Nonprofits, Crowd-Out, and Credit Constraints

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Abstract

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. While some research finds that donations fall with government grants, no empirical evidence on how grants affect the marginal productivity of fund-raising exists. We estimate this relationship directly for US social service organizations and, surprisingly, find that increases in government grants decrease the level of fund-raising expenditures but increase the marginal productivity. This counterintuitive result can be understood by accounting for resource allocation over time in the presence of credit constraints. We model a NP firm facing crowd-out and show that the response of fund-raising expenditures hinges on the timing of the grants and the sign of the cross-derivative of fund-raising with respect to fund-raising expenditures and 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.

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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. In Europe paid employment in NPs as a share of the labor force accounts for 2.8%, 8.6%, and 9.2% in Spain, Belgium and the Netherlands respectively. Those numbers increase further when including volunteer labor to average about 8% across Western Europe (Salamon, Sokolowski, and List, 2003).

Many nonprofits are funded not only by private donations but also government grants because the services provided have public good characteristics. However, if 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 finds evidence of crowd-out (Kingma, 1989; Payne, 1998; Okten and Weisbrod, 2000). However, Khanna and Sandler (2000) find evidence for many types of NPs in the United Kingdom consistent with the idea of crowd-in. Brooks (2000, 2003) suggests that both crowd-in and crowd-out may be present simultaneously. Increases in grants may lower the donations from existing donors, but through a positive reputation signal, induce more people to donate.

Andreoni and Payne (2003) investigate whether increases in government grants affect firm fund-raising expenses which may explain at least part of the fall in private donations. They provide evidence of reduced fund-raising expenditures with increases in government grants. In their model, NPs pay a non-pecuniary cost of fund-raising (a source of inefficiency) and fund-raising expenditures fall with grants due to crowd-out of donations. Fund-raising becomes less effective meaning the marginal product of fund-raising decreases with grants, i.e. the cross-derivative of funds raised with respect to
fund-raising expenditures and grants is negative.\footnote{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. 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.}

Our paper examines the response of nonprofits to changes in government grants through a two-period model of crowd-out and credit constraints. When NPs are unconstrained in the credit market, fund-raising efforts fall when grants reduce the marginal product of fund-raising expenditures through crowd-out. The result is identical to previous theories (e.g. Andreoni and Payne (2003) and Rose-Ackerman (1987)). However, a credit-constrained nonprofit may also reduce its current fund-raising expenditures when grants rise, regardless of whether crowd-out is present. The NP does so optimally because the cost of fund-raising is foregone current service provision and therefore not a source of inefficiency. We therefore find two potential (non-mutually exclusive) explanations for the empirical observation that fund-raising falls 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.

To empirically investigate these implications, we estimate the marginal effect of grants and fund-raising expenditures on donations in a manner similar to previous work (e.g. Payne, 1998) using US tax return data on social service organizations. Our contribution here is that we also estimate the cross-derivative in order to directly measure the effect of government grants on the marginal productivity of fund-raising in addition to the level of donations. To our knowledge, this is the first paper to estimate this effect.

An econometric complication arises because estimation of the cross-derivative requires jointly instrumenting for endogeneous 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.

Contrary to previous theoretical assumptions, we find that the cross-derivative is positive and robustly so, suggesting a positive fund-raising productivity effect of grants. The evidence that the cross-derivative is positive while fund-raising still falls with grants,
taken together, is inconsistent with previous theories. Unlike most work on crowd-out, we focus on the NP firm rather than the donors. 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.

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 nonprofit 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.

Our empirical work therefore also investigates the timing of government grants and the role of credit markets on NP fund-raising behavior. Controlling for endogeneity, we simultaneously estimate the effect of contemporaneous and lagged government grants on fund-raising expenditures while accounting for credit constraints. We show that the timing matters and credit constrained firms respond differently to grants than unconstrained firms.

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

2 The Model

2.1 One period

We begin with a standard one-period model of a NP firm facing crowd-out. We abstract from modeling the donors’ decision-making behavior which may depend on tax policy,
information, or altruism and focus on the firm’s behavior. A representative NP seeks
to maximize a value $V$ that depends on the level of services provided, $S$, where $V' > 0$
and $V'' < 0$. $S$ could be the level of service, it could be the quality, or something
else altogether. What matters is that providing $S$ requires resources and NPs optimize
their resources to provide that service. 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.\(^3\)

That brings us to the resource constraint for the nonprofit. 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).\(^4\)

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 relation-
ship is strictly concave such that $F_f > 0$ and $F_{ff} < 0$. We also impose a non-negativity
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.\(^5\) The

\(^2\)If the $V$ function were convex or linear, managers of NPs would have incentives to provide services
in one period and none in the other when we introduce multiple periods.

\(^3\)We abstract from the pricing decisions of the NP which is scrutinized in the literature using static
models. However, such problems could be incorporated into the framework without changing the basic
structure (See Holtmann, 1983).

\(^4\)See also Khanna, Posnett, and Sandler (1995) who find more variation than Steinberg using 159
large charities in the UK.

\(^5\)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 of the model are
largely unchanged when allowing the NP to devote resources towards obtaining more grants. Provided
the absolute value of the cross-derivative of the fund-raising production function is not extremely large
relative to the other effects, the results do not change. Our estimates in section 4 show that the cross-
derivative, while highly significant, is relatively small. 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
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 \( F_{GG} > 0 \) reflecting that the crowd-out effect diminishes at the margin.

Therefore, we write the fund-raising production function as \( F(f, G) \). We make no \textit{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 \textit{productivity} of fund-raising, that is \( F_{fG} \). 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 \textit{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 by fund-raising for any level of fund-raising expenditures, but it does not affect the marginal productivity of fund-raising, i.e. the slope of the function. The fund-raising productivity effect appears as a proportional change in the function. Figure 1 shows the two effects when \( F_{fG} < 0 \). Thus, the NP response to changes in government grants will depend on both of these effects.

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:

\[ v' (F(f, G) - f + G) F_f - v' (F(f, G) - f + G) \leq 0 \]  

(1)

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

\[ \frac{df}{dG} = -\frac{F_{fG}}{F_{ff}} \]  

(2)

The response of fund-raising with respect to grants depends solely on $F_{fG}$ 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 ($F_G$). However, anticipating the results in Section 4, we find $df/dG < 0$ but $F_{fG} > 0$. To explain this contradiction, we introduce a credit market and borrowing constraints.
2.2 Two-period 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), some 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 organization, with time-separable preferences exist for two-periods and take the following form:

\[ V = v(S_1) + \beta v(S_2) \]  

where \( \beta \), assumed \( 0 < \beta < 1 \), is the discount factor applied to the future value of \( S \). There is no uncertainty here; the NP knows the values of all variables.\(^6\)

Let \( m_0 \) be an initial level of assets (debt), and let \( m \) be the level of assets (\( < 0 \) if in debt) held between periods one and two. The return on these assets will be given by the interest rate \( 1 + i \).\(^7\) Let \( F_1 \) indicate previously obtained donations or other resources. In addition, let \( G_1 \) and \( G_2 \) be grants obtained in periods 1 and 2 respectively.

Resources allocated to fund-raising \( f \) will generate contributions for use in the second period. If fund-raising only generated donations within the same period, the one period model would suffice as the results do not change.\(^8\) That is, changes in \( f \) with respect to \( G \) depend only on the cross-derivative and we are once again left with an empirical contradiction of the theory (i.e., \( df/dG < 0 \) and \( F_fG > 0 \)). By specifying \( f \) as generating period 2 contributions, we are thinking of managers budgeting for events that require preparation and advanced planning/budgeting such as galas, mass mailings, or pledge drives. Further more, fund-raising events also have reputational effects which persist over time (Rose-Ackerman, 1986). As we will show, the intertemporal effects of fund-raising expenditures, along with credit constraints, resolves the empirical inconsistency.

\(^6\)Introducing uncertainty over governments grants does not change the results derived here. We provide these results in a separate appendix available upon request.

\(^7\)We assume here, for simplicity, a perfectly elastic supply of credit. The appendix available on request shows that relaxing this assumption does not change the results.

\(^8\)Results in the Appendix provided upon request.
The NP managers’ problem becomes:

\[ \max_{f,m} V = v(S_1) + \beta v(S_2) \]  
\[ \text{s.t. } S_1 = F_1 + G_1 - f + m_0 - m, \text{ and } \]  
\[ S_2 = F_2(f, G_2) + G_2 + m(1 + i). \]  

Now the NP has two choice variables, \( f \) and \( m \). The corresponding first-order conditions are:

\[ -v'(F_1 + G_1 - f + m_0 - m) + \beta v' \left( F_2(f, G_2) + G_2 + m(1 + i) \right) F_f \leq 0 \]  
\[ \text{and} \]  
\[ -v'(F_1 + G_1 - f + m_0 - m) + \beta v' \left( F_2(f, G_2) + G_2 + m(1 + i) \right) (1 + i) = 0. \]  

If \( F_f < 1 + i \ \forall f \geq 0 \), then the NP will choose \( f = 0 \) in a corner solution. That is, if fund-raising at all levels of resources returns less than what could be earned in the credit market, positive levels of fund-raising are not optimal. In order for the two equations to hold simultaneously, i.e. \( f^* > 0 \), we must have that \( F_f = 1 + i \). Once again, we find that changes in second period government grants will affect fund-raising expenditures entirely through the productivity effect:

\[ \frac{df}{dG_2} = -\frac{F_f G}{F_{ff}}. \]  

To understand this intuition, first assume that \( F_{fG} = 0 \), implying that changes to government grants have no effect on fund-raising productivity. Then, the available interest rate completely pins down the optimum level of fund-raising expenditures and \( \frac{df}{dG_1} = \frac{df}{dG_2} = 0 \). Even when \( F_{fG} \neq 0 \), \( \frac{df}{dG_1} = 0 \) since first period grants do not enter the fund-raising production function.

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.
For grants to affect fund-raising behavior, the cross-derivative must be non-zero. The result is therefore identical to proposition 1.

**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 government grants in period 2 increase if and only if $F_{fG} < 0$ ($F_{fG} > 0$).

**Proof.** The proof follows immediately from (8).

### 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, thus far 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. 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 in the budget constraints above. We partially relax this constraint below (allowing savings, but not borrowing).

The problem now faced by our NP managers is:

\[
\begin{align*}
\max_f V &= v(S_1) + \beta v(S_2) \\
\text{s.t. } S_1 &= F_1 + G_1 - f, \text{ and} \\
S_2 &= F_2(f, G_2) + G_2.
\end{align*}
\]

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

\[
-v' (F_1 + G_1 - f) + \beta v'(F_2(f, G_2) + G_2) F_f = 0
\]
Application of the implicit function theorem shows that \( \frac{df}{d\beta} > 0 \) and \( \frac{df}{dF_1} > 0 \). Those results are straightforward. The higher the discount factor and the larger the initial resource endowment, \( F_1 \), the more will be allocated to fund-raising.

When we look at how government grants affect fund-raising expenditures we get a different result as follows:

\[
\frac{df}{dG_1} = \frac{v''}{v'' + \beta v'' F_f^2 + \beta v' F_{ff}} > 0
\]  

(12)

and

\[
\frac{df}{dG_2} = -\left[ \beta v'' F_f + \beta v'' F_f F_G + \beta v' F_{fG} \right] \leq 0.
\]  

(13)

Suppose for the moment that grants do not crowd-out donations at all such that \( F_G = 0 \) and \( F_{fG} = 0 \). Note, (12) is unchanged while (13) becomes:

\[
\frac{df}{dG_2} = -\frac{-\beta v'' F_f}{v'' + \beta v'' F_f^2 + \beta v' F_{ff}}
\]  

(14)

and yields the following proposition.

**Proposition 3** A credit-constrained NP with decreasing returns to fund-raising and no crowd-out will increase fund-raising with an increase in \( G_1 \) and decrease fund-raising with an increase in \( G_2 \).

**Proof.** Let the problem of the NP be described as above. Assuming an interior solution, the first-order condition is given in (11). Then \( \frac{df}{dG_1} \) is (12) and \( \frac{df}{dG_2} \) is (14). Since \( v'' \) and \( F_{ff} \) are both negative, while \( F_f, v', \) and \( \beta \) are positive, \( \frac{df}{dG_1} > 0 \) and \( \frac{df}{dG_2} < 0 \). The second-order condition is satisfied as it is the denominator from above:

\[ v'' + \beta v'' F_f^2 + \beta v' F_{ff} < 0. \]

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 \( G_1 \) 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, \( \frac{df}{dG_2} < 0 \). In the absence of the ability to borrow, NPs reduce fund-raising for the reason that more resources are available in the future period, therefore the NP can increase its value by lowering fund-raising expenditures today and increasing its service provision in period one. By allocating resources over time, the NP equates the marginal values of first and second period service provision.

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 \( G_1 \) increases, the incentive is to shift resources forward via savings and grants will not affect fund-raising expenses. On the other hand if \( G_1 \) falls, but the NP cannot borrow, \( f \) falls, and \( \frac{df}{dG_1} \) remains positive. The same logic applies to future grants. A decrease in \( G_2 \) creates incentives to save to make up the reduction in future resources and grants do not alter fund-raising behavior, but an increase in \( G_2 \) alters \( f \) because of the borrowing constraint. Thus, the strict inequalities implied in Proposition 3, retain the same sign but become weak inequalities.

The result suggests that empirical analyses of the type that treat funds raised, \( F \), as the dependent variable, and grants, \( G \), as an independent variable need to be quite careful about the timing if credit constraints play any kind of role. Studies estimating crowd-out effects (including ours in Section 4) are invariably concerned with orthogonality between grants and the error term. The model suggests that using lagged government grants to correct for potential endogeneity of current grants may, in fact, cause a reversal of signs due to resource allocation.\(^9\)

Now, consider the direct and productivity effects of crowd-out, $F_G < 0$ and $F_{fG} \neq 0$. Changes in initial government grants are still positively related to fund-raising and do not change from Proposition 3. However, the crowd-out effects leave the sign of $df/dG_2$ ambiguous. The overall sign depends on the numerator from (13):

$$
\beta v'' F_f + \beta v'' F_f F_G + \beta v' F_{fG}
$$

There are three effects here. First, as above, increases in future grants cause the NP to want to shift resources to increase current service. This effect does not depend on crowd-out and appears in equation (14). That effect reduces $f$, and we refer to it as the “reallocating effect.”

Second, the direct crowd-out of private donations, $F_G$, is a negative income effect and provides an incentive to increase fund-raising expenditures to offset the losses. This change in fund-raising expenditures we label the “revenue adjustment effect” rather than the “direct crowd-out effect” which drives it. The distinction is that direct crowd-out effect lowers the amount of funds raised for a given level of fund-raising expenditures, but the “revenue adjustment effect” shows the increase in fund-raising expenditures that occurs because of direct crowd-out.

The final effect includes 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. This effect is the “fund-raising productivity effect” discussed above. If $F_{fG} < 0$ then fund-raising expenditures could fall because of the reduction in the productivity of fund-raising. If grants positively affect fund-raising productivity, $F_{fG} > 0$, then we might observe an increase in fund-raising and funds-raised provided the effect is strong enough to overcome the reallocation effect.

However, only the fund-raising productivity effect could explain why fund-raising might fall with an increase in government grants because of crowd-out. The first effect is merely an optimal reallocation of resources that is present with or without crowd-out effects as before. The second effect does depend on crowd-out but works in the opposite
direction.

Empirical evidence suggests that the entire effect, $\frac{df}{dG^2}$, is negative (Andreoni and Payne, 2003). However, it is unclear what portion of the incentive to reduce fund-raising arises from the presence of crowd-out. If the overall effect is indeed negative, this could occur with a positive cross-derivative which would indicate a dominant resource allocation effect stemming from credit constraints. On the other hand, even if the productivity effect is negative, a sufficiently strong revenue adjustment effect would make $\frac{df}{dG^2} > 0$. Thus, a negative cross-derivative is neither a necessary nor sufficient condition for $\frac{df}{dG^2} < 0$.

**Proposition 4** In the presence of credit constraints, a negative fund-raising productivity effect is neither a necessary nor a sufficient condition for fund-raising expenditures to be negatively related to government grants.

**Proof.** From (17), the denominator is negative, thus $\frac{df}{dG^2} < 0$ if $v''F_f + v''F_fF_G + v'F_fG < 0$. Assume that $F_fG < 0$, then $\frac{df}{dG^2} > 0$ requires $v''F_f(1+F_G) > -v'F_fG$. The right-hand side is positive and the left-hand side is positive if $F_G < -1$. Thus, there exists a large enough direct crowd-out effect such that $\frac{df}{dG^2} > 0$. Thus, $F_fG < 0$ is not sufficient. Now assume that $F_fG \geq 0$, then $\frac{df}{dG^2} < 0$ if $F_fG < \frac{-v''F_f(1+F_G)}{v'}$ which requires that $F_G > -1$. Thus, $F_fG < 0$ is not necessary. **Q.E.D.**

Notice that the result hinges on the magnitude of $F_G$, the direct crowd-out effect which governs the revenue adjustment effect, relative to the resource allocation effect. Estimates of $F_G$ range widely in the literature, but none find evidence of “complete” crowd-out ($F_G = -1$). Instead they find “partial” crowd-out, i.e. $F_G > -1$. If it holds that $F_G > -1$, then we can extract the following result from Proposition 4.

**Lemma 5** If $F_G > -1$, then $F_fG < 0$ is a sufficient, but not a necessary condition for fund-raising expenditures to be negatively related to government grants.

**Proof.** The proof follows immediately from the proof of proposition 4. **Q.E.D.**

Note the implication of Lemma 5 that if there are no direct crowd-out effects, i.e. $F_G = 0$, then the reallocation effect is all that matters. We cannot have a non-zero
productivity effect without a direct crowd-out effect.\textsuperscript{10} Therefore no matter the sign of $F_G$ when estimating the crowd-out effect it is the cross-derivative that matters for identifying the true effect.

The next section discusses our empirical approach to controlling for access to credit markets and a manner for estimating $F_{fG}$ directly. If $F_{fG} < 0$, we view that as evidence in support of the presence of crowd-out and in support of the notion that NPs reduce their fund-raising expenditures with higher government grants as a result of crowd-out. If we cannot reject the null hypothesis that $F_{fG} = 0$, it suggests that the previous empirical literature which finds a crowd-out effect may in fact have been finding that NPs are merely allocating resources efficiently. That is, $dF/dG$ may be negative because the NPs make decisions over time. Finally, what would a finding of $F_{fG} > 0$ suggest? In essence it implies that a second order crowd-in effect, via signaling, exists. Note that a crowd-in effect, does not preclude a reduction in fund-raising expenditures resulting from larger government grants if resource allocation effect is the dominant effect.

3 Empirical Model and Data

3.1 Model

In the theoretical model above, we show that crowd-out of private donations by government grants is not the only potential explanation for lower fund-raising expenditures when government grants increase. Fund-raising expenditures may decline in response to increased government grants due to reallocation of resources over time if NPs are credit constrained.

To empirically investigate resource allocation and the effect of credit access, we estimate the following regression:

\begin{equation}
  f_t = \alpha_0 + \alpha_1 G_t + \alpha_2 G_{t-1} + \alpha_3 m_t + \alpha_4 G_t \ast m_t + \alpha_5 Z_t + \epsilon \tag{15}
\end{equation}

\textsuperscript{10}It can never be the case that $F_{fG} \neq 0$ and $F_G = 0$ for all $G$. 

14
where $f$ is fund-raising expenditures, $G$ denotes government grants, $m$ is a measure of credit access, and $Z$ includes other firm financial and state-level characteristics. We include both contemporaneous and lagged government grants in order to directly test our hypotheses. Notice that $G_{t-1}$ and $G_t$ correspond to the theoretical model $G_1$ and $G_2$ respectively. In the model, funds raised in period 2 are a function of $f$ and $G_2$. In other words, $f$ is allocated in period 1 but realized in period 2. Within the data, budgeting decisions for fund-raising are unobserved by the econometrician. We only observe the expenses once they are realized. Moreover, fund-raising expenses, once spent, generally create contributions within the same period due to the nature of the fund-raising (e.g., galas, direct mailings, etc.). Thus, we use reported fund-raising expenses and government grants within the same time period to measure $f$ and $G_2$. The above notation is therefore used for the remainder of the empirical sections.

As government grants at time $t-1$ increase, firms will increase fund-raising expenditures when credit-constrained with no effect otherwise. Thus, we expect a weakly positive coefficient on $\alpha_2$. The sign on $\alpha_1$ is ambiguous and depends on the magnitude and sign of the resource, revenue adjustment and fund-raising productivity effects respectively. In previous studies, a negative $\alpha_1$ followed theoretically from the assumption that $F_{fG} < 0$. Proposition 4, in contrast, states that the fund-raising productivity effect ($F_{fG}$) is neither a necessary nor sufficient condition for determining the sign of $\alpha_1$. In particular, $df/dG_2 = \alpha_1 + \alpha_4 \cdot m_t$ can be negative even if $F_{fG} > 0$, provided the resource allocation effect is sufficiently large. Thus, if we find that $df/dG_2$ is negative or zero and $F_{fG} > 0$, then this result further supports the existence of resource allocation and credit constraints. However, if $F_{fG} < 0$, then we take this as evidence that crowd-out of private donations by government grants negatively affects the productivity of fund-raising. The resource allocation effect and the fund-raising productivity effect both provide an incentive to decrease fund-raising expenses in this scenario and consequently, the individual effects cannot be identified using our data.

The regressor $m$ is measured so that a larger $m$ implies increased 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. In contrast, the fund-raising reallocation and revenue adjustment effects are additional determinants for credit-constrained firms. We therefore anticipate $\alpha_4$ should be significant if credit constraints exist. That is, firms with better credit access should react differently to changes in government grants. The expected sign of $\alpha_4$ depends however on the sign of $\alpha_1$ and the sign of the fund-raising productivity effect.

Per the above discussion, it is important to not only directly test for resource allocation and credit constraints through equation (15), but also to directly measure the fund-raising productivity effect ($F_{fG}$). In order to examine the fund-raising productivity effect, we run the following regression:

$$F_t = \beta_0 + \beta_1 f_t + \beta_2 G_t + \beta_3 f_t \ast G_t + \beta_4 X_t + \epsilon$$

where $F$ is total donations given to the nonprofit, $f$ is fund-raising expenditures, $G$ denotes government grants, and $X$ includes other firm and state-level characteristics. Previous studies have found a donor crowd-out effect strongly suggesting that $\beta_2$ is negative (Kingma, 1989; Payne, 1998). We also anticipate that the marginal productivity of fund-raising ($\beta_1$) should be positive. In addition, note that under this specification $\beta_3 = F_{fG}$. Thus, we can empirically test whether $F_{fG}$ is significantly different from zero controlling for other firm characteristics.

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 (15) and (16). 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 uncorrelated to the fund-raising expenditure decision (for the 1st regression) or to the funds raised (for the 2nd regression). We then employ 2SLS to instrument for government grants in the above regressions.

Before discussing our choice of instruments (see Section 3.3), the specifications above present an econometric complication. The endogeneous variable \( G \) appears linearly and in an interaction term for both regressions. Two methodologies are possible. Let \( W \) denote the instrument, \( V \) denote the variable that is interacted with the endogeneous variable, \( G \), and \( Y \) represent the dependent variable from the regression of interest. One approach instruments separately for the two terms. Thus, the instrument for \( G \) is \( W \) while the instrument for \( V \ast G \) is \( V \ast W \). We therefore produce predicted values \( \hat{G} \) and \( \hat{V} \ast \hat{G} \). Alternatively, we can predict \( G \) in the first stage and then substitute this value for the true \( G \) in the linear and interaction term. The second stage therefore regresses \( Y \) on \( \hat{G} \) and \( V \ast \hat{G} \). Harrison (2007) shows that the first method leads to larger bias when the mean of \( V \) is large, relative to the variance, and additional controls, correlated with \( G \), are included in the regression. Indeed, our results using the first approach produced wildly implausible estimates. For example, estimates for \( \beta_2 \) in (16) using the first approach were well above -1 in absolute value (ranging from -6 to -8), implying that an increase in government grants by $1 decreases donations by more than $6. We therefore use the second approach.

Under the first methodology, 2SLS is easily implemented using almost any standard statistical package. The second approach is not, to our knowledge, provided as a canned procedure. Since the first and second stages are run separately, standard errors computed using \( \hat{G} \) rather than \( G \) are not accurate. We therefore compute the correct asymptotic standard errors.
3.2 Data

Our sample of nonprofits comes from the Statistics of Income (SOI) 990 tax return dataset for 1985-2002. Although 501(c)3 nonprofits are exempt from federal corporate taxes, they are still required to file an annual tax return with the Internal Revenue Service. This dataset contains all NPs with greater than $10 million in assets and a random sample of smaller organizations. Thus our sample likely contains 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 nonprofits. Given the hypothesized role of credit constraints, accuracy of the information is key even though our sample likely understates the overall impact of credit constraints.

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). Total interest expenses is our proxy for access to the credit markets (m). Note that we want to measure credit access in future periods in order to assess the effect of credit markets on resource allocation. Based on our model, it is the ability to borrow in upcoming years that influences how government grants affect fund-raising expenses. Therefore, higher interest expenses incurred at $t$ reflect either larger interest rates or principal borrowed at time $t - 1$. Thus, these expenses provide information on the cost of borrowing additional funds at time $t$. Larger interest rates signal a riskier firm from a creditor’s perspective. Moreover, take two firms with similar characteristics (i.e., assets, interest rate) such that their current credit access is equal. If one firm borrows more than the other, this firm has a higher debt ratio. Relative to the firm with lower principal, this firm is a less attractive credit risk to the bank and thus, is more credit constrained in borrowing additional funds. These riskier firms should face increased interest rates in the future. Thus, higher interest expenses imply less future access to the credit market. We

\footnote{We thank the Urban Institute for access to the data.}
multiply interest expenses by \(-1\) so that larger \(m\) measures increased credit access. As a robustness check, we also use interest expenses divided by assets and total investment securities as alternative measures of credit access, \(m\). Our results, including the results for government grants, are consistent with those reported in Table 2.\(^{12}\)

We also control for other financial characteristics. Firm size is measured as assets at the beginning of the fiscal year (ASSETS).\(^{13}\) In addition, firms receive revenues not only from donations and government grants but also from mission-related services, also called 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 (15). In other specifications not reported in this paper, we controlled for several other financial variables. The results were very similar to the reported results.\(^{14}\)

We should note that much of our empirical strategy, including sample, regressor, and specification choices, closely follow recent work in the literature (Payne, 1998; Okten and Weisbrod, 2000; Andreoni and Payne, 2003). Our objective is to ensure that our work is easily comparable to these studies and that as much as possible, any potential differences are not a function of data choices. To that effect, we focus our analysis on social and human service organizations since these organizations often depend heavily on donations. The dependence on donations makes these nonprofits 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 nonprofits into 26 broad categories from Arts to Health Care to International. Following Andreoni and Payne (2003), our sample contains nonprofits with a mission related to

\(^{12}\)The only exception is that the coefficient on \(m\) is still negative as reported in Table 2 but is insignificant when we use investment securities as our credit access measure. The interaction effect remains positive and significant.

\(^{13}\)Some studies use age to control for reputation effects, but find counterintuitive results. See Okten and Weisbrod (2000). Reputational effects, which presumably enhance fund-raising productivity are likely correlated with size for which assets is our measure.

\(^{14}\)Results provided upon request.
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). 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 unemployment insurance, retirement, welfare, veterans, Medicare and Medicaid are additional control variables in each specification (UNEMPINS, PAYRET, WELBEN, VETBEN, MEDICARE, MEDICAID respectively).

Even though the financial information in the SOI data is verified, we still delete observations with implausible or missing information from the sample. Organizations reporting negative indirect contributions, total contributions, 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 deleted observations with implausible or missing information from the sample. Organizations reporting negative indirect contributions, total contributions, 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

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15 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.
16 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 2 and 3 were very similar.
17 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.
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 nonprofits, this deletion essentially ensures that our sample focuses on larger organizations. If these larger organizations have greater credit access and our theory is correct, then our results will underestimate the coefficients on government grants in equation (15). Thus, in some sense, we are providing a lower bound on the sensitivity of nonprofits to changes in government grants. After these deletions, we have 1080 nonprofits in the sample for a total of 10,000 firm-year observations. For equation (15), we need contemporaneous and lagged government grants and therefore delete observations where the difference between periods is more than 1 year. This leaves 8,287 firm-year observations and 1,027 firms for the crowd-out regressions.

Table 1 reports the descriptive statistics for the variables where all economic variables are adjusted for inflation using 1985 as the base year. On average, nonprofits earn more revenue from total direct contributions ($F$) than from government grants. We find wide variation in the level of all firm financial characteristics including donations, government grants, fund-raising expenditures, and credit access. Thus, controlling for industry and firm effects will likely be important. Moreover, even though our sample is primarily large NPs, we observe enough variation in access to the credit market to test our hypothesis that firms with greater credit access are less responsive to changes in government grants.

### 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 nonprofits 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). That is,

\[
LOFIRM_{i,j,k} = \sum_{\ell} G_{\ell,j,k} \quad \text{where} \quad \ell \neq i
\]  

(17)

and

\[
LOINDUS_{i,j,k} = \sum_{\ell} \sum_{n} G_{\ell,n,k} \quad \text{where} \quad n \neq j
\]  

(18)

In addition, recall that the SOI only contains a random sample of smaller nonprofits. However, weights included in the dataset are used in order to represent the entire nonprofit population and accurately measure the total level of government grants within a state. We use total government grants rather than the average in order to account for the size of the nonprofit market within a state which is related to the demand for nonprofits.\(^{18}\)

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; An-

\(^{18}\)We ran the first stage using the average rather than the total and found these to be weak instruments.
dreoni and Payne, 2003). To test the validity of the instruments, we perform a Wald test for the significance of the instruments in the first-stage. In addition, tests for the exogeneity of government grants and overidentification are reported. For the crowd-out regression (equation (15)), we employ a traditional Hausman test for exogeneity where OLS and 2SLS estimates are compared. As is common, we encountered singularity of the differenced variance-covariance matrix for the production function regression (Hausman, 1978; Wooldridge, 2002). Exogeneity is therefore tested using a regression based approach. The residual from the 1st stage regression is included as a regressor in the primary equation. If the residual is significant in explaining donations, then we reject exogeneity of government grants (see Hausman, 1978 or Wooldridge, 2002 for more details).

3.4 Panel Data Techniques

We employ panel data techniques for the estimation of equations (15) and (16), including year fixed effects in both empirical specifications. As seen in Table 1, a large degree of variation exists between the amount of dependence on donations and government grants, thus creating wide differences in fund-raising expenditures. Much of this variation is between industry types rather than within industries, suggesting that industry fixed effects may yield more explanatory power than firm fixed effects. Indeed, for the production function regression, we find that industry fixed effects are jointly significant. Since both industry and firm fixed effects cannot be included simultaneously due to perfect collinearity, we therefore use industry fixed effects and then include firm random effects to further account for any idiosyncratic variation within an industry type.\textsuperscript{19} Traditionally, a Hausman test is performed to assess whether a random effects specification is more appropriate than fixed effects. However, since a firm fixed effects specification cannot include the industry fixed effects, the random and fixed effects do not have the

\textsuperscript{19}We ran the regression with firm fixed effects and obtained the same signs for the fund-raising productivity effect. However, the direct donor crowd-out was larger than 1 providing additional evidence that the random effects specification is superior.
same number of coefficients. Thus, a formal Hausman test could not be performed. We instead report the Breusch-Pagan test for random effects.

For equation (15), industry fixed effects are not jointly significant in explaining variations in fund-raising expenses, after controlling for our other regressors. This result is likely due to the fact that program service revenues and assets vary by industry and therefore leave little idiosyncratic variation to be identified by the industry fixed effects. Now, without the industry effects, we can construct a formal Hausman test of fixed versus random effects. We reject a random effects specification in favor of a fixed effects specification. We therefore present regression results with firm fixed effects for the crowd-out regression.

4 Empirical Results

Tables 2 and 3 present the estimation results for equations (15) and (16) 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. However, the instruments, particularly LOINDUS, are stronger for the production function than for the crowd-out regression.\textsuperscript{20} We therefore provide estimates using both instruments simultaneously and then separately to assess the robustness of our results. We fail to reject overidentification for both regressions and strongly reject exogeneity of government grants for Table 2. Exogeneity is only weakly rejected for the production function specification but the OLS results in terms of sign and significance are consistent with the instrumented estimates.

Our findings in Table 2 provide support for our theoretical hypotheses. The results indicate: (i) the importance of credit market access; and (ii) a negative fund-raising response to changes in future government grants. When we do not control for credit access (columns 2, 4, 6), government grants received at time \( t - 1 \) increase fund-raising

\textsuperscript{20}Complete first stage results are provided in Appendix.
expenses. Conversely, the coefficient on $G_t$ is negative although insignificant, but only slightly so. However, the point estimate is not only consistent with our theory but also with previous findings (Andreoni and Payne, 2003). Moreover, the ambiguity in the sign of contemporaneous government grants is expected since the revenue adjustment effect works against the reallocation effect.

When we control for credit access in specifications (3), (5), and (7), we find that $G_{t-1}$ becomes insignificant. However, the total effect of $G_t$ is given by:

$$\alpha_1 + \alpha_4 m$$

and is jointly significant and negative. Evaluating $\frac{df}{dG_t}$ at the mean level of interest expenses (column 3), we find that a one dollar increase in government grants decreases fund-raising expenditures by 7 cents, very similar to the 5.4 cents found in Andreoni and Payne (2003). Moreover, the coefficient on $m \times G_t$ is positive which works against the negative point estimate of $\alpha_1$. This result suggests that more credit-worthy firms are less responsive to changes in government grants. The diminished response occurs because resource allocation via fund-raising expenses is unnecessary when firms can have credit market access.

At this point, we cannot rule out the possibility that the fund-raising productivity effect is driving the negative coefficient. That is, if $F_{fG}$ is negative, then the overall inverse relation between fund-raising and government grants could stem from the resource allocation effect, the fund-raising productivity effect, or both. We therefore turn to Table 3 to examine whether the resource allocation effect is the main determinant.

Table 3 presents evidence, like previous studies, 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 specification (2) indicate that one additional dollar of government grants decreases individual donations by about 86 cents. Although larger in magnitude than Payne (1998), the level of crowd-out is still consistent with the previous literature. As expected, we also find a positive
relation between fund-raising expenditures and total funds raised.

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. More government grants raise the marginal productivity of fund-raising. Thus, we find evidence that $F_{FG}$ is positive. This relation suggests that government grants provide a credible signal of quality to donors and can be used to garner greater financial support for the organization. In essence, government grants may be an advertising mechanism for nonprofits.

The interaction effect is also a second-order effect on funds raised. Combining the direct donor crowd-out effect with the interaction and evaluating at the mean for specification (3), we find that the overall marginal effect of government grants with respect to donations equals $-0.8457$. Notice that, failure to control for the cross-derivative may create a bias on the direct crowd-out. Specification (2) without the interaction term produces a $-0.8588$ point estimate of crowd-out. This slight positive bias is directly attributable to the positive fund-raising productivity effect.

Relating our findings back to Proposition 4, $F_{FG} > 0$ implies that the resource allocation effect is the only component driving $\frac{df}{dG_2}$ negative. Thus, the negative coefficient on $\frac{df}{dG_2}$ and the significant role of the credit variable in Table 2, indicate that the fund-raising and the revenue adjustment effect are dominated by the resource allocation effect. Therefore, resource allocation over time appears to strongly affect nonprofit firm behavior.

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 as opposed to the common expla-
nation of crowd-out. 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 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 evidence suggests that NPs’ efforts to allocate resources over time explains the observation that fund-raising expenditures decline with increases in grants.

Our results suggest that a fall in fund-raising is perfectly consistent with efficient NP behavior, once we take into account the incentives for nonprofits 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.

6 Citations

References


Ben-ner, Avner (1986) “Nonprofit Organizations: Why Do They Exist in Market Economies?” in Rose-Ackerman, Susan, ed., *The Economics of Nonprofit Institu-


<table>
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<th>Variable</th>
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<th>Standard Deviation</th>
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<th>Max</th>
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<td>414,200.20</td>
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N=10000

Note: STINC-VETBEN are measured at the state level.
## Table 2

### Firm Crowd-out Estimation

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<th>Variable</th>
<th>(1)</th>
<th>(2)</th>
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<th>(4)</th>
<th>(5)</th>
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Note: Standard errors in parentheses. *, **, *** correspond to significance at $\alpha = .10, .05,$ and .01 respectively. We used fixed effects panel estimation for this regression. Specification (1) presents the OLS estimates while specifications (2)-(7) are 2SLS where the instruments are LOFIRM, LOINDUS or both. We report the Wald test for the significance of the instruments as well as tests for exogeneity and overidentification of the instruments.
### Table 3

**Fund-raising Production Function Estimation**

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Note: Standard errors in parentheses. *, **, *** correspond to significance at $\alpha=.10, .05, \text{and } .01$ respectively. We used random effects panel estimation for this regression. Specification (1) presents the OLS estimates while specifications (2)-(5) are 2SLS where the instruments are LOFIRM, LOINDUS or both. The Breusch-Pagan statistic tests for whether the random effects specification is superior to pooled OLS. We report the Wald test for the significance of the instruments as well as tests for exogeneity and overidentification of the instruments.
## Appendix A: First Stage Regressions

Table A.1

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<td>(0.0023)</td>
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Wald test of state-level controls 3.2500 3.2200 3.78 3.7300 3.1400 3.1100
p-value 0.0000 0.0000 0.0000 0.0000 0.0001 0.0001

Note: Standard errors in parentheses.
* *, **, *** correspond to significance at $\alpha=.10, .05$, and .01 respectively
Table A.2

First-Stage for Production Function

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Wald test of state-level controls 66.7700 81.2500 62.9200
p-value 0.0000 0.0000 0.0000
Wald test of industry-level effects 39.4100 41.8200 39.3200
p-value 0.3625 0.2694 0.3666

Note: Standard errors in parentheses.
*, **, *** correspond to significance at $\alpha=.10, .05, \text{ and } .01$ respectively.
Figure 1a: Direct Crowd-Out Effect

Figure 1b: Fund-raising Productivity Effect