bellman equation to get an expression for $V_{\Phi G}$:

$$\frac{\partial V_t}{\partial \Phi_t} = v'(S_t) F_\Phi + \beta\phi V'(\Phi_{t+1}, G_{t+1}) \tag{21}$$

$$\frac{\partial^2 V_t}{\partial \Phi_t \partial G_t} = v''(S_t) F_\Phi [F_G + 1] + v'(S_t) F_{\Phi G} + \beta\phi V_{\Phi G}(\Phi_{t+1}, G_{t+1}) \tag{22}$$

Update one period to get:

$$\frac{\partial^2 V_{t+1}}{\partial \Phi_{t+1} \partial G_{t+1}} = v''(S_{t+1}) F_\Phi [F_G + 1] + v'(S_{t+1}) F_{\Phi G} + \beta\phi V_{\Phi G}(\Phi_{t+2}, G_{t+2}).$$

Substituting this expression into the derivative in (19), still setting $F_G = F_{fG} = 0$, and iterating we have:

$$\frac{df_t}{dG_{t+1}} = -\frac{1}{\Delta}\left[\sum_{u=t+1}^{\infty} (\beta\phi)^{u-t} [v''(S_u) F_\Phi]\right] < 0. \tag{23}$$

Proposition 3 summarizes the results with no crowd-out effects under credit constraints.

Proposition 3 *A credit-constrained NP with decreasing returns to fund-raising and no crowd-out will increase fund-raising with an increase in G_t and decrease fund-raising with an increase in G_{t+1}.*

Proof. Let the problem of the NP be described as above. Assuming an interior solution, the first-order condition is given in (17). Then $\frac{df_t}{dG_t}$ is (20) and $\frac{df_t}{dG_{t+1}}$ is (23). Since v'', F_{ff}, and $V_{\Phi\Phi}$ are all negative, while $F_f - 1$ is negative, $\frac{df_t}{dG_t} > 0$. Also, β, ϕ, and $F_\Phi > 0$ make $\frac{df_t}{dG_{t+1}} < 0$. The second-order condition is satisfied as it is the denominator from above:

$$v''(S_t)[F_f - 1]^2 + v'(S_t) F_{ff} + \beta\phi^2 V_{\Phi\Phi} < 0.$$

Q.E.D. ■

Intuitively, this result is a classic resource allocation problem. By increasing fund-raising, the NP is reducing the amount of service it can provide in the current period. The benefit of doing so is increased service provision in the future. The choice depends on the marginal trade-off which is governed by the discount factor and the marginal productivity of the fund-raising function, F_f.

When G_t rises, because the NP has more resources, some will be devoted to raising current service provision and some towards future service provision. Future grants have the opposite effect, $\frac{df_t}{dG_{t+1}} < 0$. In the absence of the ability to borrow, NPs reduce fund-raising for the reason that more resources are available in the future, therefore the NP can increase its value by lowering fund-raising expenditures today and increasing its current service provision. By reallocating resources over time through adjustments to fund-raising, the NP re-optimizes the marginal values of current and future service provision. Further note that if we remove the assumption that f has intermporal effects and set $\phi = 0$, then future grants have no effect on current fund-raising expenditures.

If we relax the credit constraint half-way and allow the NP to save but not borrow, the results do not change much. In this case the fund-raising response depends on the direction of the change in grants. If G_t increases, the incentive is to shift resources forward via savings and grants will not affect fund-raising expenses. On the other hand if G_t falls, but the NP cannot borrow, f falls, and $\frac{df_t}{dG_t}$ remains positive. The same logic applies to future grants. A decrease in G_{t+1} creates incentives to save to make up the reduction in future resources and grants do not alter fund-raising behavior, but an increase in G_{t+1} alters f because of the borrowing constraint. Thus, the strict inequalities of Proposition 3 retain the same sign but become weak inequalities.

Now consider the direct and productivity effects of crowd-out, $F_G < 0$ and $F_{fG} \neq 0$, in (18). Taking into account the minus sign in front the overall sign is dependent on the terms in brackets. There are two effects here. First $v''(S_t)[F_f - 1]$, as above, means increases in current grants cause the NP to want to shift resources to increase future service provision. This effect does not depend on crowd-out and appears in equation (20). That effect increases f, and we refer to it as the "reallocation effect."

However, the direct crowd-out of private donations, F_G, mitigates the reallocation effect. Note that $1+F_G$ is positive provided the NP faces partial crowd-out. The stronger the direct crowd-out effect the less effective reallocating resources becomes. If crowd-out were perfect, the reallocation effect would be zero leaving the overall sign dependent on the second effect, the productivity effect.

The productivity effect follows from the cross-derivative, F_{fG}. As before, this term shows how the change in the marginal product of fund-raising expenditures changes with government grants. If $F_{fG} < 0$ then fund-raising expenditures could fall because of the reduction in the productivity of fund-raising provided it is sufficiently strong enough to offset the reallocation effect. If grants positively affect fund-raising productivity, $F_{fG} > 0$, then fund-raising expenditures unambiguously rise.

Now, when we look at how future government grants affect fund-raising expenditures in (19), the sign again depends on the cross-derivative and the reallocation effect. Using our previous envelope theorem results, we have:

$$\frac{df_t}{dG_{t+1}} = -\frac{1}{\Delta}\left[\sum_{u=t+1}^{\infty} (\beta\phi)^{u-t}\left[v''(S_u)\, F_\Phi\left[F_G + 1\right] + v'(S_u)\, F_{\Phi G}\right]\right] \gtrless 0. \tag{24}$$

The term in front, $-\frac{1}{\Delta}$, is positive. There are two terms inside the summation. The first, $v''(S_u)\, F_\Phi\left[F_G + 1\right]$, is negative and represents the decrease in fund-raising expenditures that occurs due to reallocation of resources. More grants in the future means that more services will be provided and the marginal value declines. Therefore the NP optimizes by reducing fund-raising expenditures today in order to increase current service provision and attain intertemporal efficiency. Again, the reallocation effect is mitigated by the strength of crowd-out.

The second term is ambiguous, but reflects the marginal impact of government grants on productivity that comes from cumulative fund-raising. If that term is negative, then the overal sign of $\frac{df_t}{dG_{t+1}}$ is indeed negative without ambiguity. However, if grants enhance the effect of fund-raising, the sign of $F_{\Phi G}$ is positive leaving the overall sign ambiguous.

For a credit-constrained NP, the total effect of grants depends on the tension between the reallocation and productivity effects. These results are summarized in Proposition 4:

Proposition 4 *A credit-constrained NP with decreasing returns to fund-raising, facing crowd-out:*

*4A. Will **increase** f_t with an increase in G_t if the reallocation effect dominates a negative productivity effect or if the productivity effect is positive.*

*4B. Will **decrease** f_t with an increase in G_t if and only if the productivity effect is negative and the productivity effect dominates the reallocation effect.*

*4C. Will **decrease** f_t with an increase in G_{t+1} if the reallocation effect dominates a positive productivity effect or if the productivity effect is negative.*

*4D. Will **increase** f_t with an increase in G_{t+1} if and only if the productivity effect is positive and the productivity effect dominates the reallocation effect.*

Proof. For parts A and B we have:

$$\frac{df_t}{dG_t} = -\frac{1}{\Delta}\{v''(S_t)[F_f - 1][1 + F_G] + v'(S_t) F_{fG}\} \gtrless 0$$

$-\frac{1}{\Delta} > 0$ and $v''(S_t)[F_f - 1][1 + F_G] > 0$ unambiguously. Thus, if $F_{fG} \geq 0$, then $\frac{df_t}{dG_t} > 0$. If $F_{fG} < 0$, then $\frac{df_t}{dG_t} < 0$ only if $|v'(S_t) F_{fG}| > v''(S_t)[F_f - 1][1 + F_G]$.

For parts C and D we have:

$$\frac{df_t}{dG_{t+1}} = -\frac{1}{\Delta}\left[\sum_{u=t+1}^{\infty} (\beta\phi)^{u-t}[v''(S_u) F_\Phi [F_G + 1] + v'(S_u) F_{\Phi G}]\right] \gtrless 0.$$

$-\frac{1}{\Delta} > 0$ and $v''(S_u)[F_\Phi][1 + F_G] < 0$ unambiguously. Thus, if $F_{\Phi G} \leq 0$, then $\frac{df_t}{dG_{t+1}} < 0$. If $F_{\Phi G} > 0$, then $\frac{df_t}{dG_{t+1}} > 0$ only if $\left|\sum_{u=t+1}^{\infty}[v''(S_u) F_\Phi [F_G + 1]]\right| < \sum_{u=t+1}^{\infty}[v'(S_u) F_{\Phi G}]$. *Q.E.D.* ∎

Table 1 summarizes our main results drawing from Propositions 2 and 4. What Proposition 4 establishes is that a negative productivity effect, assumed in previous theories as the driving force, does matter for how credit-constrained NPs respond to changes in grants, but it does not tell the whole story. A negative fund-raising productivity effect is a necessary, but not a sufficient condition for fund-raising expenditures to be negatively related to current government grants. In $\frac{df_t}{dG_t}$ there is an opposing tension between the NPs' desire to allocate resources across time efficiently and the negative productivity effect arising from crowd-out. If the productivity effect is indeed negative and substantially large enough, we would expect that $\frac{df_t}{dG_t} < 0$ and $\frac{df_t}{dG_{t+1}} < 0$, i.e. fund-raising expenditures are always negatively related to grants, no matter the timing.

However, suppose the effect is negative but small relative to the reallocation effect. Then we expect a reversal of signs on current grants $\frac{df_t}{dG_t} > 0$ while $\frac{df_t}{dG_{t+1}}$ remains negative.

Suppose instead that the productivity effect is positive. In this case $\frac{df_t}{dG_t} > 0$ unambiguously, while $\frac{df_t}{dG_{t+1}}$ becomes ambiguous. If the positive productivity effect is sufficiently large, it will dominate the reallocation effect and make fund-raising expenditures respond positively to increases in future grants. However, even if the productivity effect is positive, a small cross-derivative in magnitude would leave the effect negative as the NP allocates resources efficiently over time. Stated in a different manner, a decrease in current grants will cause a *reduction* in fund-raising expenditures as the NP seeks to dampen the decrease in current service provision. With a dominant reallocation effect, a decrease in future grants will cause an *increase* in current fund-raising as the NP shifts resources from current service provision to more fund-raising to smooth out service provision over time.[12]

3 Empirical Model and Data

3.1 Model

In order to further understand NP fund-raising behavior, the theoretical results necessitate an examination of the timing of government grants, the presence of credit constraints, and the effect of grants on the productivity of fund-raising. First, we estimate the following regression:

$$f_t = \alpha_0 + \alpha_1 G_{t+1} + \alpha_2 G_t + \alpha_3 m_t + \alpha_4 G_{t+1} * m_t + \alpha_5 Z_t + \epsilon \tag{25}$$

where f is fund-raising expenditures. G denotes government grants in future and current time periods while m measures credit access. Z includes other firm financial and state-level characteristics.

[12]Introducing a non-pecuniary cost of fund-raising, k, as in footnote 7, does not alter Propositions 2, 3, or 4.

This regression allows the timing of government grants to potentially have different effects. Referring to Table 1, the effect of government grants on fund-raising is ambiguous because it depends on the sign and magnitude of the productivity effects (F_{fG} and $F_{\Phi G}$) relative to the reallocation effect. Therefore the signs of α_1 and α_2 convey information about the dominant effect and the extent of credit constraints. When α_1 and α_2 have the same sign, that indicates a dominant productivity effect or no credit constraints, but when they are of opposite signs it indicates a dominant reallocation effect and credit constraints.

Moreover, in previous studies, a negative effect of grants on fund-raising followed theoretically from the assumption that $F_{fG} < 0$. However, Proposition 4 extends these results to demonstrate that the productivity effects are not sufficient for determining the signs of α_1 and α_2. For example, $df_t/dG_t = \alpha_2$ can be positive even if $F_{fG} < 0$ when NPs face credit constraints.

The regressor m is measured so that a larger m implies better credit access. We include this variable since our theoretical model shows that access to the credit market is an important determinant in the fund-raising expenditure decision. Specifically, firms with perfect credit access should only be affected by changes in government grants if the fund-raising productivity effect, F_{fG}, is non-zero. The reallocation effect only applies to credit-constrained firms.

Credit access affects fund-raising directly through α_3 but also indirectly through $df_t/dG_{t+1} = \alpha_1 + \alpha_4 * m_t$. α_4 should be significant if credit constraints exist. The theory predicts that the sign of α_4 will be the opposite of α_1 because more access to credit diminishes the need to use fund-raising as a reallocation instrument. This is most easily seen in Table 1 when $F_{fG} > 0$. With no credit market, df_t/dG_{t+1} is negative if the reallocation effect dominates. With perfect credit access, reallocation via fund-raising plays no role and $df_t/dG_{t+1} > 0$. With $F_{fG} < 0$ and no credit market both the productivity and reallocation effect work in the same direction. Greater credit market access still diminishes the reallocation effect; the absolute magnitude of df_t/dG_{t+1}

decreases but the overall response is still negative.

To identify the sign and magnitude of the fund-raising productivity effect, we run the following regression:

$$F_t = \beta_0 + \beta_1 f_t + \beta_2 G_t + \beta_3 f_t * G_t + \beta_4 X_t + \epsilon \tag{26}$$

where F is total donations given to the NP, f is fund-raising expenditures, G denotes government grants, and X includes other firm and state-level characteristics.[13] Previous studies found a negative value for β_2 interpreted as donor crowd-out (Kingma, 1989; Payne, 1998). We also anticipate that the marginal productivity of fund-raising (β_1) should be positive.

Most importantly, under this specification $\beta_3 = F_{fG}$. We therefore empirically test whether F_{fG} is significantly different from zero controlling for other firm characteristics. To our knowledge, this paper is the first to directly measure the fund-raising productivity effect.

As many studies indicate (e.g. Payne, 1998 and Khanna and Sandler, 2000), accurate identification of the effect of government grants on fund-raising expenditures and donations is crucial. Unobserved factors that determine the level of government grants are likely correlated with the error term in equations (25) and (26). This may occur if unmeasured firm characteristics jointly influence the level of government grants, fund-raising expenditures, and the level of donations. It is also likely that these firms choose their fund-raising and grant-seeking activities simultaneously such that fund-raising expenses affect the intensity of applying for grants. To break this correlation, we seek instruments that are correlated to government grants but not directly correlated to fund-raising expenditures (for the 1st regression) or to funds raised (for the 2nd regression). Section 3.3 discusses the specific choice of instruments.

[13] Note that because these regressions are recursive, we do not need to estimate them simultaneously. The recursive nature of the specifications is further emphasized since use of lagged f in (26) produces similar results.

The 2SLS procedure we employ is complicated by the fact that the endogenous variable (G) appears linearly *and* in an interaction term for both regressions. Let W denote the instrument, V denote the variable that is interacted with the endogenous variable, G, and Y represent the dependent variable from the regression of interest. We instrument separately for the two terms. That is, the instrument for G is W while the instrument for $V * G$ is $V * W$. The first stage regression produces predicted values $\widehat{G}$ and $\widehat{V * G}$. Using standard instrumenting procedures, the first stage regression includes all other exogenous regressors X from the main equation. Kelejian (1971) states that all instruments should be of the same order in the first stage regression in order to produce consistent estimates. More specific to our case, Harrison (2009) shows that failure to include $V * X$ when regressing $V * G$ on $V * W$ leads to biased coefficients for both the linear and interaction terms. Monte Carlo results show that this bias can be large, in some cases even more severe than the OLS estimates. Indeed, our results excluding $V * X$ produced wildly implausible estimates. For example, estimates for β_2 in (26) were well below -1 (ranging from -4 to -8), implying that an increase in government grants by \$1 decreases donations by more than \$4. Furthermore, the estimate for β_2 was consistent with previous studies when the interaction term was excluded from the specification, providing further evidence that the procedure rather than the instruments produced the implausible estimates. Results in the next section therefore include $V * X$ in the instrument set.

3.2 Data

Our sample of NPs comes from the Statistics of Income (SOI) 990 tax return dataset for 1985-2002.[14] From the SOI dataset, we obtain all of our financial information including data on government grants (G), funds raised/total donations (F), and fund-raising expenditures (f). Although 501(c)3 NPs are exempt from federal corporate taxes, they are still required to file an annual tax return with the Internal Revenue Service. This

[14] We thank the Urban Institute for access to the data.

dataset contains all NPs with greater than $10 million in assets and a random sample of smaller organizations. Thus our sample may contain a smaller share of credit constrained NPs than broader datasets. Importantly though, the financial information for organizations in this dataset is entered twice and then cross checked for accuracy. Thus, the information is more reliable than in other tax return datasets containing the entire universe of NPs.

The presence of binding credit constraints is generally unobserved directly by the econometrician. An agent or NP is constrained if the demand for credit exceeds the supply. Some strategies split a sample of potential borrowers by an observed characteristic, such as income, assuming a higher likelihood of binding constraints for the lower income group. Grant (2007) shows this strategy is flawed because it fails to consider demand and supply simultaneously. In his study of US consumers, he finds that the young, educated, middle income households are more likely to be constrained than poor households.

Our strategy differs in that we are not concerned with the direct estimation of the degree of credit constraints, but their effect on fund-raising behavior as external funding through government grants vary.[15] We use total investment securities as our primary proxy for credit access (m). Increased collateral due to more financial investments should improve a firm's credit worthiness and reduce the NP's dependence on banks. These type of assets are generally more liquid and therefore decrease the uncertainty of recovering losses in the event of a loan default. Thus, we expect that firms with larger investments should have better access to the credit markets. As a robustness check, we also use interest expenses as a credit access measure with very similar results.

We also control for other financial characteristics. Firm size is measured as assets at the beginning of the fiscal year (ASSETS). In addition, firms receive revenues not only from donations and government grants but also from mission-related services, called

[15]We also do not have sufficient data for a full estimation of both the supply and demand sides of the loan market for NPs. Grant (1997) uses the quarter of the year as his exclusion restriction on the demand side, but our data are annual. However, given our results, future work on the extent of credit constraints appears fruitful for understanding NP decision making.

program service revenues (PSREV). Firms with more of these revenues, all else equal, are less dependent on donations and government grants. Since these firms likely react less to changes in government grants, we include this variable in regression (25). We do not include age as a control for several reasons. Calculation of age within the SOI is fraught with errors (Tinkelman, 2004) and increments simultaneously with the time fixed effects, providing no additional variability within the firm.

We focus our analysis on social and human service organizations since these organizations often depend heavily on donations. The dependence on donations makes these NPs more susceptible to donor crowd-out and fund-raising productivity shocks due to changes in government grants. Similar to NAICS codes, the National Taxonomy of Exempt Entities (NTEE) classifies NPs based on their primary mission. The 1st digit of the 4 digit code divides NPs into 26 broad categories from Arts to Health Care to International. Following Andreoni and Payne (2003), our sample contains NPs with a mission related to the Environment, Crime Prevention, Employment, Food and Nutrition, Housing, Human Services, and Community Improvement.[16]

Given the emphasis on social service organizations, we account for factors that affect the demand for social services. We control for demographic and economic characteristics using state-level data on income per capita, unemployment rate, total population, and percentage of the population under 18, over 65 and below the poverty line (STINC, UNEMP, STPOP, POPU18, POPO65, POPUPOV respectively).[17] In addition, governmental provision of social services varies across states. Some of this variation may stem from political and cultural differences. We therefore include the percentage of US Representatives and Senators that are Democrats from each state. Moreover, since NPs are the primary substitute provider for social services, we also include variables for the level of government-provided social services within a state. Total payments for unem-

[16]These organizations correspond to the 1-digit NTEE code of C, I, J, K, L, P, and S respectively. For more information on the NTEE classification system, please see www.nccs.urban.org.

[17]We could only obtain data for POPUPOV for 1989-2000. To avoid deleting the missing years we fill backward for 1985-1988 and fill forward for 2001-2002. To ensure that this procedure did not change our results, we ran the regressions excluding POPUPOV. The results for both Table 3 and 4 were very similar.

ployment insurance, retirement, welfare, veterans, Medicare and Medicaid are additional control variables in each specification (UNEMPINS, PAYRET, WELBEN, VETBEN, MEDICARE, MEDICAID respectively).

In addition to these state-level controls, we also include year and firm fixed effects. Persistence in donations, grants, or fund-raising over time for a firm could give rise to serial correlation in the error term. We therefore allow for an arbitrary correlation structure between the errors. This methodology has been shown to be superior to other methods when the number of groups within the data is large, as in our case (Bertrand, Duflo, and Mullainathn, 2004).

Even though the entry of the financial information in the SOI data is verified, measurement error still exists, particularly given that most of the tax forms are not audited (Tinkelman, 2004). We therefore take care to delete observations with implausible or missing information from the sample. Organizations reporting negative indirect contributions, total contributions,[18] program service revenues, assets, liabilities, or interest expenses are deleted. Since our primary focus is the effect of government grants on fund-raising expenditures and total funds raised (total direct contributions), we delete firms reporting no fund-raising or donation activity in every period. For government grants, many firms report zero for several consecutive years. Since we are interested in the change in levels from one year to the next, we additionally exclude observations at time t where government grants are zero at $t-1$, t, and $t+1$. Note that this procedure allows us to capture firms with no activity in one year, but positive levels in an adjacent year and examine how such a change affects their behavior. We also restrict the sample to NPs that appear in the dataset more than 4 times. Due to the random sampling of the smaller NPs, this deletion essentially ensures that our sample focuses on larger organizations. If these larger organizations have better credit access, then our results will underestimate the sensitivity of credit constrained NPs to changes in government grants. After these deletions, we have 1080 NPs in the sample for a total of 9,994 firm-

[18]Indirect contributions are donations from third-party associations like the United Way. Total contributions is the sum of direct donations, government grants, and indirect donations.

year observations. For equation (25), we need contemporaneous and lagged government grants and therefore delete observations where the difference between periods is more than 1 year. This leaves 1,027 firms and 8,287 firm-year observations.

Table 2 reports the descriptive statistics for the variables where all economic variables are adjusted for inflation using 1985 as the base year. On average, NPs earn about the same percentage of revenue from total direct contributions (F) as government grants (G), but the dispersion is larger for donations. Despite the bias toward large firms, we also find wide variation in other firm financial characteristics including fund-raising expenditures and credit access. This heterogeneity across firms suggests that controlling for firm effects will likely be important.

3.3 Instruments

We develop two instruments for government grants. First, for firm i in the 1-digit NTEE classification j located in state k, we sum total government grants for all NPs within NTEE j and state k excluding firm i (LOFIRM). The second instrument uses government grants for all NPs, not just social service organizations, outside NTEE j located in state k (LOINDUS).[19] That is,

$$LOFIRM_{i,j,k} = \sum_{\ell} G_{\ell,j,k} \quad \text{where} \quad \ell \neq i \tag{27}$$

and

$$LOINDUS_{i,j,k} = \sum_{\ell} \sum_{n} G_{\ell,n,k} \quad \text{where} \quad n \neq j \tag{28}$$

Recall that the SOI only contains a random sample of smaller NPs. However, weights included in the dataset are used in order to represent the entire NP population and accurately measure the total level of government grants within a state. We use total

[19] We use the levels of these instruments rather than the change in the levels since our first-stage regression also includes fixed effects. Moreover, a levels specification should perform as well as a change specification since the latter is just a linear combination of the former (Wooldridge, 2002).

government grants rather than the average in order to account for the size of the NP market within a state which is related to the demand for NPs.[20]

There are several reasons to believe that LOFIRM and LOINDUS are highly related to a firm's ability to obtain government grants. First, the behavior of entities within the same group is generally very similar (Manski, 1993). In addition, the grants received by other firms in the same industry and state (LOFIRM) provide information on the government's affinity for this industry. Depending on the political and social issues, some industries are generally more in favor than others at different points in time. Firms in states and industries with more government grants should have a higher probability of receiving grants. Similarly, higher LOINDUS suggests greater overall ability to lure grants to this state perhaps due to influential politicians. We may however observe a negative relation between an individual firm's grants and LOINDUS due to the competitive nature for grants. A rise in grants outside the firm's industry could indicate that the industry is not in favor relative to other industries. Such instruments are analogous to demand estimation where prices in other regions are used as instruments for own-region price and consistent with previous studies of crowd-out (Payne, 1998; Andreoni and Payne, 2003). Moreover, for both instruments, it is reasonable to think that grants allocated to other firms would not affect fund-raising expenses or donations for firm i, except through their effect on government grants. To test the validity of the instruments, we perform a Wald test for the significance of the instruments in the first-stage.[21] In addition, tests for the exogeneity of government grants are reported.[22]

[20]We ran the first stage using the average rather than the total and found these to be weak instruments.

[21]We employ Schaeffer's (2007) xtivreg2 command in STATA to calculate the endogeneity and first-stage statistics as well as the GMM estimation.

[22]Note that the standard overidentification test is not valid here. The overidentification test uses a regression based approach where the residual from the second stage regression is regressed on the instruments and exogenous variables. A chi-squared statistic is formed by multiplying the number of observations by R^2 from this auxiliary regression. A small chi-squared implies that the instruments are exogenous from the structural error term and therefore valid instruments (see Wooldridge, 2002 for more details). However, recall from above that when we instrument for an interaction variable $V * G$, we use $V * X$ as part of our instrument set. In this case, the regressors in the auxiliary regression are no longer additively separable. Moreover, they are not included in the structural equation but simultaneously do not satisfy the exclusion restriction. This appears to be an area for further research.

4 Empirical Results

Tables 3 and 4 present the estimation results for equations (25) and (26) respectively. In order to illustrate how the endogeneity of government grants affects our estimates, we report both the OLS and 2SLS results. Overall, our instruments perform well and are significant.[23] We also strongly reject exogeneity of government grants.

Our findings in Table 3 provide support for our theoretical hypotheses. We present results using future and contemporaneous government grants separately and jointly, instrumenting for both using LOFIRM and LOINDUS at time $t + 1$ and t respectively. When used separately (columns (2)-(4)), we find that an increase in government grants decreases fund-raising expenditures. This first-order impact of government grants on fund-raising expenses suggests a decline in fund-raising expenses between 7 and 8 cents. The point estimates are consistent with our theory and also with previous findings (Andreoni and Payne, 2003).

Focusing on the regression including future and contemporaneous government grants simultaneously (column (5)), we see that the negative effect for contemporaneous government grants at time t stems from identifying the independent impact of the timing of government grants. We find alternating signs on G_{t+1} and G_t. Our estimates suggest that increases in future government grants decrease fund-raising while contemporaneous grants increase fund-raising. The negative coefficient for government grants in column (4) occurs because future grants are not also included. Our results therefore suggest that the timing of the government grants does affect the firm's fund-raising response.

Moreover, the alternating signs for future and contemporaneous grants begins to provide evidence of resource allocation and/or the importance of credit constraints. Our theoretical results indicate two ways that df_t/dG_t could be positive. As shown in Table 1, if firms are not credit constrained, then df_t/dG_t is positive if and only if the productivity effect is also positive. With credit constraints, fund-raising will still increase in response to more current grants if the productivity effect is positive or the

[23] Complete first stage results are provided upon request.

reallocation effect dominates. In the first case (a positive productivity effect), df_t/dG_t could still be positive without reallocation dominating. But, for df_t/dG_{t+1}, our finding of a negative coefficient suggests that firms are shifting funds from $t+1$ to t when grants are anticipated to increase in $t+1$. The inverse relation in the presence of a positive productivity effect can only occur if credit constraints exist and the reallocation effect dominates. Suppose that the productivity effect was zero or even negative. Under this case, the positive coefficient for df_t/dG_t occurs when firms are credit constrained and the reallocation effect dominates. Either way, our results suggest that resource allocation and credit constraints seem to play a role.

Turning directly to the effect of credit constraints, we find that NPs with more credit access have lower levels of fund-raising expenditures on average. Our results also indicate a positive and significant coefficient on the interaction between credit access and government grants across all specifications, diminishing the negative effect of grants. These results suggest that as firms' access to credit markets increases they are (i) less likely to use fund-raising and (ii) less responsive to changes in government grants. Evaluated at the mean level of investment securities for column (5), we find that better credit access diminishes the negative firm response to government grants by about a half cent for an additional dollar in grants. Although the nominal dollar amount is small, this represents a two percent reduction in the 28 cent fall in f for the average NP's response to changes in future government grants.

Furthermore, we would not expect the average NP to have perfect credit access. This is important to note because it is only for firms with no constraints on credit that we expect the reallocation effect to be completely negated. Holdings of securities are low relative to total assets and highly skewed as can be seen in Table 2. In other words, it is the NPs with the highest investment securities that we anticipate will not need to reallocate resources via fund-raising shifts. Indeed, we see that for the NP with the largest amount of investment securities, an increase in future government grants will *increase* fund-raising expenditures by about 67 cents. Our estimates therefore reinforce the importance of credit markets but also stress that most NPs are likely using fund-raising as a mechanism to smooth service expenditures across time.

Comparing the above estimates to the theoretical predictions in Table 1, we see that the alternating signs on G_t and $G_t + 1$ suggest that the reallocation effect is playing a dominant role in the fund-raising decisions of NPs. However, we cannot rule out the possibility that the fund-raising productivity effect is driving the negative coefficient on G_{t+1}. Table 4 presents estimates of the productivity effect and evidence of partial crowd-out. Comparison of the OLS and 2SLS estimates shows a positive bias on crowd-out when we do not account for the endogeneity of government grants. Our instrumented results in specifications (2) and (3) imply a direct crowd-out effect between 57 to 78 cents per dollar of grants, consistent with previous findings. As expected, we also find a positive relation between fund-raising expenditures and total funds raised. Using lagged fund-raising or the sum of all previous fund-raising (i.e., the stock of f) in columns (4) and (5) respectively alters the magnitude of crowd-out and especially the fund-raising productivity, but provides similar qualitative results. The decreased coefficient on f is intuitively sensible, indicating that prior fund-raising does not provide the same impact as current fund-raising.

When we look at the interaction effect between fund-raising and government grants, we find a positive and highly significant coefficient that is robust across specifications, including the OLS regression. More government grants raise the *marginal productivity* of fund-raising. Thus, we find evidence that F_{fG} is positive. Government grants may provide a credible signal of quality to donors which can then be used to garner greater financial support for the organization. In essence, government grants may be an advertising mechanism for NPs. The interaction for the lagged and stock values of f are also significant, positive, and of similar magnitude to the previous specifications, indicating that $F_{\Phi G}$ is also positive.

The economic impact for the average NP from this increase in the marginal productivity of fund-raising is relatively small; it reduces the magnitude of the total crowd-out effect by about 1 cent at the mean level of fund-raising expenses. The small magnitude suggests that changes to fund-raising owing to the productivity effect will also be small. Andreoni and Payne (2003 and 2009) suggest that grants have large negative effects on fund-raising and our results, when we do not control for the timing of grants, show quite similar effects. However, the large decreases found empirically are inconsistent with both the sign and magnitude of the productivity effect being the driving force. The results presented here are consistent with credit-constrained NPs and the reallocation effect being the dominant factor.

In Table 5, we report estimates using various robustness checks in order to address potential concerns with the estimation. First, one might question whether investment securities provides an accurate measure of credit access. Although the tax data are somewhat limited in their information on credit, we do observe the reported value of total interest expenses for the tax year and therefore use it as an alternative measure of credit access (column (1)). Second, prior literature discusses the difficulty with breaking the endogeneity and particularly the possible simultaneity between government grants, donations, and fund-raising expenditures. Lagged values of the instruments may therefore be a better choice. Column (2) therefore uses lagged values of LOFIRM and LOINDUS as instruments. Third, following Arellano and Bond (1991), we also employ lagged values of government grants as instruments (column (3)). Fourth, capturing variation within an industry may be more important than firm level heterogeneity. We therefore run each regression using industry fixed effects with random firm effects in column (4). Finally, we estimate the models using GMM which is more efficient in the presence of heteroskedasticity.

The results are remarkably similar, particularly for the fund-raising expenditure regression in Panel A. The coefficient on G from the fund-raising production function is smaller when lagged G is an instrument. Overall, our results continue to point strongly to a larger fund-raising response for credit-constrained firms and increased marginal fund-raising productivity with respect to government grants.

Relating our findings back to Proposition 4, $F_{fG} > 0$ implies that the reallocation effect is the only component driving $\frac{df_t}{dG_{t+1}}$ negative. Combining the positive productivity effect with the negative coefficient on $\frac{df_t}{dG_{t+1}}$ and the significant role of the credit variable casts doubt on theories that assume a negative cross-derivative is the driving force behind fund-raising responses to government grants. The small magnitude of the productivity effect suggests it has little direct effect on crowd-out. However, the results do indicate the presence of credit constraints and provide strong evidence for reallocation over time by NP firms.

In our theory we assumed NPs are maximizers and not satisficers as suggested in Andreoni and Payne (2009), building on Weisbrod (1988). Suppose that is indeed the case and NPs choose f to meet a target level of funds $\bar{F}$. This argument differs from the distaste for fund-raising which includes a non-pecuniary cost to fund-raising as in Andreoni and Payne (2003) (and mentioned in footnotes 7 and 12). Under satisficing behavior, NPs treat grants and donations as substitutes for reaching the target $\bar{F}$. Thus, a NP may reduce f with an increase in G because they have more alternative resources and can rely less on donations *or* because the increased marginal productivity, $F_{fG} > 0$, means less f is required to meet the target (Table 4 indicates the second reason is unlikely given the small magnitude). Our results regarding the effect of future grants are consistent with satisficing behavior. However, satisficing behavior would also imply a negative coefficient for current grants which is not what we find in Table 3 after controlling for the timing of grants. Our findings therefore do not fit with treating grants and donations as substitutes in reaching a specific target.

5 Conclusions

This paper presents a straightforward model of NP decision making over time. We find that the timing of government grants matters for how NPs allocate resources. Moreover, the model suggests alternative explanations for why private donations and resources spent on fund-raising may fall with government grants. Both resource allocation and a reduced productivity of fund-raising due to grants can cause a reduction in fund-raising expenditures. Moreover, when NPs have full access to a credit market, only the productivity effect should matter.

We empirically test these ideas and find that the presence of credit constraints and the timing of grants does indeed matter for fund-raising expenditures in a manner consistent with the theory. We also find that the impact of grants on the marginal productivity of fund-raising is positive and significant, while confirming negative estimates of direct crowd-out. Thus, our results suggest that NPs' efforts to allocate resources over time explains the observation that fund-raising expenditures decline with increases in grants.

A fall in fund-raising expenditure is perfectly consistent with efficient NP behavior once we take into account credit constraints and the incentives for NPs to allocate resources across time. Using a static framework, the fall in fund-raising expenditures with an increase in government grants could be interpreted as inefficiency and provide a rationale for tying grants to fund-raising behavior. While such policies might be socially beneficial, our theory and empirics advocate caution in interpreting the negative relationship between fund-raising efforts and government grants as evidence of NP inefficiency. In the face of credit constraints, policies tying fund-raising behavior to grants may lead to less efficient provision of the public goods that NPs supply. Instead, our evidence of differences between credit-constrained and unconstrained NPs suggests that policies directed at alleviating frictions in the credit market would result in more efficient public good provision by NPs.

The model and the empirical results provide a basis for further exploring inter-temporal issues for NPs. For example, we restricted Φ to include only past fund-raising expenditures. However, a broadening of the idea to reputational capital accumulation (including past service provision) might shed further light on NP decision-making. In addition our finding of significantly different marginal productivities of fund-raising depending on whether we use current, lagged, or stock levels for f suggests the potential for intertemporal effects that have not yet been explored. Finally, the empirical analysis here was purposefully restricted to social service organizations to make it comparable to the existing empirical literature. The robust finding of a positive productivity effect of grants may or may not apply to other types of NPs and remains an open question.

6 Citations

References

Andreoni, J. "Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving." *The Economic Journal*, 100, 1990, 464-477.

Andreoni, J. and A. A. Payne. "Do Government Grants to Private Charities Crowd Out Giving or fund-raising?" *American Economic Review*, 93(3), 2003, 792-812.

Andreoni, J. and A. A. Payne. "Is Crowding Out Due Entirely to fund-raising? Evidence from a Panel of Charities." Working Paper, 2009.

Arellano, M., and S. Bond. "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *Review of Economic Studies* 58, 1991, 277-297.

Ben-ner, A. "Nonprofit Organizations: Why Do They Exist in Market Economies?" in Rose-Ackerman, Susan, ed., *The Economics of Nonprofit Institutions. Studies in Structure and Policy*, Oxford University Press, Oxford and New York, 1986, 94-113.

Bertrand, M., E. Duflo, and S. Mullainathan. "How much should we trust differences-in-differences estimates? " *Quarterly Journal of Economics*, 119(1), 2004, 249-275.

Bowman, W. "The Uniqueness of Nonprofit Finance and the Decision to Borrow." *Nonprofit Management and Leadership*, 12(3), 2002, 293-311.

Brooks, A. C. "Public Subsidies and Charitable Giving: Crowding out, Crowding in, or Both?" *Journal of Policy Analysis and Management*, 19(3), 2000, 451-464.

Brooks, A. C. "Do Government Subsidies to Nonprofits Crowd Out Donations or Donors?" *Public Finance Review*, 31(2), 2003, 166-179.

Duncan, B. "Modeling charitable contributions of time and money." *Journal of Public Economics*, 72(2), 1999, 213-242.

Friedman, J.W. "Advertising in oligopolistic equilibrium." *Bell Journal of Economics*, 14(2), 1983, 464-473.

Grant, C. "Estimating Credit Constraints Among US Households." *Oxford Economic Papers*, 59(4), 2007, 583-605.

Gruber, J. and D. Hungerman. "Faith-Based Charity and Crowd Out During the Great Depression." *Journal of Public Economics*, 91(5-6), 2007, 1043-1069.

Harrison, T. (2009), "On 2SLS Estimation of an Interaction Coefficient in a Multivariate Setting." Working paper, Drexel University.

Hirschey, M. "Intangible capital assets of advertising and R&D expenditures." *Journal of Industrial Economics*, 30(4), 1982, 375-390.

Holtmann, A. G. "A Theory of Non-Profit Firms." *Economica*, 50(200), 1983, 439-449.

Hungerman, D. "Crowd Out and Diversity." *Journal of Public Economics*, 93, 2009, 729-740.

Kelejian, H. "Two-stage Least Squares and Econometric Systems Linear in Parameters but Nonlinear in the Endogenous Variable." *Journal of the American Statistical Association*, 66(334), 1971, 373-374.

Khanna, J., J. Posnett, and T. Sandler. "Charity donations in the UK: New evidence based on panel data." *Journal of Public Economics*, 56, 1995, 257-272.

Khanna, J., and T. Sandler. “Partners in giving: The crowding-in effects of UK government grants.” *European Economic Review*, 44, 2000, 1543-1556.

Kingma, B.R. “An Accurate Measurement of the Crowd-out Effect, Income Effect, and Price Effect for Charitable Contributions.” *Journal of Political Economy*, 97(5), 1989, 1197-1207.

Manski, C.F. “Identification of Endogeneous Social Effects: The Reflection Problem.” *Review of Economic Studies*, 60(3), 1993, 531-542.

Moore, C. J. ”Nonprofit Organizations are Hiring Workers at a Faster Pace Than Government”, Businesses, *The Chronicle of Philanthropy*, June 10, 2004.

Okten, C. and B. Weisbrod. “Determinants of donations in private nonprofit markets.” *Journal of Public Economics*, 75(2), 2000, 255-272.

Payne, A. A. “Does the Government Crowd-Out Private Donations? New Evidence from a Sample of Non-profit Firms.” *Journal of Public Economics*, 69(3), 1998, 323-345.

Ribar, D.C. and M.O. Wilhelm. “Altruistic and joy-of-giving motivations in charitable behavior.” *Journal of Political Economy*, 110(2), 2002, 425-457.

Roberts, R. B. “A Positive Model of Private Charity and Public Transfers.” *Journal of Political Economy*, 92(1), 1984, 136-148.

Rose-Ackerman, S. “Do Government Grants to Charity Reduce Private Donations?” in Rose-Ackerman, Susan, ed., *The Economics of Nonprofit Institutions. Studies in Structure and Policy*, Oxford University Press, Oxford and New York, 1986, 313-329.

Rose-Ackerman, S. “Ideals versus Dollars: Donors, Charity Managers, and Government Grants.” *Journal of Political Economy*, 95(4), 1987, 810-823.

Schaffer, M.E. "xtivreg2: Stata module to perform extended IV/2SLS, GMM and AC/HAC, LIML and k-class regression for panel data models." 2007. http://ideas.repec.org/c/boc/bocode/s456501.html

Steinberg, R. "The Revealed Objective Functions of Nonprofit Firms." *RAND Journal of Economics*, 17(4), 1986, 508-526.

Tinkelman, D. "Using nonprofit organization-level financial data to infer managers' fund-raising strategies." *Journal of Public Economics*, 88, 2004, 2181-2192.

Weisbrod, B. *The Nonprofit Economy*. Harvard University Press. Cambridge, 1988.

Wooldridge, J. *Econometric Analysis of Cross Section and Panel Data*. MIT Press. Cambridge, 2002.

Table 1: Summary of Key Results

	Credit Market		**No Credit Market**		
Cross-Derivative	$\frac{df_t}{dG_t}$	$\frac{df_t}{dG_{t+1}}$	**Dominant Effect**	$\frac{df_t}{dG_t}$	$\frac{df_t}{dG_{t+1}}$
$F_{fG} < 0$	< 0	< 0	Reallocation	> 0	< 0
$F_{fG} < 0$	< 0	< 0	Productivity	< 0	< 0
$F_{fG} > 0$	> 0	> 0	Reallocation	> 0	< 0
$F_{fG} > 0$	> 0	> 0	Productivity	> 0	> 0

Table 2

Descriptive Statistics

Variable	Description	Mean	Standard Deviation	Min	Max
F	Total donations	2.14E+06	1.47E+07	0	1.04E+09
G	Grants	2.31E+06	6,931,634.00	0	8.84E+07
f	Fund-raising expenses	306,811.90	2,341,552.00	0	9.16E+07
m	Investment Securities	4.41E+06	1.94E+07	0	1.15E+09
PSREV	Mission revenues	4.97E+06	4.04E+07	0	1.46E+09
ASSETS	Assets	1.71E+07	7.59E+07	735	2.31E+09
STINC	Per capita income	18,773.11	3,070.81	9,678	31,050
UNEMP	Unemployment	5.35	1.46	2	13
POPUPOV	% below poverty line	12.75	3.20	5	26
POPU18	% under 18	25.35	1.70	18	33
POPO65	% over 65	12.73	1.83	3	19
STPOP	Population	1.19E+07	9,054,329.00	453,401	3.50E+07
DEMREPS	% Democratic representatives	51.47	18.94	0	100
DEMSEN	# Democratic Senators	60.57	38.60	0	100
PAYRET	Retirement benefits	1.15E+07	8,016,097.00	149,640	3.20E+07
UNEMPINS	Unemployment insurance	945,490.70	921,276.10	9,904	4.81E+06
MEDICARE	Medicare benefits	5.97E+06	4,790,946.00	45,093	1.98E+07
MEDICAID	Medicaid benefits	6.10E+06	6,314,129.00	36,056	2.56E+07
WELBEN	Welfare benefits	3.70E+06	3,773,606.00	50,110	1.40E+07
VETBEN	Veteran benefits	614,054.70	414,157.30	14,537	1.67E+06

N=9994

Note: STINC-VETBEN are measured at the state level.

Table 3
Fund-raising Expenditure Estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)
G_{t+1}	-0.0079***	-0.0681***	-0.0796***		-0.2835***
	(0.0019)	(0.0128)	(0.0186)		(0.0341)
G_t				-0.0720***	0.2228***
				(0.0154)	(0.0261)
m	-0.0038***	-0.0132***	-0.0061***	-0.0085***	-0.0045***
	(0.0005)	(0.0015)	(0.0008)	(0.0008)	(0.0011)
$G * m$	5.6e-10***	1.2e-09***	9.7e-10***	1.6e-09***	8.3e-10***
	(6.0e-11)	(2.4e-10)	(1.5e-10)	(1.3e-10)	(1.9e-10)
PSREV	0.0649***	0.0191***	0.0629***	0.0639***	0.0643***
	(0.0006)	(0.0013)	(0.0010)	(0.0009)	(0.0012)
ASSETS	0.0045***	0.0201***	0.0061***	0.0058***	0.0034***
	(0.0004)	(0.0008)	(0.0007)	(0.0007)	(0.0009)
R^2	0.7413	0.7756	0.8037	0.8046	0.6124
State controls	21.42	61.61	151.65	184.39	73.56
P-Value	0.0000	0.0000	0.0000	0.0000	0.0000
Estimation Technique	OLS	2SLS	2SLS	2SLS	2SLS
Fixed Effects	Firm/Year	Industry/Year	Firm/Year	Firm/Year	Firm/Year
Wald-instruments for G	N/A	3.61	2.70	3.54	2.74
p-value		0.0000	0.0000	0.0000	0.0000
Wald-instruments for G*m		96.16	118.26	132.09	116.67
p-value		0.0000	0.0000	0.0000	0.0000
Exogeneity		25.657	22.283	60.026	160.922
p-value		0.0000	0.0000	0.0000	0.0000

Note: Standard errors robust to serial correlation in parentheses. *, **, *** correspond to significance at α=.10, .05, and .01 respectively. All regressions include year dummies and either firm or industry fixed effects. Specification (1) presents the OLS estimates while specifications (2) and (3) use 2SLS to instrument for G_{t+1} and $G_{t+1} * m$. The instruments are LOFIRM and LOINDUS at time t+1. Column (4) uses G_t, and $G_t * m$ and instruments at time t. Column (5) instruments for both G_{t+1} and G_t using instruments at the respective time periods. We report the Wald test for the significance of the instruments as well as tests for exogeneity of the instruments.

Table 4
Fund-raising Production Function Estimation

VARIABLES	(1)	(2)	(3)	(4)	(5)
G	-0.1032***	-0.5690***	-0.7770***	-0.8973***	-0.7160***
	(0.0247)	(0.0618)	(0.0860)	(0.1192)	(0.1155)
f	6.2250***	4.8842***	5.6382***	1.5031***	0.2050***
	(0.1444)	(0.1001)	(0.1593)	(0.2112)	(0.0235)
f*G	3.2e-08***	1.9e-08***	4.5e-08***	9.0e-08***	1.0e-08***
	(2.4e-09)	(1.9e-09)	(2.8e-09)	(4.3e-09)	(4.9e-10)
ASSETS	-0.0440***	0.0078***	-0.0373***	0.0464***	0.0071
	(0.0050)	(0.0027)	(0.0050)	(0.0066)	(0.0062)
R^2	0.7345	0.7247	0.4928	0.3225	0.3930
State controls	3.61	43.33	80.07	32.37	45.74
P-Value	0.0000	0.0000	0.0000	0.0036	0.0000
Estimation Technique	OLS	2SLS	2SLS	2SLS	2SLS
Fixed Effects	Firm/Year	Industry/Year	Firm/Year	Firm/Year	Firm/Year
Time period for f	Current	Current	Current	Lagged	Stock
Wald-instruments for G	N/A	3.92	9.85	9.07	6.97
p-value		0.0000	0.0000	0.0000	0.0000
Wald-instruments for G*f		2415.00	2142.90	2052.59	938.58
p-value		0.0000	0.0000	0.0000	0.0000
Exogeneity		142.137	80.699	61.782	56.934
p-value		0.0000	0.0000	0.0000	0.0000

Note: Standard errors robust to serial correlation in parentheses. *, **, *** correspond to significance at α=.10, .05, and .01 respectively. All regressions include year dummies and either firm or industry fixed effects. Specification (1) presents the OLS estimates while specifications (2)-(5) use 2SLS to instrument for contemporaneous G and $G * f$. The instruments are LOFIRM and LOINDUS. We report the Wald test for the significance of the instruments as well as tests for exogeneity of the instruments. Column (4) uses lagged f while Column (5) uses the sum of all previous fund-raising (the stock of f).

Table 5
Robustness of Estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)
Panel A: Crowd-out Regression					
G_{t+1}	-0.2921***	-0.2569***	-0.2715***	-0.3396***	-0.2110***
	(0.0174)	(0.0318)	(0.0296)	(0.0376)	(0.0063)
G_t	0.1305***	0.2035***	0.2185***	0.2234***	0.2358***
	(0.0136)	(0.0238)	(0.0239)	(0.0345)	(0.0064)
m	-1.4e-01***	-0.0039***	-0.0043***	-0.0076***	-0.0002
	(2.8e-02)	(0.0010)	(0.0008)	(0.0013)	(0.0002)
$G_{t+1} * m$	9.4e-09***	7.5e-10***	8.3e-10***	1.4e-09***	1.3e-09
	(7.3e-10)	(1.8e-10)	(1.2e-10)	(2.0e-10)	(3.0e-09)
Panel B: Production Function					
G_t		-0.627***	-0.150***	-0.635***	-0.773***
		(0.0966)	(0.0371)	(0.062)	(0.018)
$G_t * f$		4.536e-08***	3.937e-08***	2.290e-08***	4.51e-08***
		(3.11e-09)	(2.65e-09)	(1.938e-09)	(3.43e-10)
Specification Change					
m	Interest Expenses	Invsec	Invsec	Invsec	Invsec
Instrument	LOFIRM	LOFIRM_{t-1}	G_{t-1}	LOFIRM	LOFIRM
Estimation Technique	2SLS	2SLS	2SLS	2SLS	GMM
Panel Technique	Fixed	Fixed	Fixed	Random	Fixed
Fixed Effects	Firm/Year	Firm/Year	Firm/Year	Industry/Year	Firm/Year

Note: Standard errors robust to serial correlation in parentheses. *, **, *** correspond to significance at α=.10, .05, and .01 respectively. All regressions include year dummies and either firm or industry fixed effects. Columns (1)-(4) use 2SLS with various instruments while column (5) employs GMM estimation.