# Does Market Size Matter for Charities?

Simon Lapointe[a], Carlo Perroni[b,c], Kimberley Scharf[d,e,c], Janne Tukiainen[a,f,*]

[a] *VATT Institute for Economic Research, Arkadiankatu 7, FI-00101, Finland*
[b] *University of Warwick, Department of Economics, Gibbet Hill Road, Coventry, CV4 7AL, UK*
[c] *CESIfo*
[d] *University of Birmingham, Department of Economics, Edgbaston, Birmingham, B15 2TT, UK*
[e] *CEPR*
[f] *London School of Economics and Political Science, Department of Government, Houghton Street, London WC2A 2AE*

**Abstract**

We analyze implications of market size for market structure in the charity sector. While a standard model of oligopolistic for-profit competition predicts a positive relationship between market size and firm size, our analogous model of competition between prosocially motivated charities predicts no such correlation. If charities are biased towards their own provision, a positive association between market size and provider size can arise. We examine these predictions empirically for six different local charity markets. Our empirical findings suggest that charities do not solely pursue prosocial objectives, and that increased competition in the charity sector can lead to rationalization in provision.

*Keywords:* Competition in charity sectors, Market structure
*JEL:* H41, L11, L13, L31, L33

*Corresponding author.

*Email addresses:* simon.lapointe@vatt.fi (Simon Lapointe), c.perroni@warwick.ac.uk (Carlo Perroni), k.scharf@bham.ac.uk (Kimberley Scharf), janne.tukiainen@vatt.fi (Janne Tukiainen)

**Highlights**

- We provide novel theoretical results on oligopolistic competition in the charity sector.
- Non-prosocial bias towards own provision leads to excessive entry.
- Increased competition in larger markets can lead to rationalization of entry and production choices in the charity sector as it does in the for-profit sector.
- We show evidence of non-prosocial motives for Canadian charities.

## 1. Introduction

There is growing interest in the question of how to measure performance in the provision of collective goods (Atkinson, 2005; Simpson, 2009). As the not-for-profit sector is responsible for providing a sizeable share of collective goods and services and receives a substantial amount of direct or indirect financial support from government,[1] there is also specific interest in the performance of not-for-profit providers and its determinants.[2]

In this paper, we study how inter-charity competition shapes entry decisions and market structure in charitable sectors.[3] This question is important, because the design of optimal government policies vis-à-vis the charitable sector is likely to depend on the answer.

We offer a new model of oligopolistic competition between charities providing horizontally differentiated goods and services, as well as the first empirical analysis of competitive conduct in different charitable sectors.[4] Charities operate in different areas and have different geographical scope; but they also differ in their precise roles. Because of this, when evaluating implications of the number of charities competing within a particular location and charitable activity, one must account for variety effects as well as technological considerations. In the presence of product differentiation, the key trade-off driving economic performance is between the fixed costs incurred by each charitable provider and the additional benefits delivered by the distinctiveness of that provider's offering. To date there has been no systematic attempt to derive a

[1]For example, in the United Kingdom in 2017, the annual gross income from 168,237 charities in the UK was £75.35 billion, with those charities receiving almost £3.8 billion of tax relief from the UK government (see www.gov.uk/government/statistics/cost-of-tax-relief); in Canada in 2016, tax relief for 86,000 registered charities was about CDN$8.5 billion, that is, 67% of the sector's annual income of approximately CDN$12.8 billion (see www.canadahelps.org/en/the-giving-report/).

[2]We use the words charity and not-for-profit here interchangeably as our analysis applies to both not-for-profits that rely on donations and those that rely on sales for revenue.

[3]This question has been little studied in the academic literature, which has mostly focused on donors' choices – for example, on how tax incentives can promote charitable giving (studies include Almunia et al., 2018; Scharf and Smith, 2015).

[4]Implications of policy reforms for competition and quality of provision of health services have been analyzed extensively (e.g., see Propper et al., 2008; Cooper et al., 2011). However, these studies do not focus on entry (a recent exception being the theoretical analysis of Besley and Malcomson, 2016) or market structure. Other studies (including Gaynor and Vogt, 2003; Gaynor and Town, 2011; Capps et al., 2010) have asked if the choice of organizational form affects the pricing decisions of competing hospitals; but these studies abstract from entry decisions. There is research on the effect of competition on entry decisions of hospitals, but there are very few contributions looking at other types of private providers of public goods, which is what we are interested in doing here; a recent exception is Bowblis (2011), who examines, among other things, the effect of public insurance on closures of for-profit and not-for-profit nursing homes respectively. One paper that focuses on entry in the broader not-for-profit context is Lakdawalla and Philipson (2006), but their interest is on the question of selection of organizational form through entry decisions, and not, as is ours, the implications of market size on market structure in a not-for-profit context. Two recent related studies are Scharf (2014), which presents a theoretical model of competition between charities and charity selection; and Perroni et al. (2018), which examines the effect of coordination on efficient charity selection. The paper by Gaynor and Town (2011) contains a comprehensive and fairly recent overview of the literature.

theory of not-for-profit competition under product differentiation that can be directly compared to and related to analogous models used to study and measure competition in the for-profit sector.

As a benchmark case, we first model competition between for-profit firms providing symmetrically differentiated products under conditions of free entry and through technologies that give rise to economies of scale in production (resulting from a combination of fixed costs and linear variable costs). To adapt this framework to the not-for-profit case, we incorporate the key feature that differentiates a for-profit organization from a not-for-profit organization – namely, charities face a non-distribution constraint. This requires them to balance revenues and expenses over time "on average", which in turn shapes their conduct "on average", preventing them from pursuing profit maximization. In our analysis, we consider both the case where charities' motivation is purely prosocial, that is, when their objective is the maximization of social surplus, and the case where charities are biased towards their own activities and are therefore also driven by non-prosocial motives (as in Scharf, 2014).

Our model generates the usual predictions for the for-profit sector – both the number of firms and their average size will increase in market size, as in Bresnahan and Reiss (1991). Intuitively, under oligopoly firm size is inefficiently low because of excessively high mark-ups; larger markets are more competitive and result in lower mark-ups, which in turn requires a larger volume of sales to cover fixed costs. An increase in market size can thus bring firm size closer to its socially optimum size, promoting rationalization in production. The results for the not-for-profit case when providers are fully prosocially motivated are strikingly different: an increase in market size raises the number of providers (proportionally) but has no effect on the size of individual providers (which always remains equal to its social optimum). In contrast, when not-for-profit providers are biased towards their own activities, they will be inefficiently small, since this bias causes over-entry. In this case, an increase in the market size increases number of providers less than proportionally, and also raises the size of individual providers, and thus, leads to rationalization in production. However, this mechanism is different from the one operating in the for-profit case. For not-for-profits, larger markets already serve more varieties, making it harder for a provider that is partially driven by prosocial motives to justify adding new varieties at the expense of a decrease in the scale of provision of existing varieties. The model thus delivers testable predictions concerning the relationship between market size and average producer size, and these predictions are distinctively different depending on providers' competitive conduct and motives.

We then test empirically whether these predictions hold in panel data for registered Canadian charities. We study six different charitable sectors providing local goods and services: food and clothes banks, daycare, housing, senior care, disabled care, and festivals and performances. We find that market size (defined as population at the municipality level) is positively correlated with both average charity size (expenditures and number of employees) and the number of charities, with the latter increasing less than proportionally with market size. Neither of these findings should arise in a setting of not-for-profit competition amongst charities that are purely driven by prosocial motives; however, they are consistent with a scenario where the charities are biased towards their own output. The results on charity size are not robust across all specifications, in particular to including market level fixed effects, but further results that compare the elasticities in the not-for-profit sectors to elasticities in comparable for-profit sectors provide additional support for the presence of non-prosocial motives, as does our analysis of the association between competition and fundraising in the data. Despite the overall pattern of results pointing towards non-prosocial motives, the evidence is not conclusive as it suffers from occasional imprecisions, non-robustness, and potential endogeneity issues.

Our findings have direct implications for the debate on the effects of government policies targeted at the charitable sector, a debate that has largely ignored how public policies affect inter-charity competition and market performance. Our analytical framework predicts that, when charities are biased towards their own output, free entry can result in charities that are inefficiently small relative to their socially optimal size. Government intervention may then be warranted to discourage excessive entry, inducing charities to raise their size and optimally exploit economies of scale. Even in the absence of government intervention, however, an increase in market size that leads to increased competition amongst non-profits can be counted on to mitigate inefficient entry as it does in the for-profit case, but for very different reasons. This also suggests that there may be a comparatively stronger need for direct corrective measures in not-for-profit markets that are comparatively small, either because they address a need that has a comparatively more limited scope or because of the limited geographical reach of charities' activities.

To the best of our knowledge, our study is the first to investigate the relationship between market size and provider size in the not-for-profit sector. The departure from profit maximization in the context of not-for-profit competition has been investigated by others; as mentioned, however, that literature has focused mainly on the provision of education and health services. Here we focus on more broadly defined not-for-profits. There have been a few contributions studying inter-charity competition, but these have focused mainly on the implications of organizational form,[5] and/or differential regulatory and tax regimes.[6] The mechanics of entry in the not-for-profit sector, and their implications for market structure in the charitable sector have received scant attention. This is rather surprising, as it is hard to find another category of economic activity for which competition would not be at the center of any analysis of economic performance. In striking contrast, the competitive conduct of firms in the profit sector and its implications for industry structure have been studied extensively by a long and established literature.

[5]See for example, Alchian and Demsetz (1972); Hansmann (1980); Easley and O'Hara (1983); and Glaeser and Schleifer (2001).

[6]For example, Lakdawalla and Philipson (2006).

The rest of the paper is structured as follows. The next section introduces a theoretical model that compares competition outcomes for for-profit firms and for not-for-profit providers. Section 3 describes the data, the estimation procedures and the empirical results. Section 4 concludes.

## 2. Market Size and Market Structure

We describe parallel models of oligopoly competition under conditions of free entry for the for-profit and the charity sectors. Our aim is to make both of these models as simple as possible and as comparable as possible, both with respect to each other and with respect to standard theories of competition between providers.

In our analysis, we take market size (defined in terms of the aggregate value of demand) as exogenous, and model how the equilibrium size and number of providers vary endogenously with exogenous changes in market size. In this sense, the model is a partial-equilibrium model that abstracts from endogenous effects on market size arising from changes that occur in other markets – or, equivalently, as a general equilibrium model in which the the cross-price elasticity of demand of the good produced in the market under consideration is zero. In turn, exogenous variation in market size in the model can be thought of arising from variation in income and/or population or variation in the level of demand itself.

### *2.1. Preferences, Technologies, and Optimal Industry Structure*

Consider an economy with a large number of consumers having identical incomes and identical preferences for symmetrically differentiated varieties of a given good produced by $N$ providers. Preferences have a CES structure (as in Dixit and Stiglitz, 1977), with primal, linearly homogeneous representation (in terms of utility)

$$U = \left( \sum_{i=1}^{N} {q_i}^{(\sigma-1)/\sigma} \right)^{\sigma/(\sigma-1)}, \quad \sigma > 1, \tag{1}$$

where $q_i$ is consumption of variety $i$ – the variety produced by provider $i \in \{1, \ldots, N\}$ – and $\sigma$ is the (constant) elasticity of substitution between different varieties. With identical preferences and incomes, the utility of a representative individual (1) coincides with social welfare.

The total spend by consumers on all varieties (i.e. market size) is $M$. Providers face identical costs, $C(q_i) = F + c\, q_i$ for producing a given quantity $q_i$ of their variety, where $F$ represents fixed costs, and $c$ is a constant marginal cost.

We characterize outcomes for two different industry structures, namely competition between for-profit providers and competition between charities. The planning optimum, which is common to the two scenarios, is found by maximizing the level of welfare (which coincides with (1)) by choice of $N$ and for $q_i = q$ for all $i$, subject to the resource constraint $N(c\,q + F) = M$. This gives

$$N^* = \frac{M}{\sigma F}\,, \tag{2}$$

which increases proportionally with market size, $M$. The socially optimal provider size, measured as the sum of variable and fixed costs, is

$$s^* = \frac{M}{N^*} = \sigma F\,, \tag{3}$$

which is independent of market size, $M$, and corresponds to a level of output (quantity) per provider equal to $q^* = (\sigma - 1)F/c$. The feature that, under symmetric product differentiation, optimal provider size is invariant to market size — a property that is central to the analysis that follows — holds under general conditions and does not hinge on preferences being of the CES form.[7]

*2.2. The For-profit Case*

We next derive predictions about the relationship between market size and market structure in a model of for-profit oligopolistic competition under symmetric product differentiation.

The dual representation of (1) in terms of the unit cost of utility, $P$, is

$$P = \left( \sum_{i=1}^{N} {p_i}^{1-\sigma} \right)^{1/(1-\sigma)}, \tag{4}$$

where $p_i$ is the price of variety $i$. From this, using standard principles, we can derive an expression for uncompensated demand for variety $i$:

$$q_i = M\,P^{\sigma-1}\,{p_i}^{-\sigma}. \tag{5}$$

Profits for firm $i$ are $\pi_i = (p_i - c)q_i - F$, and associated revenues are $r_i = p_i q_i$. Each firm, $i$, then chooses $p_i$ so as to maximize its own profits while taking the pricing choices of all other firms, $p_{-i}$, as given. For a given $N$, a symmetric non-cooperative equilibrium in pricing choices, $p_i = p$, $\forall i$, is identified by the condition

$$\left| \frac{\partial \pi_i}{\partial p_i} \right|_{p_i = p\ \forall i} = 0. \tag{6}$$

[7]A general formulation of symmetric product differentiation specification with preferences defined by a utility function of the form $U = \sum_{i=1}^{N} v(q_i)$, $v'(.) > 0$, $v''(.) < 0$, still implies that optimal provider size is independent of market size. A departure from symmetric product differentiation – as reflected by a utility function of the form $U = \sum_{i=1}^{N} v_i(q_i)$, where the $v_i(.)$'s are product-specific – could cause the result to break down.

This gives $p_i = p = c\left(1 + \frac{N}{(N-1)(\sigma-1)}\right)$, $x_i = x = \frac{M}{Nc}\frac{(N-1)(\sigma-1)}{1+(N-1)\sigma}$, $\forall i$, and so

$$\pi_i = \pi = \frac{M}{1+(N-1)\sigma} - F, \ \ \forall i. \tag{7}$$

In an equilibrium with free entry, we must have $\pi_i = \pi = 0$, $\forall i$. This identifies an equilibrium number of firms, $N$, as

$$N = \frac{M + (\sigma-1)F}{\sigma F} > \frac{M}{\sigma F} = N^*; \tag{8}$$

and thus an equilibrium firm size (variable plus fixed costs, which in equilibrium must equate revenues) equal to

$$s = r = M/N = \frac{\sigma F}{1 + (\sigma-1)F/M} < \sigma F = s^*. \tag{9}$$

**Proposition 1.** *An increase in market size produces a less-than-proportional increase in the number of for-profit firms along with an increase in the size of individual firms.*

PROOF: The effect of an increase in $M$ on the number of firms, $N$, after replacing $M$ with $(\sigma-1)F\,r/(\sigma F - r)$ from (9) into (8), can be expressed as

$$\frac{\mathrm{d}N}{\mathrm{d}M}\frac{M}{N} = \frac{r}{\sigma\,F} < 1. \tag{10}$$

where the inequality comes from (9). The effect of an increase in $M$ on charity size, $s$, is

$$\frac{\mathrm{d}s}{\mathrm{d}M}\frac{M}{s} = \frac{\sigma\,F - r}{\sigma\,F} > 0, \tag{11}$$

where $s$ equals firm revenues, $r$. □

The equilibrium number and size of providers in a for-profit oligopoly equilibrium with free entry, as identified by (8) and (9), differ from their socially optimum counterparts: the number of firms is inefficiently large and firm size is inefficiently small ($N > N^*$ and $s < s^*$). An increase in market size causes firms to become larger and closer in size to the socially optimal size (for $N$ approaching infinity, condition (9) coincides with the condition identifying the socially optimal firm size); i.e., a larger market brings about rationalization in production choices. Intuitively, an increase in market size induces entry by new firms, causing the demand faced by individual firms to become more price elastic; this lowers mark-ups and gross profit margins, which implies that, in order to be able to cover fixed costs and break even in a zero-profit equilibrium, each firm must earn greater revenues.

This result parallels the prediction tested by Bresnahan and Reiss (1991) with reference to an oligopolistic setting where firms produce a homogeneous good but face increasing marginal costs. In their model, as in ours, under oligopoly competition between for-profit providers there is too much entry resulting in a suboptimal firm size; an increase in market size then raises competition and brings firm size closer to its socially optimal level.[8]

A formulation with CES preferences provides an ideal benchmark for modelling the relationship between competition and firm size, because it implies that for $N$ large – i.e. under "monopolistic competition" – the decentralized market outcome coincides with a social planning optimum (Dixit and Stiglitz, 1977), which would generally not be the case with non-CES preferences. So, in this model, if the number of competing firms is sufficiently large, an increase in market size has no effect on firm size. This means that effects of market size on firm size stem only from oligopolistic responses (for $N$ small), and that they asymptotically vanish as competition increases.

### *2.3. Charity Markets*

Charities – be they donative charities (non-commercial, i.e. receiving donations) or commercial charities (charging a price for its output) – differ from for-profit organizations because they face a non-distribution constraint, i.e. they cannot disperse any surplus of revenues over costs. So, although they can incur surpluses and losses in the short run, on average (i.e., in a long-run sense) their revenues cannot depart from their expenditures,[9] and so there is no scope for them to pursue a profit maximization objective.

The discussion in this section relates to the donative charity case, which directly implies marginal cost pricing; but it can be shown that the same analysis and results also apply to the case of commercial charities – provided that they operate under the same non-distribution constraint. In deriving results for the not-for-profit case, we also abstract from the public good nature of output – if present (the case where charities provide public goods is addressed later, when we discuss results). We consider a scenario where active charities are simply passive recipients of donations; the only decision they make is whether or not to become active (entry), a decision that precedes donors' giving decisions. We start by examining the case of perfectly prosocially motivated charities whose payoff coincides with social welfare, and then examine the implications of departures from a pure pro-social objective.

Suppose that the number, $N$, of active charities is given. Focusing on symmetric noncooperative equilibria, a binding non-distribution constraint means that, in order for providers not to incur a loss, the donations, $d_i$, received by provider $i$ must cover

[8] A classic paper demonstrating the possibility of excess entry in equilibrium is Mankiw and Whinston (1986). See Amir et al. (2014) for an example of a recent extension of that framework.

[9] Many not-for-profit organizations, such as schools and hospitals, routinely run current-account surpluses that translate into capital-account investments that allow the organization to grow in size. Even if sustained indefinitely, this pattern is consistent with the organization breaking even in present value terms, with donors anticipating this and carrying out a forward-looking calculation analogous to the one we describe here for a static environment. As a robustness check, in our empirical analysis we look at how market size affects both average expenditures and average revenues of providers.

full costs, $c\,q_i + F$, and so $q_i = (d_i - F)/c$. At the margin, however, donors face a marginal cost of provision equal to $c$.[10] The allocation of the total spend, $M$, that maximizes utility (1) from the point of view of donors is then identified by the conditions $\frac{\sigma-1}{\sigma}\left(\frac{d_i - F}{c}\right)^{-1/\sigma} = c$, $\forall i$, and $\sum_{i=1}^{N} d_i = M$. These give

$$d_i = d = M/N, \tag{12}$$

and

$$q_i = q = \frac{M/N - F}{c}. \tag{13}$$

The associated level of utility is $N^{\sigma/(\sigma-1)}(M/N - F)/c \equiv \widehat{U}(N)$, and provider size is $M/N \equiv \widehat{s}(N)$.

Denoting with $\Gamma^E(N)$ the payoff for a participating representative provider if $N$ providers are present in total, and with $\Gamma^X(N)$ the payoff for a representative provider if $N$ providers are present and the provider in question does not participate, the marginal entry decision, characterizing an equilibrium level of $N$ in a symmetric outcome, is then identified by the level of $N$ for which $\Gamma^E(N) \geq \Gamma^X(N-1)$ and $\Gamma^E(N+1) < \Gamma^X(N)$. The payoff for a fully prosocially motivated, not-for-profit provider coincides with social welfare, and thus equals $\widehat{U}(N) = \Gamma(N) = \Gamma^E(N) = \Gamma^X(N)$; the marginal entry decision is then simply given by the inequalities $\widehat{U}(N) \geq \widehat{U}(N+1)$ and $\widehat{U}(N) \geq \widehat{U}(N+1)$, or, in differential terms (i.e. allowing $N$ to vary continuously),

$$\frac{\mathrm{d}\widehat{U}}{\mathrm{d}N} = N^{1/(\sigma-1)}\,\frac{M/N - \sigma F}{(\sigma-1)\,c} = 0. \tag{14}$$

This gives

$$N = \frac{M}{\sigma F} = N^*. \tag{15}$$

and so $q = (\sigma - 1)F/c$, which in turn gives

$$s = r = c\,q + F = \sigma F = s^*; \tag{16}$$

i.e. fully prosocially motivated providers should replicate the socially optimum out-

[10] A substantial fraction of charities' revenues come from government, but this need not affect charities' and donors' marginal calculations; i.e. if $X$ is a government grant and so $q_i = (d_i - F + X)/c$, the marginal cost of provision faced by donors is still $c$. Matching government grants or tax relief for donations, on the other hand, can affect the price of giving and thus marginal giving incentives. The implications and effects of these incentives have been studied by a large literature (which includes Feldstein and Clotfelter, 1976; Roberts, 1987; Scharf, 2000; Bakija and Heim, 2011; Almunia et al., 2018). We will touch on the role of donation subsidies later when we discuss government policies that could be used to correct for excessive entry.

come – which, as previously discussed, is independent of market size. This immediately delivers the following result:

**Proposition 2.** *If charities are fully prosocially motivated, an increase in market size produces a proportional increase in the number of charities, and so it has no effect on the size of individual charities.*

Unlike in the for-profit case, increased competition in a larger market between prosocially motivated, not-for-profit providers does not produce a downward pressure on mark-ups that induces providers to become larger – there are no mark-ups. Consequently, it has no beneficial effect on production choices, which always be efficient independently of market size.[11]

The assumption that charities are fully prosocially motivated is a strong one; and indeed a large literature has highlighted how charities may pursue objectives other than profit maximization or social surplus maximization, such as, for example, the maximization of own revenues (see the previously mentioned survey by Gaynor and Town, 2011).

A simple way of modelling a departure from the objective of surplus maximization is to amend $\Gamma^X(N)$ and $\Gamma^E(N)$ as follows:

$$\Gamma^E(N) = \mu\,\widehat{\omega}(N) + \widehat{U}(N), \tag{17}$$

where the first term, with $\mu \geq 0$, is a premium that the charity attaches to its own activities, above and beyond the charity's concern for social welfare (prosocial motivation), and $\widehat{\omega}(N)$ is a measure of own activities.[12] We will consider the implications of non-prosocial concerns based on two alternative measures: revenue, i.e. $\widehat{\omega}(N) = \widehat{r}(N) = M/N$, and market share, i.e. $\widehat{\omega}(N) = 1/N$.

While the social surplus component accrues to a charity independently of whether or not it enters the market, accrual of the non-prosocial component is contingent upon entry. The no-entry condition (14) must thus be amended as follows:

$$\mu\,\widehat{\omega}(N) + \frac{\mathrm{d}\widehat{U}(N)}{\mathrm{d}N} = 0. \tag{18}$$

The presence of a premium on own activities results in a divergence from optimality with respect to the number and size of providers operating in the charitable market: for $\mu = 0$, condition (18) coincides with the condition for social surplus maximization,

[11]These conclusions extend to commercial charities. If a charity is a prosocially motivated commercial provider pricing at average cost, then the symmetric provision equilibrium for given $N$ coincides with the one found under marginal cost pricing, as do entry choices.

[12]This specification is consistent with the literature incorporating additional elements over and above social surplus in charities' objectives. Much of that literature however, has not focused on entry decisions, but rather on the effect that these additional elements may have on ex-post competitive conduct.

i.e. it identifies the socially optimal number of providers for a given market size, $M$; an increase in $\mu$ from zero starting from the socially optimal $N$ makes the left-hand side of the above positive, and so $N$ must rise relative to a case with $\mu = 0$ (the total derivative $\mathrm{d}N/\mathrm{d}\mu$ evaluated at $\mu = 0$ is positive).[13]

Own-output biased, not-for-profit providers make positively biased entry decisions, resulting in excessive entry and a suboptimal scale of production. If charities are passive recipients of donations, the presence of an own-output bias cannot produce a direct positive effect on size for those charities that are active.[14] What it can do, however, is generate a positive entry bias, causing charities to be active even if, in terms of social welfare (i.e. from the point of view of donors), the variety gains from adding an additional provider do not justify incurring the additional fixed cost. In equilibrium, an above-optimal number of providers translates into individual providers being too small.

In this case, it can be shown that an increase in market size mitigates excessive entry:

**Proposition 3.** *If charities providers are partially prosocially motivated, being also concerned about their own revenue or their market share beyond social surplus, an increase in market size raises the size of individual charities. The number of charities rises less than proportionally with market size.*

PROOF: Considering first a scenario with revenue concerns ($\hat{\omega}(N) = r = M/N$), and letting $r = M/N$, we can rewrite the FOC as

$$\mu\,(\sigma - 1)\,\frac{r^{\sigma/(\sigma-1)}}{\sigma\,F - r} = M^{1/(\sigma-1)}. \tag{19}$$

Totally differentiating (18) with respect to $N$ and $M$, and using (19) to substitute for $M^{1/(\sigma-1)}$, gives

$$\frac{\mathrm{d}N}{\mathrm{d}M}\,\frac{M}{N} = 1 - \frac{\sigma\,F - r}{\sigma^2 F - r} < 1. \tag{20}$$

where the positive sign of the ratio in the second term follows from $\sigma\,F - r > 0$ and $\sigma > 1$ (implying $\sigma^2\,F - r > \sigma\,F - r > 0$). Totally differentiating (19) with respect to $r$ and $M$, and using (19) to substitute for $M^{1/(\sigma-1)}$, gives

$$\frac{\mathrm{d}s}{\mathrm{d}M}\,\frac{M}{s} = \frac{\sigma\,F - r}{\sigma^2 F - r} > 0; \tag{21}$$

where size, $s$, equals revenue, $r$. Proceeding in the same way for a scenario with market share

[13] Some of the literature on not-for-profits, for example, Philipson and Posner (2009) effectively assume that $\mu = \infty$, i.e. that not-for-profit providers only care about their own output.

[14] Fundraising competition might possibly do so, but not if charities compete for a fixed total amount, $M$, as is assumed here.

concerns, we obtain

$$\frac{\mathrm{d}N}{\mathrm{d}M}\frac{M}{N} = 1 - \frac{\sigma F - r}{\sigma F - r/\sigma} < 1; \tag{22}$$

$$\frac{\mathrm{d}s}{\mathrm{d}M}\frac{M}{s} = \frac{\sigma F - r}{\sigma F - r/\sigma} > 0. \tag{23}$$

□

The intuition for this result is that the marginal entrant balances the prosocial opportunity cost of entry – the second term in (18) – against the non-prosocial gains from entering – the first term in (18), which is proportional to size. The larger is market size (and thus the number of varieties provided) the smaller are the variety gains from having an additional variety being provided, and so the higher the net social cost to potential entrants (who are partially driven by prosocial motives) of adding varieties above the socially optimum number while sacrificing scale in the provision of existing varieties, which in turn discourages entry.[15]

Thus, if charities are biased towards their own activities, an increase in market size can mitigate incentives for excessive entry and raise provider size closer to its socially optimum level, as it does in the for-profit case. In the for-profit case, this happens because increased competition raises the elasticity of firm-specific demand and lowers mark-ups, which in turn forces firms to operate on a larger scale in order to cover fixed costs. In the not-for-profit case, the effect does not come from increased competition in the traditional sense of the term; rather, a larger market size raises the relative social cost of pursuing non-prosocial objectives.

### *2.4. Discussion*

The theoretical implications of our analysis are, in principle, empirically testable. On the basis of Propositions 2 and 3, if we observe provider size in charity markets to be invariant with respect to market size, this should be interpreted as a reflection of providers being purely prosocially motivated, whereas if we see provider size to increase in $M$, we should conclude that providers must be only partially prosocially motivated.

Our discussion has focused on scenarios where providers are homogeneous in terms of their technology and size. In Appendix A, we show that in a for-profit, monopolistically competitive scenario where the distribution of productivity types is Pareto – a

[15]For a given provider size, $r = M/N$, the absolute value of the marginal social cost of adding varieties above the optimum equals $(M/r)^{1/(\sigma-1)}\,(\sigma F - r)/(\sigma - 1)$, which is increasing in $M$. The prediction of Proposition 3 could be reversed if the marginal valuation of social welfare in the charities' objective was decreasing in the level of social welfare. In this case, the marginal effect of a given marginal deviation from the optimal level of social welfare is decreasing in market size. If the decline is large enough, a larger market size can weaken the effect of own-output bias relative to that of pro-social concerns, which discourages entry and raises size.

specification widely adopted in the literature that focuses on firm heterogeneity, following Hopenhayn (1992) – *average* firm size is invariant to a change in market size. The same is true for not-for-profit providers. Thus, under these conditions, even when providers are heterogeneous in terms of their size, effects of market size on firm size should come solely from oligopolistic responses. This also implies that an estimation strategy that focuses on the average size of charities in the market is appropriate whether or not firms are heterogeneous in size.[16]

We have abstracted from the fact that in many cases the goods that are funded by private donations and provided by charities are public goods. Accounting for the public good nature of not-for-profit provision, however, does not change the structure of the question or the conclusions. The main implication is that there are positive externalities that are not accounted for in the donation decision of individual donors, i.e. for any given variety the social effect on the quantity available for consumption from an additional dollar of donations towards that variety is larger than the corresponding private effect (the effect that is accounted for in donations choices) by a constant factor that equals the number of donors/users of the good. If income can also be used for private consumption – unlike in the formulation of preferences (1) that we have used to develop our arguments – then, for any given variety, the amount supplied will be below the social optimum. However, conditional on this wedge being in place for *any* number of providers, the (second-best) socially optimal level of $N$ is as before, and conclusions concerning the effect of an increase in market size on charity size are the same as for a scenario with private goods.[17]

We have also abstracted from the role of fundraising in the competition between charities for donors. Loosely speaking, fundraising can be thought of as lowering the perceived price of giving (or equivalently as raising the perceived benefits of giving) to donors, and so in this respect it has analogous effects to a donation subsidy. But unlike donation subsidies, fundraising involves real costs and so it inefficiently dissipates resources. Rose-Ackerman (1982) was among the first study to point to a link between the non-prosocial motives of competing charities and 'excessive' (socially wasteful) fundraising: for a given total spend, $M$, competitive fundraising reduces the funds available to finance provision and hence welfare (assuming that it does not directly affect the value of charities' activities), and so fundraising competition is a symptom of charities' conduct departing from social welfare maximization. From this perspective, if charities are, at least in part, driven by non-prosocial motives, we would ex-

[16] In our case, the distribution of charity sizes is broadly consistent with Pareto, that is, there are many small charities and a long tail of larger charities. Moreover, we show that our empirical results are robust to conducting the analysis at the level of individual charities instead of the market average.

[17] Suppose for example, that there are $K$ donors with identical preferences and all contributing to the same varieties of public goods; and that preferences are quasilinear in the public good composite, as defined by (1), with the utility function taking the form $y + \theta U^{\eta}$, with $\eta \in (0, 1)$. If we compare the cooperative and noncooperative levels of spending ($M$) on collective goods in this case, the noncooperative level is lower by a factor $K^{1/(\eta-1)} < 1$. However, other than for the fact that $M$ is at a suboptimal level, our analysis and results goes trough unchanged.

pect changes in the degree of competition between them to be reflected in changes in their fundraising efforts; and vice-versa, observing an empirical relationship between inter-charity competition and fundraising effort would be indicative of non-prosocial motives in inter-charity competition.

In theoretical terms, however, the sign of the relationship between the degree of competition and the intensity of charities' fundraising efforts is not a priori clear: having to compete with more charities may prompt a charity to do more fundraising, but it may also reduce the effectiveness of any given fundraising promotion, inducing a charity to reduce its fundraising efforts. In a model of differentiated charity provision (which assumes CES preferences as we do in ours), Castaneda et al. (2008) show that increased competition (an increase in the number of competing charities) is predicted to raise the share of charities' expenditures devoted to fundraising.[18] Thus, an increase in market size, provided it that raises the number of charities, should cause fundraising costs to rise in relative terms.

Finally, our theoretical framework can also provide testable predictions with respect to the comparison between for-profits and charities. This, however, requires making some additional ceteris paribus assumptions. For the same size and the same technology and preferences parameters ($F$, $c$ and $\sigma$), the theory predicts that, when charities' non-prosocial concerns relate to market share, the elasticity of provider size with respect to market size (expression (23)) should be larger in the not-for-profit case than in the for-profit case (expression (11)); i.e., assuming that the departure from optimal size is the same in both situations – in one case due to mark-ups in the other to a non-prosocial bias as represented by a positive $\mu$ – when we increase the market size, provider size should respond comparatively more in the not-for-profit case. If charities' non-prosocial concerns relate to revenues, on the other hand, the comparison is ambiguous. Also note that, since market size equals $M = Ns$ (where $s$ is size), if the positive elasticity of $s$ with respect to an increase in market size is larger for charities than it is for for-profit providers, then the positive elasticity of $N$ with respect to an increase in market size must be *smaller* for non-profits than it is for for-profits; and vice-versa.

There is a widespread presumption amongst both academic economists and practitioners that free competition is the most effective cure for monopolistic inefficiencies in private markets. Market enlargement, resulting either from increased economic activity or from integration of previously segmented markets (e.g. following a reduction in trade costs) intensifies competition, reducing the market power of individual firms and improving allocative efficiency. This idea is based on well-established notions of firms' incentives in for-profit markets; but previously it has not been clear if and how it carries over to the case of not-for-profit providers. If charities' motives depart from pure

[18] In their analysis an increase in inter-charity competition is modelled as an increase in the number of charities. In ours, the size of individual charities also changes; if there are scale economies in fundraising, there could be further effects on fundraising effort, which could compound with the effects described by Castaneda et al. (2008).

prosocial objectives, they will choose to operate at a scale that is sub-optimally small, just as in the for-profit case. In this case, any intervention that encourages charities to increase their size is efficiency-enhancing. Then, as we have shown, increased competition from a larger market size can correct for the excessive entry and sub-optimal size, just as in the for-profit case. The novel lesson is that for charities the effect operates through the tradeoff faced by providers between their prosocial and non-prosocial motives, rather than through a change in the elasticity of demand they face as in the for-profit case.[19]

## 3. Empirical Evidence

### *3.1. Data, Measurement and Sample Selection*

Charitable contributions in Canada are eligible for tax relief, with tax receipts provided to donors by the organizations to whom the donation is made. The Canada Customs and Revenue Authority (CCRA) keeps track of these tax receipts by requiring all issuing organizations to file an annual information return, the T3010, within a specified period after the end of the charity's financial year. Among other things, information contained on the forms includes charities' fiscal period end, their registration number, detailed information about their revenues and expenditures, their geographical areas of activities (municipal; provincial; national; international);[20] their full postal address; and a summary of their main activities. Our raw data consists of the universe of T3010 forms submitted to CCRA over the period 1997-2005 and 2011.

These data consists of 84,677 charities (in the year 2011). The most common type of charity is a religious organization, which we do not consider here. We focus on six charity service sectors that are likely to benefit only local residents, providing public services that could in principle be also provided by the public sector and that are well represented in the data: food and clothing banks, daycare centers, housing charities, senior care, disabled care, and charities organizing festivals and performances.[21]

Given the information available in our data, we could define geographic markets as municipalities (i.e., Census Sub-Divisions (CSD)), Forward Sortation Areas (FSA), Census Metropolitan Areas (CMA) or Census Agglomerations (CA). The market definition is important as the results are not robust to this choice. In Appendix C, we analyze in detail which option is preferable, concluding that CSDs define the relevant markets. In short, we provide both a theoretical argument and simulation evidence in support of

[19] A direct policy intervention to offset excessive entry would involve raising the cost of opportunity cost of entry, i.e. "taxing" entry. For example, government grants to charities could be structured so as to raise the opportunity cost of entry, either by limiting the extent to which funds can be used to cover entry costs or by rewarding larger, more established firms. A limitation of such an approach, however, is that there may be other good reasons for not adopting policies that could undermine charities' ability to deal with core costs (Perroni et al., 2018).

[20] This information is only available until 2008.

[21] These sectors and their selection criteria are described in more detail in the Appendix B.

the claim that, for the purpose of studying our question, focusing on markets that are too small can bias our estimates of the elasticity of provider size with respect to market size towards zero, while using markets that are too large does not lead to any bias. Reflecting this argument, we conduct our main analysis at three different geography levels: FSA (small), CSD (medium), and CMA/CA (large). We find that the results are consistent with CSDs being the relevant markets (or at least a good approximation). Indeed, assuming CSDs are the relevant markets, we would expect to find smaller estimates in the FSA-level analysis, since FSAs are often smaller than CSDs. We would also expect to find similar estimates in CMA/CA- and CSD-level analyses, since CMAs and CAs are strictly larger than CSDs. This is indeed mostly the case. In the pooled analysis of all six sectors (and in five of six individual charitable sectors), the elasticity of charity size with respect to market size is lower at the FSA level than at the CSD level. Similarly, in the pooled analysis and in four sectors, the estimates are comparable at the CSD and CMA level. Therefore, we are confident that CSD is the preferable unit of analysis in our case amongst those available.

Therefore, markets are defined at the level of Census Sub-Divisions (CSD), a statistical unit defined by Statistics Canada that usually corresponds to municipalities as defined by the provincial governments. As the borders of CSDs change often, such as when municipalities merge or secede, to keep our units of observation stable through our analysis, we use the 2011 CSD definitions to define our markets. We adjust the data from earlier years to correspond as closely as possible to 2011 CSDs. We then assign each charity to its market with geospatial software, using either the geographic coordinates of the charity (available until 2005), or the address and postal code (for 2011).[22]

Average charity size in a market is measured as the average of charities' total expenditures in the market. Market size is measured by the total population in the CSD. We construct a panel with information on market characteristics by linking our charity data to Canadian census data from years 1996, 2001, 2006 and 2011 at the CSD level, by linking 1996 Census data to 1997 charity information, and 2006 Census data to 2005 charity information. Being able to rely on a panel with five years intervals between each cross-section is useful for our estimation purposes, as it hopefully gives us information on within-market, over-time variation in market size – the main explanatory variable.

We complement our analysis of not-for-profit markets with a comparable data set on for-profits firms. Every business in Canada that fills an annual tax form (including the usual T2 but also the T3010 filled by charities) is included in the Canadian Business Register (BR), maintained by Statistics Canada. We have data from the BR from 2007 to 2011: Number of firms by employment category, Dissemination Area (small statistical area of 400 to 700 population) and 6-digit NAICS industry. We aggregate Dissemination Areas (DA) at the level of Census Subdivisions. Since a direct mapping between

[22] Appendix D explains the construction of our dataset in more detail.

DAs and CSDs is not available in Statistics Canada, we use GIS software and boundary files to allocate DAs to CSDs (see Appendix D for more details). The BR data contains employment information only by size categories and geographic unit. Unlike the charity data, it is not at the individual business level. From this dataset, we calculate the number and average employment of firms by 6-digit industries and CSD. The number of firms is given by employment size category (1 to 4 employees, 5 to 9, 10 to 19, 20 to 49, 50 to 99, 100 to 199, 200 to 499, and 500 or more.). To measure average firm size, we use the mid-point of each size category, times the number of firms in that category. We do not count firms of indeterminate size.

One important limitation of this data is that the BR includes both for-profit and not-for-profit entities, and there is no reliable way of excluding the charities from the BR on the basis of the information that is available. Still, comparing patterns found in the charity data with corresponding patterns found in the BR data can allow for an indirect comparison between charities and for-profit providers, although the difference in the elasticity estimates obtained for the two dataset will understate the difference between the responses of for-profit and not-for-profit providers.

The nature of the data also calls for some further sample selection. In the Canadian system, the costs to an organization to remain registered as a charity are negligible. Accordingly, in the Charity data we observe many instances in which a charity remains registered in a given year but is inactive (dormant), i.e., it reports zero expenditures or it provides no expenditure information. In some cases, charities report expenditures that are negligible, which strongly suggests *de facto* dormancy. To deal with this measurement problem, we treat charities as inactive if they report expenditures less than CDN$30,000[23] – or if they do not report them at all. Nevertheless, any minimum cost, revenue or expenditure threshold that we may want to set in order to discriminate between active and inactive charities is necessarily arbitrary. We investigate the robustness of the results to the inclusion of the smaller charities: results are quite similar to our main results.

In addition to excluding charities below the CDN$30,000 threshold, when analyzing the effects of market size on expenditures, we only include those charities that are active for the full duration of the sample. Given this sample restriction, the size of the charities that are continuously active is implicitly taken as being representative of all charities, including those that are not continuously active. This may be desirable because the classification of charity sectors can be quite broad, and an increase in market size may attract a wider variety of charity types, which could affect average provider size for reasons other than the competition mechanism that we want to focus on. For example, new senior care entrants may possibly not provide the standard care service but perhaps only some consulting. Such new entrants could be small due to being different, but not due to the effect of market size in the way that we think about it in the theoretical model. Focusing on how the size of charities already in the market

[23] This amount corresponds to the revenue limit needed to be included in public data from the BR.

responds to market size change provides a cleaner test of our theoretical predictions. However, we also carried out the regressions using the full sample of active charities, and results are quite similar to our main results. Moreover, as this sample restriction omits any entrant and exiting charities, and thus removes any time series variation in the number of charities in each market, we relax this restriction when analyzing the effect of market size on the number of charities.

*3.2. Analysis*

The testable predictions of our model concern the effects of market size on the number and size of charities.[24] To analyze these relationships in the data, we focus on the number of charities and their average size within individual markets. Our main specification estimates the following equation:

$$\ln Y_{it} \; = \; \alpha + \theta_t + \gamma \ln \mathit{Market\_Size}_{it} + \mathbf{x}'_{it}\beta + \epsilon_{it}, \tag{24}$$

with markets indexed by $i$, and $t \in \{1997, 2001, 2005, 2011\}$. In our main specifications, our variable of interest, $\mathit{Market\_Size}_{it}$, is measured as the total population in a market in a given year, and the outcome, $Y_{it}$, as the number of providers in the market in a given year or the average level of expenditures by providers in a market in a given year. The vector $\mathbf{x}_{it}$ includes a number of market-specific control variables.[25] We also include year fixed effects ($\theta_t$). In the market fixed-effects specifications, $\alpha$ is replaced with $\alpha_i$.

To begin with, we present descriptive statistics on these main outcome variables of interest in Table 1. We have altogether 5,253 markets, many of which do not contain any charities operating in our chosen sectors. After the sample restrictions, with reference to the year 2011, we use information on 403 markets containing food and clothing banks, 399 markets for daycare centers, 463 markets for housing charities, 413 markets for senior care and 446 markets for disabled care organizations as well as 304 markets for charities organizing festivals and performances. All the variables appear to contain considerable variation across markets.

Our main results are shown in Table 2 for the association between market size and average charity size, and in Table 3 for the association between market size and the number of providers. Both tables include results from pooled (across years) OLS regressions and market-level fixed-effects regressions, with and without additional control variables. The sample includes all the four years in the panel (1996, 2001, 2006 and 2011). The tables report first the results from analyzing all the sectors jointly, and then the results for each sector separately. The benefit of the former is higher precision of the estimates and of the latter scope for understanding whether charities behave differently in different sectors.

[24] For similar analysis in the context of for-profits, see Campbell and Hopenhayn (2005, 2007).

[25] These variables are: log of mean household income, share of population over sixty-five years old, share of population under five years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.

Table 1: Descriptive Statistics on Charities and Business Register, by CSD, for 2011

| | *N* | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Charities, Number of Providers (exp.>30,000) | | | | | |
| Daycare | 399 | 2.65 | 9.12 | 1 | 132 |
| Food and Clothing Banks | 403 | 2.41 | 5.36 | 1 | 75 |
| Housing | 463 | 2.69 | 6.63 | 1 | 90 |
| Seniors | 413 | 2.11 | 5.27 | 1 | 72 |
| Disabled | 446 | 3.29 | 7.74 | 1 | 99 |
| Festivals and Performances | 304 | 4.97 | 16.9 | 1 | 193 |
| Charities, Average Employment (Non-dormant, exp.>30,000) | | | | | |
| Daycare | 315 | 37.1 | 35.2 | 2.50 | 249.5 |
| Food and Clothing Banks | 154 | 12.4 | 13.6 | 2.50 | 68 |
| Housing | 279 | 40.4 | 62.5 | 2.50 | 500 |
| Seniors | 179 | 22.8 | 49.6 | 2.50 | 349.5 |
| Disabled | 295 | 72.9 | 85.1 | 2.50 | 500 |
| Festivals and Performances | 111 | 15.4 | 25.1 | 2.50 | 172.3 |
| Charities, Average Expenditures (Non-dormant, exp.>30,000) | | | | | |
| Daycare | 323 | 1,074,483 | 1,219,222 | 31,853 | 8,641,190 |
| Food and Clothing Banks | 190 | 409,487 | 647,394 | 30,277 | 5,408,711 |
| Housing | 317 | 1,571,627 | 2,440,329 | 35,008 | 23,707,902 |
| Seniors | 208 | 757,937 | 2,048,451 | 32,776 | 23,115,650 |
| Disabled | 312 | 2,614,811 | 4,045,785 | 31,997 | 51,355,444 |
| Festivals and Performances | 148 | 445,053 | 1,110,827 | 33,000 | 12,617,122 |
| Business Register, Number of Providers (exp.>30,000) | | | | | |
| Daycare | 1,390 | 6.63 | 35.1 | 1 | 964 |
| Food and Clothing Banks | 2,634 | 23.0 | 154.0 | 1 | 5,059 |
| Housing | 1,603 | 6.36 | 42.3 | 1 | 1,313 |
| Seniors and Disabled | 890 | 4.21 | 13.1 | 1 | 237 |
| Festivals and Performances | 563 | 5.59 | 28.7 | 1 | 439 |
| Business Register, Average Employment (exp.>30,000) | | | | | |
| Daycare | 1,390 | 12.4 | 13.0 | 2.50 | 149.5 |
| Food and Clothing Banks | 2,634 | 13.1 | 12.3 | 2.50 | 349.5 |
| Housing | 1,603 | 5.36 | 6.72 | 2.50 | 76 |
| Seniors and Disabled | 890 | 19.6 | 34.6 | 2.50 | 500 |
| Festivals and Performances | 563 | 7.71 | 17.6 | 2.50 | 349.5 |

Given that our data has a panel structure, we have a choice to make between pooled OLS or market level fixed-effects regressions. One potential endogeneity issue in our analysis is that large markets may have higher population density, thus possibly leading to larger (unobserved) fixed costs for firms (e.g., through higher house and land prices, or wages). Large markets may also feature more elastic demand as they may contain a wider variety of choices. Both features would translate in larger markets containing larger producers even if an increase in the size of each market does not lower mark-ups. This would result in a spurious positive correlation between market size and establishment size. The benefit of fixed-effects estimation is that it may alleviate these concerns. However, one drawback of fixed-effects estimation is that market sizes may not vary enough over time for there to be enough identifying variation.[26] In some sense this is a standard bias vs. precision trade-off (pooling the six sectors increases the precision somewhat). In addition, even with fixed effects, we cannot rule out potential endogeneity as the omitted variables may also change with market size changes. Moreover, fixed effects can potentially even increase the estimate bias arising from endogeneity if the time series correlation between market size and unobserved economic conditions is stronger than the cross-sectional correlation. Due to these issues, our analysis should be taken merely as suggestive evidence.

Table 2 reports our results on average charity size. We discuss first the joint analysis of all six sectors. Both with and without control variables, we find a statistically significant positive association between market size and charity size. The elasticities are all well below unity (0.22 and 0.24), and they are precisely estimated. In the last two columns, we add CSD-level fixed effects. With these fixed effects, both with and without control variables, the relationship between market size and provider size is absent, with coefficients close to zero. However, the standard errors are almost 10 times larger than without the fixed effects. Nonetheless, 95% confidence intervals can rule out effects larger than about 0.2. The sector by sector analysis does not reveal much differences across sectors. In the OLS specifications (columns 1 and 2), the point estimates are very close to each other, varying between 0.15 and 0.35. In the fixed-effects specifications (columns 3 and 4), the estimates vary a lot across the sectors, but due to the imprecision, it is not possible to infer any differences between the sectors.

In Table 3 we report the results on the association between market size and the number of charities. The results show a robust pattern of positive and statistically significant association across the specifications both for all the sectors jointly analyzed and the individual sectors. The only exception is the daycare sector, where the fixed-effects results are negative and statistically not significant. An important result is that the estimated elasticities are also all well below unity, and unity is also well outside any reasonable confidence interval.

To interpret the results in Tables 2 and 3, recall first that Proposition 2 predicts that if our charities are fully prosocially motivated, an increase in market size would increase

---

[26]In sample of markets relevant for the analysis pooling all six sectors, the within-market standard deviation in *log(population)* is 0.09 while the overall standard deviation is 1.67.

Table 2: Association Between Market Population (in log) and Average Expenditures (in log)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.22*** | 0.24*** | -0.0077 | -0.053 |
| | (0.014) | (0.019) | (0.11) | (0.13) |
| N | 5521 | 5338 | 5521 | 5338 |
| $R^2$ | 0.113 | 0.122 | 0.027 | 0.011 |
| Daycare | 0.23*** | 0.26*** | 0.043 | 0.053 |
| | (0.023) | (0.032) | (0.17) | (0.18) |
| N | 1214 | 1171 | 1214 | 1171 |
| $R^2$ | 0.259 | 0.311 | 0.165 | 0.143 |
| Food and Clothing Banks | 0.24*** | 0.35*** | 0.42 | 0.25 |
| | (0.036) | (0.042) | (0.26) | (0.29) |
| N | 635 | 614 | 635 | 614 |
| $R^2$ | 0.232 | 0.295 | 0.227 | 0.165 |
| Housing | 0.26*** | 0.30*** | 0.063 | -0.088 |
| | (0.027) | (0.042) | (0.12) | (0.12) |
| N | 1208 | 1161 | 1208 | 1161 |
| $R^2$ | 0.160 | 0.191 | 0.101 | 0.000 |
| Seniors | 0.21*** | 0.24*** | -0.10 | -0.091 |
| | (0.033) | (0.049) | (0.28) | (0.47) |
| N | 755 | 733 | 755 | 733 |
| $R^2$ | 0.094 | 0.102 | 0.004 | 0.001 |
| Disabled | 0.35*** | 0.28*** | -0.038 | -0.24 |
| | (0.033) | (0.051) | (0.15) | (0.19) |
| N | 1181 | 1154 | 1181 | 1154 |
| $R^2$ | 0.190 | 0.270 | 0.021 | 0.000 |
| Festivals and Performances | 0.15*** | 0.22*** | 0.28 | 0.73* |
| | (0.038) | (0.049) | (0.36) | (0.42) |
| N | 528 | 505 | 528 | 505 |
| $R^2$ | 0.075 | 0.129 | 0.072 | 0.077 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table 3: Association between Market Size (in log) and Number of Providers (in log)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.32*** | 0.37*** | 0.098*** | 0.087** |
| | (0.024) | (0.023) | (0.032) | (0.035) |
| N | 8937 | 8630 | 8937 | 8630 |
| $R^2$ | 0.470 | 0.553 | 0.456 | 0.470 |
| Daycare | 0.30*** | 0.34*** | -0.083 | -0.12 |
| | (0.029) | (0.033) | (0.073) | (0.084) |
| N | 1505 | 1447 | 1505 | 1447 |
| $R^2$ | 0.462 | 0.545 | 0.432 | 0.402 |
| Food and Clothing Banks | 0.32*** | 0.39*** | 0.22** | 0.27** |
| | (0.027) | (0.026) | (0.099) | (0.12) |
| N | 1299 | 1265 | 1299 | 1265 |
| $R^2$ | 0.488 | 0.607 | 0.481 | 0.521 |
| Housing | 0.30*** | 0.33*** | 0.13** | 0.14** |
| | (0.022) | (0.025) | (0.066) | (0.066) |
| N | 1748 | 1678 | 1748 | 1678 |
| $R^2$ | 0.488 | 0.562 | 0.480 | 0.466 |
| Seniors | 0.24*** | 0.28*** | 0.18* | 0.25** |
| | (0.028) | (0.031) | (0.093) | (0.12) |
| N | 1455 | 1397 | 1455 | 1397 |
| $R^2$ | 0.373 | 0.458 | 0.372 | 0.390 |
| Disabled | 0.39*** | 0.47*** | 0.14** | 0.13 |
| | (0.024) | (0.024) | (0.071) | (0.092) |
| N | 1742 | 1698 | 1742 | 1698 |
| $R^2$ | 0.549 | 0.640 | 0.537 | 0.530 |
| Festivals and Performances | 0.41*** | 0.47*** | 0.24*** | 0.25*** |
| | (0.036) | (0.032) | (0.083) | (0.096) |
| N | 1188 | 1145 | 1188 | 1145 |
| $R^2$ | 0.515 | 0.631 | 0.508 | 0.592 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*number of providers*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

their number proportionally, but not their average size. In contrast, Proposition 3 predicts that for only partially prosocially motivated charities, market size raises the size of providers, and the number of providers increases less than proportionally with market size. The results in Table 3 clearly point towards the charities' motives not being fully prosocial. However, the results in Table 2 are more ambiguous, as non-prosocial motives are only supported by the specifications (1) and (2). Overall, the results point more towards charities being only partially prosocially motived.

To find additional support for our theoretical interpretation of the relationship between market size and the size and number of charities, we can look at how market size affects fundraising. As discussed in Section 2, we would expect an increase in market size to raise the share of fundraising costs in total costs if charities' motives are not fully prosocial.

Table 4 presents results of regressions of market size on the average share of expenditures dedicated to fundraising activities. As in previous specifications, these results are expressed as elasticities.[27] The number of observations is lower, since information on fundraising is missing for many charities. The analysis using all sectors combined points towards a positive elasticity, as the estimates are positive in all four specifications, and statistically significant in three of them. The sector-by-sector analysis is somewhat less robust, as the statistical significance of the estimates, and sometimes even their sign, changes with the fixed effects one way or the other. However, a positive and statistically significant estimate is present in every sector, and none of the (rare) negative coefficients are statistically significant. These patterns are again more in line with an explanation where charities are partially prosocially motivated, which leads to both excessive entry and fundraising. In that case, a larger market size (leading to increased competition) not only mitigates the bias in entry, increasing the size of charities and bringing it closer to the social optimum, but also, at the same time, exacerbates the positive bias in fundraising.

### *3.3. Comparison to the Private Sector*

Our theoretical framework provides testable predictions also with respect to the comparison between for-profits and not-for-profits. As discussed in Section 2, the theory predicts that when charities' non-prosocial concerns relate to market share, the elasticity of provider size with respect to market size should be larger in the not-for-profit case than in the for-profit case. Similarly, with non-prosocial charities, the elasticity of the number of providers with respect to market size should be smaller in the not-for-profit case than in the for-profit case.

[27] The share of fundraising expenditures reflects a ratio, so it is not clear whether we should estimate our regressions in log-log form. In fact, using a linear form we do not find any statistically significant effect of market size on the share of fundraising expenditures, although the estimates are mostly positive. However, a Box-Cox regression (with controls, using all six sectors) suggests an optimal $\theta = 0.076$, which is close to a logarithmic specification. Moreover, a comparison of the log-likelihoods with $\theta = \{-1, 0, 1\}$ suggests that $\theta = 0$ is the most appropriate model, corresponding to a logarithmic specification.

Table 4: Association between Market Size (in log) and the Share of Fundraising Expenditures (in log)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.16*** | 0.22*** | 0.99* | 0.60 |
| | (0.025) | (0.037) | (0.51) | (0.63) |
| N | 2416 | 2356 | 2416 | 2356 |
| $R^2$ | 0.034 | 0.043 | 0.028 | 0.024 |
| Daycare | 0.015 | 0.097 | 1.97* | 1.68 |
| | (0.039) | (0.060) | (1.04) | (1.13) |
| N | 628 | 608 | 628 | 608 |
| $R^2$ | 0.018 | 0.066 | 0.001 | 0.005 |
| Food and Clothing Banks | 0.17*** | 0.15 | 1.78 | 0.53 |
| | (0.062) | (0.093) | (1.11) | (1.68) |
| N | 300 | 293 | 300 | 293 |
| $R^2$ | 0.052 | 0.094 | 0.034 | 0.030 |
| Housing | 0.29*** | 0.41*** | -0.43 | -3.48 |
| | (0.071) | (0.11) | (2.16) | (2.53) |
| N | 253 | 247 | 253 | 247 |
| $R^2$ | 0.099 | 0.157 | 0.069 | 0.085 |
| Seniors | 0.093 | 0.0068 | 3.45** | 5.30** |
| | (0.068) | (0.11) | (1.47) | (2.27) |
| N | 307 | 303 | 307 | 303 |
| $R^2$ | 0.019 | 0.039 | 0.008 | 0.010 |
| Disabled | 0.27*** | 0.25*** | -0.026 | -0.62 |
| | (0.059) | (0.097) | (0.91) | (0.95) |
| N | 606 | 598 | 606 | 598 |
| $R^2$ | 0.065 | 0.119 | 0.010 | 0.035 |
| Festivals and Performances | 0.15*** | 0.19*** | 0.44 | 0.89 |
| | (0.056) | (0.067) | (1.04) | (2.00) |
| N | 322 | 307 | 322 | 307 |
| $R^2$ | 0.067 | 0.099 | 0.051 | 0.032 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*share of fundraising expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Besides providing yet another angle for testing the model, the comparison of for-profits to charities may help in alleviating some of the endogeneity issues discussed before. Assuming the endogeneity issues related to unobserved costs and demand are similar for charities and for-profits, they are largely differenced out when we compare the elasticities estimated from the for-profit data to those from the charity data. That is, even if both the estimates are biased, their difference is not. Therefore, we focus the analysis here only to the OLS specifications without fixed effects, as the differencing alleviates endogeneity issues. Moreover, the fixed-effects specifications of these comparisons are too imprecise to teach us much (they reported in the online supplementary material).

Previously, we used expenditures as our measure of producer size. In the Business Register data, however, only employment is available. For that reason, we use employment also as the measure of producer size in the charity data to carry out our comparisons. Another difficulty lies in the way BR data is made available publicly: we do not have micro-level data, or a direct measure of average size of providers in a market. Instead, we have the number of firms per category of employment size, from which we infer average employment in the market. In order to facilitate the comparisons, we first create a similar categorization by employment in the charities data, and then estimate average employment from those categories. Therefore, we have calculated the average employment variable for the charity data in exactly the same way as in the BR data, despite this leading to lower accuracy of information in the charities data. We also omit some markets from the analysis relative to the previous tables in order to include exactly the same set of markets in the for-profit as for the not-for profit analysis. For that reason, the number of observations are not the same in these tables compared to the previous ones.

We manually match the NAICS 6-digit industries that seem to best correspond to the six charity sectors chosen for our analysis, using the sector and industry definitions. For some industries the comparison is straightforward. For example, there are both for-profits and not-for-profits providing daycare services, and they all operate under the same single NAICS code. On the other extreme are charities providing food and clothing banks, which we compare to all private businesses who provide food and clothing (cafeterias, limited service restaurants, grocery retail stores, etc.). In that case, we may be comparing across somewhat different products.[28]

Table 5 describes the association between market size and average employment per charity and the number of providers, both for charities and for the providers in the Business Register. We report the coefficient and standard errors regarding both these data sets, as well as the $p$-value of a $t$-test for whether these two coefficients are different from each other. For the joint analysis of all sectors we find positive and statistically significant associations for both the data sets, outcomes and specifications. The key result is that the elasticity of provider size with respect market size is larger

[28] The full list of correspondences is described in the Appendix E.

for charities than for the BR, whereas the opposite is true for the elasticity of number of providers with respect to the market size. Both of these results are in line with charities pursuing non-prosocial motives. The differences are statistically significant in three out of four specifications.

The interpretation of results on the number of providers is not straightforward, since the BR dataset includes both charities and for-profit firms – and so, by construction, the number of providers is always larger in that dataset. If our regressions were comparing levels across datasets, this would mechanically imply a larger coefficient for the BR dataset. However, because we calculate elasticities, coefficients are comparable across the two datasets, and the larger coefficients in the BR data imply a larger elasticities for for-profit firms than for charities. When it comes to the number of providers, the results hold also for each individual sector. However, the provider size results are more imprecise in the sector-by-sector analysis, with statistically significant differences only in the case of daycare (in both specifications). Interestingly, the daycare sector was also the one with the most direct correspondence to a NAICS industry, and thus, perhaps the most reliable comparison. Overall, despite some limitations, the results in this and the previous subsection are at least suggestive of charities not acting in a fully prosocially motivated way.

*3.4. Robustness Checks and Discussion*

To assess the reliability of our findings, we conduct several robustness checks. First, we use average revenues instead of average expenditures as an alternative measure of charity size. This is to account for the fact that charities face a non-distribution constraint that is only binding in the long run, but expenses and costs do not have to balance on a short-term basis (and they do not, particularly for not-for-profit organizations that incur large capital expenses, such as hospitals). The results confirm our previous findings.[29]

Second, we use alternative definitions of market size. For the senior and disabled care sector we re-define market size as the number of old residents (over 65 years old), and for the daycare sector as the number of young (under 5 years old). It should be noted that while these measures are likely to capture better the size of the market in terms of demand for these services in these industries, it is not clear that they are better than overall population size at measuring the volume of donations that charities are competing for. The results are similar to those obtained using total population.

Third, we estimate our regressions with a sample that also includes dormant charities. Our results do not change significantly. Fourth, results are also robust to trimming out large (top 5% in terms of population) and small (bottom 5%) markets, which is an indication that outliers are not driving the results. Fifth, instead of estimating our regressions using the average size of charities in a market as the outcome, we estimate our regressions with individual charities as the unit of observation, and thus the size

[29]The tables reporting the results of this robustness check and the following ones in this section are all available in the online supplementary material.

Table 5: Association between Market Population (in log), and Average Employment (in log) and the Number of Providers (in log), Charities Only vs. Business Register (Pooled OLS)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *Dependent Variable:* | Average Employment | | Number of Providers | |
| | All Five Sectors | | | |
| Charities | 0.22*** | 0.21*** | 0.46*** | 0.50*** |
| | (0.024) | (0.033) | (0.024) | (0.025) |
| Business Register | 0.14*** | 0.16*** | 0.95*** | 0.99*** |
| | (0.013) | (0.015) | (0.012) | (0.016) |
| *t*-test (*p*-value) | 0.002 | 0.160 | 0.000 | 0.000 |
| | Daycare | | | |
| Charities | 0.17*** | 0.21*** | 0.31*** | 0.31*** |
| | (0.029) | (0.035) | (0.041) | (0.039) |
| Business Register | 0.058*** | 0.088*** | 0.79*** | 0.78*** |
| | (0.022) | (0.027) | (0.032) | (0.035) |
| *t*-test (*p*-value) | 0.000 | 0.000 | 0.000 | 0.000 |
| | Festivals | | | |
| Charities | 0.075 | 0.046 | 0.40*** | 0.45*** |
| | (0.081) | (0.098) | (0.10) | (0.081) |
| Business Register | 0.12** | 0.19** | 0.62*** | 0.61*** |
| | (0.054) | (0.085) | (0.10) | (0.10) |
| *t*-test (*p*-value) | 0.500 | 0.070 | 0.000 | 0.070 |
| | Housing | | | |
| Charities | 0.12** | 0.17* | 0.36*** | 0.33*** |
| | (0.053) | (0.092) | (0.044) | (0.049) |
| Business Register | 0.12*** | 0.12*** | 0.83*** | 0.82*** |
| | (0.030) | (0.041) | (0.046) | (0.051) |
| *t*-test (*p*-value) | 0.954 | 0.590 | 0.000 | 0.000 |
| | Seniors and Disabled | | | |
| Charities | 0.26*** | 0.11 | 0.38*** | 0.44*** |
| | (0.046) | (0.071) | (0.039) | (0.045) |
| Business Register | 0.20*** | 0.15*** | 0.65*** | 0.72*** |
| | (0.037) | (0.058) | (0.029) | (0.034) |
| *t*-test (*p*-value) | 0.205 | 0.626 | 0.000 | 0.000 |
| | Food and clothing | | | |
| Charities | 0.23*** | 0.44*** | 0.23*** | 0.34*** |
| | (0.056) | (0.069) | (0.032) | (0.040) |
| Business Register | 0.14*** | 0.081** | 0.98*** | 1.05*** |
| | (0.040) | (0.041) | (0.034) | (0.055) |
| *t*-test (*p*-value) | 0.241 | 0.000 | 0.000 | 0.000 |
| Controls | No | Yes | No | Yes |

Note: The outcomes are *ln(average employment)* and *ln(number of providers)*. The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. Tests are for the equality of the coefficients across datasets, combined using *suest* in Stata. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

of each individual charity as the outcome. The results are robust also to this change of specification. Sixth, to address the possible concern that government funding might be treated differently than private donor funding when competing for donations and in regulating the charities' profits, we investigate how results change if we add the share of government funding as a control variable. The results are robust also to expanding the specification in this way. Seventh, we use the median of expenditures instead of the average, to account for potential differences in the distributions across markets. The results are robust to this modification. Eighth, we add *province*, and *province* $\times$ *year* fixed effects, since provinces could introduce different policies at different times that affect both population levels and the size of charities. The results are robust to this modification.

Another potential source of bias for our regressions using the charities data is that we are missing information on the number of other active producers in these markets. However, this is unlikely to lead to wrong conclusions for two reasons. First, our model's predictions apply to each individual producer; we use the average over providers as the outcome only because we need a market-level variable. But since the prediction applies to each individual provider, average size should respond in the same way in any subset of producers in a given market. Second, the presence of private or public producers is very likely to vary across sectors, and is nonexistent in the Food and Clothing Banks sectors. If this omitted information was driving the results, we should see more heterogeneity in results across the sectors in terms of qualitative conclusions.

Because the 2011 data does not contain information on whether a charity operates at the local, regional or national level, we use all charities in our main estimations. However, our theoretical model relates to charities providing services and competing for donations in a single market; it does not consider the implications of competition in overlapping markets. To restrict the analysis to well-defined markets, we carry out the same analysis for a restricted sample in which we omit year 2011 data and only include local charities, that is those charities that report being active only within their municipality. These results confirm those from our main specification.

Finally, we conduct one additional robustness check regarding the comparison between charities and for-profits. In one sector, housing, the Business Register data is available separately for non-profits and for-profits. In particular, NAICS code 531111 is for lessors of residential buildings except social housing, while NAICS code 531112 is for lessors of social housing projects. While the latter includes both government-funded entities and private non-profit housing corporations, it is the closest we have to a direct comparison of non-profit to for-profit organisations providing comparable services using the same dataset. Repeating the analysis of Table 5, but comparing across these two NAICS codes, we find a similar pattern as in our main analysis. In the housing sector, the elasticity of provider size with respect to market size is larger for non-profits, while the elasticity of the number of providers with respect to market size is smaller for non-profits (both differences are statistically significant and robust to the addition of controls).

## 4. Conclusion

We present a simple oligopoly model of charities providing differentiated services and competing for donors. The model delivers testable predictions that allow us to both contrast effects of market size in for-profit and charity markets and to discriminate between alternative modes of competitive conduct in charitable markets depending on whether charities pursue purely prosocial objectives or are also guided by non-prosocial concerns.

We test the model's predictions concerning the relationship between market size and the size and number of providers in Canadian data for registered charities as well as for for-profit entities. We analyze the association between markets size, and charity size and the number of providers. Moreover, we study how fundraising efforts correlate with market size. Finally, we compare the behavior of charities to that of for-profits. Although the evidence we provide has limitations, taken together our findings give reason to be sceptical of charities being purely driven by prosocial motives, and are more consistent with a model of charities that are biased towards own production. In this case, increased competition in larger markets can produce a beneficial pro-competitive effect in charity markets, as it does in for-profit markets. The mechanism underlying this effect is that larger markets already serve more varieties, making it harder for a provider that is partially driven by prosocial motives to justify adding new varieties at the expense of a decrease in the scale of provision of existing varieties. This curbs the excessive entry that the bias towards own provision induces.

Besides providing and testing a model of competition for the third sector, a novel undertaking as such, our results have direct policy implications. As more intense competition can be counted on to improve economic performance in charity markets as it does in for-profit markets, government policies may have a more important role to play in smaller, "less competitive" charitable markets than they do in larger ones.

## Acknowledgements

We are grateful to Itai Ater, Jana Friedrichsen, Essi Eerola, Oskari Harjunen, Ari Hyytinen, Jonathan Haskel, Heikki Pursiainen, Carol Propper, Tanja Saxell, Michael Waterson and seminar participants at HECER and VATT, and the 2014 EARIE, the 2015 FEAAM and the 2015 RES conference for their comments. We are also grateful to the editor and to the anonymous reviewers for extensive comments and guidance. We are also grateful for the financial support of the UK's Economic and Social Research Council.

## References

Alchian, A., Demsetz, H., 1972. Production, information costs, and economic organization. American Economic Review 62, 777–95.

Almunia, A., Lockwood, B., Scharf, K., 2018. More giving or more givers? the effects of tax incentives on charitable donations in the UK. Mimeo, University of Birmingham.

Amir, R., Castro, L.D., Koutsougeras, L., 2014. Free entry versus socially optimal entry. Journal of Economic Theory 154, 112–125. doi:https://doi.org/10.1016/j.jet.2014.09.003.

Atkinson, T., 2005. The Atkinson review: Final report. Measurement of Government Output and Productivity for the National Accounts. Palgrave Macmillan.

Bakija, J., Heim, B., 2011. How does charitable giving respond to incentives and income? dynamic panel estimates accounting for predictable changes in taxation. National Tax Journal 64, 615–650.

Besley, T., Malcomson, J., 2016. Choice and competition in public service provision. CEPR Discussion Papers No. 11,441.

Bowblis, J., 2011. Ownership conversion and closure in the nursing home industry. Health Economics 20, 631–644.

Bresnahan, T., Reiss, P., 1991. Entry and competition in concentrated markets. Journal of Political Economy 99, 977–1009.

Campbell, J., Hopenhayn, H., 2005. Market size matters. Journal of Industrial Economics 53, 1–25.

Campbell, J., Hopenhayn, H., 2007. Erratum. The Journal of Industrial Economics 55, 373–378. doi:10.1111/j.1467-6451.2007.00315.x.

Capps, C., Dranove, D., Lindrooth, R., 2010. Hospital closure and economic efficiency. Journal of Health Economics 29, 87–109.

Castaneda, M., Garen, J., Thornton, J., 2008. Competition, contractibility, and the market for donors to nonprofits. Journal of Law, Economics & Organization 24, 215–246.

Cooper, Z., Gibbons, S., Jones, S., McGuire, A., 2011. Does hospital competition save lives? evidence from the english nhs patient choice reforms. Economic Journal 121, F228–F260.

Dixit, A., Stiglitz, J., 1977. Monopolistic competition and optimum product diversity. American Economic Review 67, 297–308.

Easley, D., O'Hara, M., 1983. The economic role of the nonprofit firm. Bell Journal of Economics 14, 531–38.

Feldstein, M., Clotfelter, C., 1976. Tax incentives and charitable contributions in the united states: A microeconometric analysis. Journal of Public Economics 5, 1–26.

Gaynor, M., Town, R., 2011. Competition in health care markets, in: Pauly, M., McGuire, T., Barros, P.P. (Eds.), Handbook of Health Economics. Vol. 2, Elsevier, pp. 499–637.

Gaynor, M., Vogt, W., 2003. Competition among hospitals. RAND Journal of Economics 34, 764–785.

Glaeser, E., Schleifer, A., 2001. Not-for-profit entrepreneurs. Journal of Public Economics 81, 99–115.

Hansmann, H., 1980. The role of the non-profit enterprise. Yale Law Journal 89, 835–901.

Hopenhayn, H., 1992. Entry, exit, and firm dynamics in long run equilibrium. Econometrica 60, 1127–1150.

Lakdawalla, D., Philipson, T., 2006. The nonprofit sector and industry performance. Journal of Public Economics 90, 1681–98.

Mankiw, N.G., Whinston, M., 1986. Free entry and social inefficiency. RAND Journal of Economics 17, 48–58.

Melitz, M., Redding, S., 2014. Heterogeneous firms and trade, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics Economics. Vol. 4, Elsevier, pp. 1–54.

Perroni, C., Pogrebna, G., Sandford, S., Scharf, K., 2018. Are donors afraid of charities' core costs? Scale economies in nonprofit provision, technology adoption and entry. Economic Journal, forthcoming.

Philipson, T., Posner, R., 2009. Antitrust in the not-for-profit sector. Journal of Law and Economics 52, 1–18.

Propper, C., Burgess, S., Gossage, D., 2008. Competition and quality: Evidence from the NHS internal market 1991-9. Economic Journal 118, 138–170.

Roberts, R., 1987. Financing public goods. Journal of Political Economy 95, 420–37.

Rose-Ackerman, S., 1982. Charitable giving and 'excessive' fundraising. Quarterly Journal of Economics 97, 193–212.

Scharf, K., 2000. Why are tax expenditures for giving embodied in fiscal constitutions? Journal of Public Economics 75, 365–87.

Scharf, K., 2014. Impure pro-social motivation in charity provision: Warm-glow charities and implications for public funding. Journal of Public Economics 114, 50–57.

Scharf, K., Smith, S., 2015. The price elasticity of charitable giving: Does the form of tax relief matter? International Tax and Public Finance 22, 330–352.

Simpson, H., 2009. Productivity in public services. Journal of Economic Surveys 23, 250–276. doi:10.1111/j.1467-6419.2008.00562.x.

## Appendix A Heterogeneous Providers

Suppose that there is a mass $\overline{N}$ of providers differing with respect to their productivity; specifically a provider with productivity $\phi$ faces marginal cost $1/\phi$.[30] Provider productivity types are distributed according to a Pareto distribution with a continuous support $[1, \infty)$ and with p.d.f. $f(\phi) = a\phi^{-(1+a)}$, $a > 0$. As before, preferences for differentiated varieties are of the CES type. In what follows, we assume $\sigma < 1 + a$ (which is necessary for the problem to be well-defined).

In a equilibrium with free entry, if a for-profit provider with productivity $\phi'$ is active (implying that it makes non-negative profits), then all providers with productivity $\phi > \phi$ will also be active: with $\sigma > 1$ and a constant mark-up rate, revenues and thus gross profits are increasing in $\phi$, and so are net profits for a common fixed cost, $F$. So, if the marginal provider (the provider that breaks even) is of type $\phi_0$, the total number of providers is

$$N = \overline{N} \int_{\phi_0}^{\infty} f(\phi)\, d\phi = \overline{N}\, (\phi_0)^{-a}, \tag{25}$$

and we can write utility as

$$U = \overline{N} \int_{\phi_0}^{\infty} x(\phi)^{(\sigma-1)/\sigma}\, d\phi. \tag{26}$$

Constrained utility maximization gives demands

$$x(\phi) = K(\lambda)\, p(\phi)^{-\sigma}, \tag{27}$$

where $K(\lambda) \equiv ((\sigma-1)/(\lambda\sigma))^{\sigma}$, and where $\lambda$ is the marginal utility of income. In a scenario where the number of providers is large, each will take $\lambda$ as given, which results in a profit-maximizing pricing choice

$$p(\phi) = \xi\, \frac{1}{\phi}, \tag{28}$$

where $\xi \equiv \sigma/(\sigma-1)$; this results in revenues

$$r(\phi) = p(\phi), x(\phi) = \lambda^{-\sigma}\, \xi^{1-2\sigma}\, \phi^{\sigma-1}. \tag{29}$$

Total industry revenues are then

$$\overline{N} \int_{\phi_0}^{\infty} f(\phi)\, r(\phi)\, d\phi = \frac{\lambda^{-\sigma}\, \xi^{1-2\sigma}\, a\, (\phi_0)^{\sigma-(1+a)}}{1+a-\sigma}. \tag{30}$$

Equating (30) to total spend, $M$, solving for $\lambda$ and replacing the solution into (29), we obtain an

[30] The mass of providers ($\overline{N}$) can be thought of as resulting of forward-looking choices by potential entrants (as in Hopenhayn, 1992). As we will show, predictions on size are independent of $\overline{N}$, making $\overline{N}$ irrelevant for the purposes of our discussion.

expression for revenues of providers of productivity $\phi$ as a function of $M$:

$$r(\phi) = \frac{1+a-\sigma}{a} \, (M/\overline{N}) \, (\phi_0)^{1+a-\sigma} \, \phi^{\sigma-1}. \tag{31}$$

Equating the gross profits of the marginal firm, which equal to $r(\phi_0)/\sigma$, with $F$, solving for $\phi_0$, and replacing the resulting expression into (25), we obtain

$$N = \frac{1+a-\sigma}{a\,\sigma F} \, M. \tag{32}$$

This is linear in $M$ and so changes in $M$ leaves mean firm revenue $(M/N)$ unchanged. An analogous conclusion applies to an equilibrium under not-for-profit competition, which for $\mu = 0$ coincides with the planning optimum (derivations in this case involve finding the optimal level of provision for each active provider type $\phi$, producing at marginal cost $1/\phi$, as a function of $\phi_0$ and $M$, using this to find the welfare-maximizing $\phi_0$, and then substituting this into (25)). As in the homogeneous-firm case, for $N$ large, the decentralized outcome is efficient (Melitz and Redding, 2014) – and so is firm size.

Thus, if the number of providers is sufficiently large (i.e. in a monopolistically-competitive setting), market size has no effect on average provider size in either for-profit or not-for-profit markets, independently of whether providers are homogeneous or heterogeneous. This means that, whether or not providers are heterogeneous under these conditions, effects of market size on provider size come solely from oligopolistically competitive responses.

## Appendix B Charity Sectors

Our selection of charity sectors is driven mainly by practical reasons: we choose a representative set of service sectors among those that are well represented in the data. Table B.1 shows the twenty most common sectors in the data in terms of the number of charities. By far the most common type of charity is a religious organization. We do not consider those here as their objective function may differ from the other charities and perhaps their main goal is not to provide such public services that the public sector would have an interest in providing. We focus on six charity service sectors that are likely to benefit only local residents and provide public services that could in principle be also provided by the public sector. Others among the top ten most common ones we exclude are scholarships, youth services and concert halls. We exclude concert halls as we include a similar group of festivals that is more common. We exclude both scholarships and youth services as both seem to provide mainly scholarships and awards, again not a typical public service. The sectors we focus on are Food and Clothing Banks, Daycare centers, Housing charities, Senior Care, Disabled Care, and charities organizing Festivals and Performances (boldfaced in the table). We have verified that the main results are similar in the excluded four top_10 sectors to the six sectors we include in the analysis here. These results are available from the authors.

Here we report more detailed information on the type of charities that operate in the six sectors we analyze. We also describe how the number of charities in a market is related to market size. In these descriptive statistics we have not applied the sample restriction concerning dormant charities that we use in the regressions.

The charities in the Food and Cloth Bank sector seem almost always to be soup kitchens: among the English names, many mention "food bank" in the name; among the French names, "La Soupière" is common. If they engage in secondary activities, the most common type of additional activity listed is "other low-income services".

The Daycare sector charities, as far as we can tell, seem all to provide daycare services. The typical names of these charities include "Daycare center", "Daycare Society" or "Centre de la Petite Enfance". When they are involved in secondary activities, they most often list summer camps.

The charities in our Housing sector seem to be somewhat more diverse. Based on their names, some target their services to certain groups, such as the elderly or the poor. Among the ones that have listed a secondary activities, common activities include food and cloth banks, senior care, disabled care and legal assistance.

There is also some diversity in the Senior Care sector. While many of the names contain the expressions "Senior club", "Senior center" or "Senior société", others include veterans' associations or charities providing special physical equipment for the elderly. It seems that perhaps even more actual elderly care homes are listed as housing charities rather than as senior care charities. Among their secondary activities, by far the most common is disabled care; this seems to be natural, because often elderly individuals can also be more-or-less disabled.

Among the actual Disabled Care sector, the most commonly listed secondary activities are elderly care and housing. The names of the disabled care charities often reflect their target group or disability, such as mental health, blindness, physical disabilities or autism.

The Festivals and Performances sector relates to music, dance and theatre groups as well as related festivals. The listed secondary activities also relate to culture and music.

Tables B.2-B.7 show the number of firms tabulated by market size groups. The picture is similar for all the sectors. The patterns is broadly consistent with the theory, as larger markets have more charities on average. A striking difference with typical patterns for for-profit sectors is that there are a number of quite large markets that do not have any entrants.

Table B.1: Number of Charities by Sector, 2001

| Sector | Number | Percentage |
|---|---|---|
| Religion | 29,805 | 43.4 |
| Other | 2,853 | 4.15 |
| **Festivals, performing groups, musical ensembles** | 2,324 | 3.38 |
| **Services for the physically or mentally challenged** | 1,840 | 2.68 |
| Scholarships, bursaries, awards | 1,698 | 2.47 |
| **Seniors' services** | 1,483 | 2.16 |
| **Food or clothing banks, soup kitchens, hostels** | 1,448 | 2.11 |
| **Housing** | 1,407 | 2.05 |
| Children and youth services | 1,369 | 1.99 |
| Concert halls, etc. | 1,324 | 1.93 |
| **Daycare** | 1,169 | 1.70 |
| Hospitals | 951 | 1.38 |
| Public education, other study programs | 884 | 1.29 |
| Support of schools and education | 870 | 1.27 |
| Independent schools and boards | 869 | 1.26 |
| Historical sites, heritage societies | 864 | 1.26 |
| Youth groups | 842 | 1.22 |
| Specialized health organizations | 831 | 1.21 |
| Cemeteries | 818 | 1.19 |
| Other services for low-income persons | 805 | 1.17 |
| Total (including not listed) | 68,740 | 100 |

Table B.2: Number of Charities by Market Size: Daycare

| CSD Population | $N = 0$ | $N = 1$ | $N = 2$ | $N = 3$ | $N = 4$ | $N = 5+$ | Total |
|---|---|---|---|---|---|---|---|
| $< 500$ | 2,241 | 6 | 0 | 0 | 0 | 0 | 2,247 |
| $500 - 1,000$ | 906 | 29 | 0 | 0 | 0 | 0 | 935 |
| $1,000 - 5,000$ | 1,242 | 116 | 4 | 0 | 0 | 0 | 1,362 |
| $5,000 - 10,000$ | 246 | 51 | 12 | 0 | 0 | 0 | 309 |
| $10,000 - 50,000$ | 193 | 76 | 29 | 2 | 1 | 2 | 303 |
| $> 50,000$ | 14 | 16 | 25 | 11 | 6 | 25 | 97 |
| Total | 4,842 | 294 | 70 | 13 | 7 | 27 | 5,253 |

Table B.3: Number of Charities by Market Size: Food and Clothing Banks

| CSD Population | $N = 0$ | $N = 1$ | $N = 2$ | $N = 3$ | $N = 4$ | $N = 5+$ | Total |
|---|---|---|---|---|---|---|---|
| $< 500$ | 2,235 | 10 | 2 | 0 | 0 | 0 | 2,247 |
| $500 - 1,000$ | 919 | 16 | 0 | 0 | 0 | 0 | 935 |
| $1,000 - 5,000$ | 1,195 | 150 | 15 | 2 | 0 | 0 | 1,362 |
| $5,000 - 10,000$ | 195 | 90 | 21 | 3 | 0 | 0 | 309 |
| $10,000 - 50,000$ | 129 | 96 | 43 | 24 | 7 | 4 | 303 |
| $> 50,000$ | 8 | 8 | 11 | 8 | 11 | 51 | 97 |
| Total | 4,681 | 370 | 92 | 37 | 18 | 55 | 5,253 |

Table B.4: Number of Charities by Market Size: Housing

| CSD Population | $N = 0$ | $N = 1$ | $N = 2$ | $N = 3$ | $N = 4$ | $N = 5+$ | Total |
|---|---|---|---|---|---|---|---|
| $< 500$ | 2,238 | 7 | 2 | 0 | 0 | 0 | 2,247 |
| $500 - 1,000$ | 892 | 42 | 1 | 0 | 0 | 0 | 935 |
| $1,000 - 5,000$ | 1,208 | 134 | 18 | 1 | 0 | 1 | 1362 |
| $5,000 - 10,000$ | 232 | 60 | 15 | 2 | 0 | 0 | 309 |
| $10,000 - 50,000$ | 163 | 84 | 31 | 16 | 3 | 6 | 303 |
| $> 50,000$ | 9 | 9 | 10 | 14 | 8 | 47 | 97 |
| Total | 4,742 | 336 | 77 | 33 | 11 | 54 | 5,253 |

Table B.5: Number of Charities by Market Size: Seniors

| CSD Population | $N = 0$ | $N = 1$ | $N = 2$ | $N = 3$ | $N = 4$ | $N = 5+$ | Total |
|---|---|---|---|---|---|---|---|
| $< 500$ | 2,177 | 67 | 2 | 1 | 0 | 0 | 2,247 |
| $500 - 1,000$ | 856 | 68 | 10 | 1 | 0 | 0 | 935 |
| $1,000 - 5,000$ | 1,156 | 165 | 37 | 3 | 0 | 1 | 1,362 |
| $5,000 - 10,000$ | 210 | 80 | 15 | 4 | 0 | 0 | 309 |
| $10,000 - 50,000$ | 142 | 97 | 50 | 10 | 2 | 2 | 303 |
| $> 50,000$ | 10 | 16 | 20 | 15 | 8 | 28 | 97 |
| Total | 4,551 | 493 | 134 | 34 | 10 | 31 | 5,253 |

Table B.6: Number of Charities by Market Size: Disabled

| CSD Population | $N = 0$ | $N = 1$ | $N = 2$ | $N = 3$ | $N = 4$ | $N = 5+$ | Total |
|---|---|---|---|---|---|---|---|
| $< 500$ | 2,241 | 6 | 0 | 0 | 0 | 0 | 2,247 |
| $500 - 1,000$ | 911 | 24 | 0 | 0 | 0 | 0 | 935 |
| $1,000 - 5,000$ | 1,225 | 116 | 16 | 3 | 1 | 1 | 1,362 |
| $5,000 - 10,000$ | 215 | 66 | 17 | 9 | 2 | 0 | 309 |
| $10,000 - 50,000$ | 137 | 76 | 39 | 24 | 13 | 14 | 303 |
| $> 50,000$ | 4 | 2 | 14 | 7 | 4 | 66 | 97 |
| Total | 4,733 | 290 | 86 | 43 | 20 | 81 | 5,253 |

Table B.7: Number of Charities by Market Size: Festivals and Performances

| CSD Population | $N = 0$ | $N = 1$ | $N = 2$ | $N = 3$ | $N = 4$ | $N = 5+$ | Total |
|---|---|---|---|---|---|---|---|
| $< 500$ | 2,225 | 21 | 1 | 0 | 0 | 0 | 2,247 |
| $500 - 1,000$ | 912 | 20 | 3 | 0 | 0 | 0 | 935 |
| $1,000 - 5,000$ | 1,250 | 91 | 14 | 5 | 1 | 1 | 1,362 |
| $5,000 - 10,000$ | 230 | 53 | 17 | 6 | 3 | 0 | 309 |
| $10,000 - 50,000$ | 152 | 68 | 27 | 28 | 13 | 15 | 303 |
| $> 50,000$ | 4 | 13 | 7 | 3 | 6 | 64 | 97 |
| Total | 4,773 | 266 | 69 | 42 | 23 | 80 | 5,253 |

## Appendix C Market Definition

Given the information available in our data, we could define markets as municipalities (i.e. CSD), Forward Sortation Areas (FSA), Census Metropolitan Areas (CMA) or Census Agglomerations (CA). In this appendix, we look at the question of which option is preferable.

FSAs are used in the Canadian postal system. In Canada, a postal code is an alphanumeric six-character string that takes the form 'A1A 1A1'. The FSA is a geographical area in which all postal codes start with the same three characters (the 'A1A' part of the code). The first letter 'A' of the code stands for a postal district (most provinces/territories are assigned a unique postal district – with the exception of Ontario and Quebec, which, due to their respective sizes, have more (three for Ontario and five for Quebec); the cities of Toronto and Montreal each have their own postal district ('H' for Montreal and 'M' for Toronto). The digit is a variable that takes on a value of zero for wide rural regions, and nonzero for urban areas. The second letter represents a specific rural region, an entire medium-sized city, or a section of a major metropolitan area.

Census Metropolitan Areas and Census Agglomerations are statistical units defined by Statistics Canada. They comprise one or more municipalities (CSDs) that are closely integrated together. Statistics Canada uses commuter flows to determine whether two or more cities are closely integrated. CMAs must have a total population of at least 100,000, with at least 50,000 in the core municipality, while the core municipality of a CA must have a population of at least 10,000. In addition to rules based on commuter flows, CMAs and CAs are also defined in such a way that they are spatially contiguous.

To determine what level of geographical disaggregation constitutes a market, we investigate the bias caused by an inappropriate choice of market definition. The key characteristic to consider here is whether a certain market definition implies a larger or smaller market than another. In the case of CMAs and CAs, it is clear that they are larger than CSDs (or FSAs). In the case of FSAs, however, they can be larger or smaller than CSDs, although typically they are smaller. In rural areas, one FSA may include several municipalities. In urban areas, FSAs may only correspond to a small part of a municipality.

In order to understand the bias that could arise from an incorrect market definition in our estimation of the effects of market size on average provider size, consider an example economy. In this economy, the real market is defined by zone A. However, suppose that we mistakenly run our analysis using sub-zones of A as our markets: A1 and A2. Consider the case where the population increases in A1 but not in A2. Assuming that there is a positive relationship between market size and average charity size, average charity size will increase in both sub-zones A1 and A2, because the underlying relationship is based on the "true market", A. In this case, we have no population increase in A2, yet a charity size increases in A2. Moreover, we have a large relative population increase in A1, but a relatively smaller increase in the charity size, than the real effect would imply. Both of these forces lead to a bias towards zero in our estimation.

Consider now the opposite case, in which the "real" markets are zones A1 and A2, but in which we estimate our regressions using the combined zone A that includes both A1 and A2. If the population in A1 increases, so will charity size in market A1. Moreover, assume that population size does not change in A2, then neither will average charity size in A2. As we aggregate up these markets to A, we will see a moderate increase (i.e. both are smaller than in A1 alone) in both population and average charity size in A. Therefore, using markets that are too large does not automatically lead to any bias as average response in A is correct (in a linear world), even if it does lead to unnecessary imprecision.

Our claim therefore is that, for the purpose of studying our question, focusing on markets that are too small can bias conclusions but using markets that are too large does not. To prove this point, we run simple Monte Carlo simulations, using the Stata programs detailed in the online supplementary material.

First, we assume that our units of observation are too small, so that many of our data points are actually in the same market. This simulation would correspond to the case where real markets are CSDs but instead we conduct our analysis at the FSA level. In this simulation we find that the elasticity of average expenditures to market size is under-estimated. With a real value of 0.25, our average estimate is 0.088 (with a standard deviation of 0.0073). In all 1,000 repetitions, we can reject the null hypothesis that our estimate is equal to 0.25.

Second, we assume that our units of observation are too large and include more than one real market. This would correspond to the case where real markets are CSDs but we conduct the analysis at the CMA/CA level. In this simulation we find an estimate of the elasticity of average expenditures to market size about equal to the true value of 0.25: our estimate is equal to 0.26 with a standard deviation of 0.05. In only 115 of 1,000 repetitions, we can reject the null hypothesis that our estimate is equal to 0.25.

In addition to carrying out these simulations, we conduct our main analysis at three different geography levels: FSA, CSD, and CMA/CA. Table C.1 presents our results for the pooled OLS models. We find that the results are consistent with CSDs being the real markets (at least a good approximation). Indeed, in five of six charitable sectors, the elasticity of charity size with respect to market size is lower at the FSA level than at the CSD level. In four sectors, the estimates are similar at the CSD and CMA level. CMA results are less precise in many cases as the sample size is also smaller. Assuming CSDs are the relevant markets, we would expect an analysis at the FSA level to find lower estimates, since FSAs are often smaller than CSDs. We would also expect an analysis at the CMA/CA level to find estimates similar to those with CSDs, since CMAs and CAs are strictly larger than CSDs. This is indeed the case, and thus we are confident that CSD is preferable unit of analysis in our case amongst those available.

Table C.1: Association between Market Population (in log) and Average Expenditures (in log), Across Market Definitions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | FSA | | CSD | | CMA | |
| All Six Sectors | 0.052* | 0.059 | 0.22*** | 0.24*** | 0.28*** | 0.23*** |
| | (0.030) | (0.037) | (0.014) | (0.019) | (0.028) | (0.051) |
| $N$ | 8946 | 6363 | 5521 | 5338 | 1470 | 1469 |
| $R^2$ | 0.024 | 0.065 | 0.113 | 0.122 | 0.116 | 0.136 |
| Daycare | 0.028 | 0.016 | 0.23*** | 0.26*** | 0.21*** | 0.29*** |
| | (0.036) | (0.055) | (0.023) | (0.032) | (0.046) | (0.071) |
| $N$ | 1945 | 1435 | 1214 | 1171 | 315 | 314 |
| $R^2$ | 0.124 | 0.117 | 0.259 | 0.311 | 0.217 | 0.299 |
| Food and Clothing Banks | -0.038 | 0.072 | 0.24*** | 0.35*** | 0.30*** | 0.097 |
| | (0.077) | (0.087) | (0.036) | (0.042) | (0.049) | (0.071) |
| $N$ | 1116 | 783 | 635 | 614 | 204 | 204 |
| $R^2$ | 0.043 | 0.240 | 0.232 | 0.295 | 0.322 | 0.436 |
| Housing | 0.079 | 0.0011 | 0.26*** | 0.30*** | 0.26*** | 0.19* |
| | (0.072) | (0.076) | (0.027) | (0.042) | (0.051) | (0.11) |
| $N$ | 1767 | 1291 | 1208 | 1161 | 289 | 289 |
| $R^2$ | 0.023 | 0.108 | 0.160 | 0.191 | 0.135 | 0.283 |
| Seniors | 0.24*** | 0.32*** | 0.21*** | 0.24*** | 0.35*** | 0.41*** |
| | (0.089) | (0.11) | (0.033) | (0.049) | (0.077) | (0.16) |
| $N$ | 1250 | 892 | 755 | 733 | 198 | 198 |
| $R^2$ | 0.040 | 0.100 | 0.094 | 0.102 | 0.160 | 0.249 |
| Disabled | 0.12* | 0.086 | 0.35*** | 0.28*** | 0.30*** | 0.16 |
| | (0.064) | (0.080) | (0.033) | (0.051) | (0.062) | (0.11) |
| $N$ | 1819 | 1263 | 1181 | 1154 | 306 | 306 |
| $R^2$ | 0.021 | 0.121 | 0.190 | 0.270 | 0.131 | 0.267 |
| Festivals and Performances | -0.18*** | 0.031 | 0.15*** | 0.22*** | 0.45*** | 0.41*** |
| | (0.065) | (0.087) | (0.038) | (0.049) | (0.065) | (0.097) |
| $N$ | 1049 | 699 | 528 | 505 | 158 | 158 |
| $R^2$ | 0.027 | 0.188 | 0.075 | 0.129 | 0.323 | 0.385 |
| Controls | No | Yes | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

## Appendix D Data Sources

We conduct our analysis at the market level, with markets defined as municipalities (a general term encompassing towns, cities, villages, etc.). In Canadian statistics, municipalities are known as Census sub-divisions (CSD). The borders of these CSDs are re-defined (usually in Census years) according to the evolution of administrative boundaries, due, for example, to municipal mergers and secessions. This feature makes it particularly hard to study municipalities in panel data. To keep the definition of a market constant, we define markets using the borders of CSDs in 2011, and adjust data from prior years accordingly using GIS software.

For the analysis, we use three main sources of data. For data on charities, we use administrative data on charities from the Canadian Revenue Agency (form T3010). For data on all businesses, we use administrative data on businesses by industry from the Canadian Business Register, maintained by Statistics Canada. Finally, for socio-economic and control variables, we use the Community Profiles from the 1996, 2001, 2006, and 2011 Censuses, administered by Statistics Canada.

### *D.1 Charities*

Each year, charities have to fill out a form (T3010) about their activities and submit it to the Canadian Revenue Agency. We use the data from these forms at the individual charity level. We restrict our attention to years closest to the ones in which we also have Census data (so 1997, 2001, 2005, 2011).

First, we need to assign these charities to a market (i.e., 2011 CSD). From 1997 to 2005, the data is geo-coded. Using the latitude and longitude of every charity, we map the charities location on the map of Canada, and find the code of the CSD in which they are situated. For 2011 data, the charities are not geo-coded. We do, however, have the street address, postal code, city, province, and BN code (unique identifier). As a first step, we use the combination of town name and province to assign each charity to a CSD. This step assigns a CSD to 64,573 charities.

Many charities make mistakes on the T3010 forms, or list their address as some smaller village or neighbourhood that is only part of the bigger (official) municipality. To match the rest of the charities, we assign them to CSDs using the BN code and the assigned CSD of the same charity in the previous data (2007). Doing so assigns a CSD to an additional 18,145 charities. Finally, if these steps do not result in finding a location, we assign a CSD code using the postal code. Doing so requires knowing where postal codes lie on the map of CSDs. We use a crowd-sourced shapefile of postal codes available from geocoder.ca, and overlap it with the shapefile of 2011 CSDs, assigning each postal code to a CSD using the centroid of postal code geometries. Since these postal code geometries sometimes cross CSD boundaries, they only imperfectly capture the city of operation of the charity. Nevertheless, we are able to assign a market to an additional 3,657 charities using this method.

### *D.2 Business Register*

Every business in Canada is assigned a Business Number (BN), and is included in the Canadian Business Register (BR), maintained by Statistics Canada. Note that this register also includes the charities. We have simple data from the BR from 2007 to 2011: number of firms by Dissemination Area (small statistical area of 400 to 700 population) and by 6-digit NAICS industry. We aggregate Dissemination Area at the level of Census Subdivisions using GIS software and boundary files. The number of firms is disaggregated by employment size category (1 to 4 employees, 5 to 9, 10 to 19, 20 to 49, 50 to 99, 100 to 199, 200 to 499, and 500 or more). Some firms are categorized as of "indeterminate" size: these could be firms where the owner is the only worker, or where the family are employees, for example. Some firms are uncategorized in terms of geography: they are included in the provincial "residue". We cannot assign them to a CSD. To measure average firm size, we use the mid-point of each size category, times the number of firms in that category. We do not count firms of indeterminate size. We thus obtain average firm size by NAICS industry and by 2011 municipality.

### *D.3 Census*

The final data source is the Canadian Census. Specifically, we use the Community Profiles from the 1996, 2001, 2006, and 2011 Census.[31] These profiles are available for different geographical units, but we use the CSD level, available in all years. The borders of the CSDs are not stable through the whole period, so we need to adjust the data. To do so, we use the CSD shapefiles for years 1996, 2001, and 2006, and find the centroids of the CSDs. We overlap the centroids[32] on the shapefile for 2011 CSDs, and assign each CSD of prior years to a 2011 CSD. This gives us a correspondence file for $CSD_t$ to $CSD_{2011}$. The geometry of some CSDs contains errors. In those cases, we do not find the centroid, so we manually add the correspondence of those CSDs to 2011 CSDs, by looking at the geographic maps.

We then take the whole dataset of CSD Community Profiles for each year, and collapse the data to the level of 2011 CSD. For non-count data (i.e., average income), we use the population-weighted averages across CSDs. We then obtain a panel of Community Profiles from 1996 to 2011 using relatively stable geographic definitions.

[31] The 2011 Census only includes basic information such as population. In 2011, the Census was instead complemented by a National Household Survey, to which response was optional. For that reason, the 2011 Census suffered from more data suppression.

[32] We use the *realcentroids* plugin in QGIS to adjust centroids to be inside borders only.

## Appendix E Correspondence Between NAICS Codes and Charity Sectors

| NAICS 2007 code | Description |
|---|---|
| *Daycare* | |
| 624410 | Child Day Care Services |
| *Festivals and Performances* | |
| 711311 | Live theatres and other performing arts presenters with facilities |
| 711321 | Performing arts promoters (presenters) without facilities |
| 711322 | Festivals without facilities |
| 711511 | Independent Artists, Visual Arts |
| 711512 | Independent Actors, Comedians and Performers |
| 711111 | Theatre (except musical) companies |
| 711112 | Musical theatre and opera companies |
| 711120 | Dance companies |
| 711130 | Musical groups and artists |
| 711190 | Other performing arts companies |
| *Housing* | |
| 531111 | Lessors of residential buildings and dwellings (except social housing projects) |
| 531112 | Lessors of social housing projects |
| *Seniors and Disabled Care (combined)* | |
| 624120 | Services for the elderly and persons with disabilities |
| 624310 | Vocational rehabilitation services |
| *Food and Clothing Banks* | |
| 624210 | Community food services |
| 722330 | Mobile food services |
| 722210 | Limited-Service Eating Places |
| 722310 | Food Service Contractors |
| 445110 | Supermarkets and Other Grocery (except Convenience) Stores |
| 445120 | Convenience Stores |
| 448110 | Men’s Clothing Stores |
| 448120 | Women’s Clothing Stores |
| 448130 | Children’s and Infants’ Clothing Stores |
| 448140 | Family Clothing Stores |
| 448150 | Clothing Accessories Stores |
| 448199 | All Other Clothing Stores |
| 448210 | Shoe Stores |

## Appendix F Additional Tables (Online Appendix, not for publication)

Table F.1: Descriptive Statistics on control variables for 2011

| | N | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| Population | 5,253 | 6,372.9 | 55,583.9 | 0 | 2,615,060 |
| Household Mean Income | 2,831 | 54,760.6 | 18,082.1 | 10,733 | 181,454 |
| Share over 65 (%) | 4,556 | 16.6 | 7.85 | 0 | 93.7 |
| Share under 5 (%) | 4,556 | 5.79 | 3.07 | 0 | 22.4 |
| Share w/o high school (%) | 3,439 | 32.4 | 16.5 | 0 | 100 |
| Share university-educated (%) | 3,439 | 8.82 | 8.42 | 0 | 71.4 |
| Share of immigrants (%) | 2,881 | 4.53 | 6.78 | 0 | 59.6 |
| Unemployment rate (%) | 3,439 | 11.2 | 11.9 | 0 | 100 |
| Average gross rent | 2,225 | 653.3 | 213.4 | 154 | 2,148 |

Table F.2: Association Between Market Population (in log), and Average Employment (in log) and the Number of Providers (in log), Charities only vs. Business Register (with Fixed Effects)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *Dependent Variable:* | Average Employment | | Number of Providers | |
| | All Six Sectors | | | |
| Charities | 0.069 | 0.00022 | 0.27 | 0.33 |
| | (0.52) | (0.66) | (0.21) | (0.27) |
| Business Register | -0.46** | -0.16 | 0.055 | -0.12 |
| | (0.21) | (0.27) | (0.24) | (0.31) |
| *t*-test (*p*-value) | 0.342 | 0.823 | 0.499 | 0.284 |
| | Daycare | | | |
| Charities | 0.30 | -0.79 | -0.31 | -0.22 |
| | (0.65) | (0.87) | (0.24) | (0.39) |
| Business Register | -0.50 | -0.99 | 0.42 | 0.81* |
| | (0.57) | (1.03) | (0.32) | (0.46) |
| *t*-test (*p*-value) | 0.392 | 0.901 | 0.056 | 0.066 |
| | Festivals | | | |
| Charities | 1.19 | 0.31 | -0.42 | -0.71 |
| | (3.30) | (4.35) | (0.81) | (1.16) |
| Business Register | 0.83 | 2.69* | -0.030 | -0.41 |
| | (1.36) | (1.42) | (0.79) | (1.12) |
| *t*-test (*p*-value) | 0.901 | 0.480 | 0.740 | 0.859 |
| | Housing | | | |
| Charities | 0.032 | -1.62** | 0.50 | 0.098 |
| | (0.69) | (0.81) | (0.45) | (0.53) |
| Business Register | -0.064 | 0.52 | 1.16 | 1.24* |
| | (0.70) | (0.82) | (0.68) | (0.70) |
| *t*-test (*p*-value) | 0.909 | 0.019 | 0.361 | 0.194 |
| | Seniors and Disabled | | | |
| Charities | 0.41 | 0.86 | -0.33 | -0.36 |
| | (0.92) | (1.32) | (0.47) | (0.70) |
| Business Register | 0.058 | 0.59 | 0.47 | 0.51 |
| | (0.66) | (0.88) | (0.37) | (0.42) |
| *t*-test (*p*-value) | 0.757 | 0.846 | 0.224 | 0.331 |
| | Food and clothing | | | |
| Charities | 0.86 | 0.81 | -0.15 | -0.56* |
| | (0.80) | (1.07) | (0.17) | (0.32) |
| Business Register | -0.47 | 0.68 | 0.078 | 0.037 |
| | (0.48) | (0.50) | (0.51) | (0.60) |
| *t*-test (*p*-value) | 0.093 | 0.912 | 0.678 | 0.376 |
| Controls | No | Yes | No | Yes |

Note: The outcomes are *ln(average employment)* and *ln(number of providers)*. The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. Tests are for the equality of the coefficients across datasets, combined using *suest* in Stata. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.3: Association between Market Population (in log), and Average Employment (in log) and the Number of Providers (in log), Using Business Register Data Only, for the Housing Sector (Pooled OLS)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| *Dependent Variable:* | Average Employment | | Number of Providers | |
| NAICS 531111 | 0.11*** | 0.10*** | 0.86*** | 0.77*** |
| *Lessors of Residential Buildings Excl. Social Housing* | (0.020) | (0.030) | (0.029) | (0.035) |
| NAICS 531112 | 0.21*** | 0.23*** | 0.42*** | 0.43*** |
| *Lessor of Social Housing Projects* | (0.031) | (0.040) | (0.032) | (0.035) |
| $t$-test ($p$-value) | 0.007 | 0.012 | 0.000 | 0.000 |
| Controls | No | Yes | No | Yes |

Note: The outcomes are *ln(average employment)* and *ln(number of providers)*. The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. Tests are for the equality of the coefficients across regressions, combined using *suest* in Stata. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.4: Association Between Market Population (in log) and Average Revenues (in log)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.23*** | 0.24*** | 0.041 | 0.0018 |
| | (0.014) | (0.019) | (0.11) | (0.13) |
| N | 5512 | 5331 | 5512 | 5331 |
| $R^2$ | 0.113 | 0.122 | 0.061 | 0.029 |
| Daycare | 0.24*** | 0.25*** | -0.014 | -0.0088 |
| | (0.024) | (0.033) | (0.19) | (0.20) |
| N | 1212 | 1170 | 1212 | 1170 |
| $R^2$ | 0.256 | 0.299 | 0.098 | 0.091 |
| Food and Clothing Banks | 0.25*** | 0.35*** | 0.73*** | 0.71** |
| | (0.039) | (0.043) | (0.26) | (0.35) |
| N | 634 | 613 | 634 | 613 |
| $R^2$ | 0.225 | 0.282 | 0.203 | 0.197 |
| Housing | 0.26*** | 0.30*** | 0.13 | -0.043 |
| | (0.027) | (0.041) | (0.11) | (0.11) |
| N | 1205 | 1158 | 1205 | 1158 |
| $R^2$ | 0.165 | 0.200 | 0.150 | 0.028 |
| Seniors | 0.22*** | 0.25*** | -0.13 | -0.028 |
| | (0.033) | (0.049) | (0.32) | (0.50) |
| N | 753 | 731 | 753 | 731 |
| $R^2$ | 0.096 | 0.105 | 0.015 | 0.001 |
| Disabled | 0.35*** | 0.29*** | 0.036 | -0.19 |
| | (0.033) | (0.050) | (0.16) | (0.22) |
| N | 1181 | 1154 | 1181 | 1154 |
| $R^2$ | 0.185 | 0.263 | 0.072 | 0.000 |
| Festivals and Performances | 0.14*** | 0.22*** | 0.15 | 0.53 |
| | (0.038) | (0.050) | (0.34) | (0.44) |
| N | 527 | 505 | 527 | 505 |
| $R^2$ | 0.069 | 0.126 | 0.068 | 0.062 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average revenues*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.5: Association Between Market Population (in log) and Average Expenditures (in log), with Markets Defined by Relevant Sub-Population, for Selection of Sectors

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Daycare | | | |
| ln(population under 5) | 0.23*** | 0.25*** | 0.038 | 0.100 |
| | (0.023) | (0.031) | (0.10) | (0.11) |
| *N* | 1213 | 1171 | 1213 | 1171 |
| $R^2$ | 0.259 | 0.311 | 0.160 | 0.191 |
| | Seniors | | | |
| ln(population over 65) | 0.22*** | 0.25*** | -0.011 | 0.095 |
| | (0.035) | (0.048) | (0.15) | (0.24) |
| *N* | 755 | 733 | 755 | 733 |
| $R^2$ | 0.096 | 0.107 | 0.009 | 0.051 |
| | Disabled | | | |
| ln(population over 65) | 0.38*** | 0.28*** | -0.24 | -0.18 |
| | (0.035) | (0.049) | (0.15) | (0.16) |
| *N* | 1178 | 1154 | 1178 | 1154 |
| $R^2$ | 0.196 | 0.271 | 0.018 | 0.007 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*relevant sub-population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.6: Association between Market Population (in log) and the Number of Providers (in log), with Markets Defined by Relevant Sub-Population, for Selection of Sectors

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | | Daycare | | |
| ln(population under 5) | 0.29*** | 0.34*** | -0.030 | -0.058 |
| | (0.029) | (0.033) | (0.043) | (0.050) |
| $N$ | 1502 | 1446 | 1502 | 1446 |
| $R^2$ | 0.456 | 0.545 | 0.326 | 0.305 |
| | | Seniors | | |
| ln(population over 65) | 0.26*** | 0.28*** | 0.12* | 0.18** |
| | (0.029) | (0.030) | (0.065) | (0.074) |
| $N$ | 1453 | 1397 | 1453 | 1397 |
| $R^2$ | 0.386 | 0.447 | 0.380 | 0.390 |
| | | Disabled | | |
| ln(population over 65) | 0.41*** | 0.47*** | 0.13** | 0.083 |
| | (0.025) | (0.025) | (0.064) | (0.075) |
| $N$ | 1737 | 1698 | 1737 | 1698 |
| $R^2$ | 0.560 | 0.616 | 0.543 | 0.445 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*number of providers*). The table shows the coefficients on ln(*relevant sub-population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.7: Association Between Market Population (in log) and Average Expenditures (in log), Including Charities with Low Expenditures

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.19*** | 0.21*** | 0.010 | -0.087 |
| | (0.012) | (0.016) | (0.099) | (0.11) |
| N | 8937 | 8630 | 8937 | 8630 |
| $R^2$ | 0.070 | 0.076 | 0.022 | 0.002 |
| Daycare | 0.25*** | 0.26*** | 0.11 | 0.054 |
| | (0.021) | (0.029) | (0.13) | (0.16) |
| N | 1505 | 1447 | 1505 | 1447 |
| $R^2$ | 0.273 | 0.317 | 0.229 | 0.155 |
| Food and Clothing Banks | 0.19*** | 0.24*** | 0.47* | 0.38 |
| | (0.027) | (0.032) | (0.24) | (0.28) |
| N | 1299 | 1265 | 1299 | 1265 |
| $R^2$ | 0.140 | 0.189 | 0.135 | 0.139 |
| Housing | 0.26*** | 0.28*** | 0.023 | -0.18 |
| | (0.025) | (0.037) | (0.16) | (0.17) |
| N | 1748 | 1678 | 1748 | 1678 |
| $R^2$ | 0.138 | 0.181 | 0.036 | 0.013 |
| Seniors | 0.20*** | 0.25*** | -0.20 | -0.078 |
| | (0.025) | (0.037) | (0.23) | (0.28) |
| N | 1455 | 1397 | 1455 | 1397 |
| $R^2$ | 0.083 | 0.098 | 0.032 | 0.008 |
| Disabled | 0.34*** | 0.25*** | -0.013 | -0.095 |
| | (0.030) | (0.044) | (0.17) | (0.22) |
| N | 1742 | 1698 | 1742 | 1698 |
| $R^2$ | 0.164 | 0.252 | 0.030 | 0.001 |
| Festivals and Performances | 0.11*** | 0.18*** | 0.040 | 0.0081 |
| | (0.032) | (0.039) | (0.23) | (0.27) |
| N | 1188 | 1145 | 1188 | 1145 |
| $R^2$ | 0.041 | 0.101 | 0.029 | 0.004 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. This regression includes all charities, even those with expenditures lower than CDN $30,000. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.8: Association Between Market Population (in log) and Average Expenditures (in log), Excluding Top and Bottom 5% of Markets

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.22*** | 0.23*** | 0.095 | -0.036 |
| | (0.019) | (0.023) | (0.12) | (0.14) |
| N | 4990 | 4884 | 4990 | 4884 |
| $R^2$ | 0.081 | 0.091 | 0.068 | 0.032 |
| Daycare | 0.24*** | 0.28*** | 0.14 | 0.17 |
| | (0.031) | (0.038) | (0.16) | (0.17) |
| N | 1107 | 1076 | 1107 | 1076 |
| $R^2$ | 0.227 | 0.294 | 0.215 | 0.169 |
| Food and Clothing Banks | 0.25*** | 0.34*** | 0.54 | 0.33 |
| | (0.043) | (0.049) | (0.36) | (0.36) |
| N | 571 | 562 | 571 | 562 |
| $R^2$ | 0.194 | 0.237 | 0.182 | 0.126 |
| Housing | 0.30*** | 0.33*** | 0.17 | 0.018 |
| | (0.040) | (0.052) | (0.11) | (0.12) |
| N | 1084 | 1055 | 1084 | 1055 |
| $R^2$ | 0.139 | 0.177 | 0.132 | 0.052 |
| Seniors | 0.18*** | 0.20*** | 0.23 | 0.0072 |
| | (0.044) | (0.058) | (0.42) | (0.50) |
| N | 696 | 683 | 696 | 683 |
| $R^2$ | 0.057 | 0.063 | 0.054 | 0.025 |
| Disabled | 0.37*** | 0.28*** | -0.12 | -0.36* |
| | (0.050) | (0.066) | (0.19) | (0.20) |
| N | 1060 | 1047 | 1060 | 1047 |
| $R^2$ | 0.142 | 0.225 | 0.008 | 0.005 |
| Festivals and Performances | 0.063 | 0.13** | 0.57 | 0.65 |
| | (0.051) | (0.058) | (0.38) | (0.47) |
| N | 464 | 455 | 464 | 455 |
| $R^2$ | 0.026 | 0.061 | 0.011 | 0.006 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. This regression excludes markets at the top and bottom 5% of the distribution of population. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.9: Association between Market Population (in log) and the Number of Providers (in log), Excluding Top and Bottom 5% of Markets

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.29*** | 0.32*** | 0.071** | 0.066* |
| | (0.015) | (0.016) | (0.034) | (0.037) |
| N | 7857 | 7722 | 7857 | 7722 |
| $R^2$ | 0.371 | 0.415 | 0.336 | 0.310 |
| Daycare | 0.22*** | 0.23*** | -0.073 | -0.11 |
| | (0.020) | (0.026) | (0.081) | (0.088) |
| N | 1355 | 1317 | 1355 | 1317 |
| $R^2$ | 0.336 | 0.373 | 0.294 | 0.257 |
| Food and Clothing Banks | 0.28*** | 0.34*** | 0.10 | 0.12 |
| | (0.021) | (0.022) | (0.10) | (0.13) |
| N | 1170 | 1155 | 1170 | 1155 |
| $R^2$ | 0.390 | 0.491 | 0.318 | 0.339 |
| Housing | 0.25*** | 0.27*** | 0.12* | 0.15** |
| | (0.017) | (0.022) | (0.070) | (0.068) |
| N | 1574 | 1528 | 1574 | 1528 |
| $R^2$ | 0.374 | 0.415 | 0.365 | 0.312 |
| Seniors | 0.15*** | 0.18*** | 0.17 | 0.16 |
| | (0.016) | (0.021) | (0.11) | (0.13) |
| N | 1311 | 1278 | 1311 | 1278 |
| $R^2$ | 0.206 | 0.241 | 0.204 | 0.177 |
| Disabled | 0.34*** | 0.41*** | 0.11 | 0.14 |
| | (0.020) | (0.023) | (0.088) | (0.10) |
| N | 1568 | 1545 | 1568 | 1545 |
| $R^2$ | 0.422 | 0.495 | 0.394 | 0.405 |
| Festivals and Performances | 0.37*** | 0.39*** | 0.23*** | 0.23** |
| | (0.025) | (0.029) | (0.089) | (0.092) |
| N | 1070 | 1054 | 1070 | 1054 |
| $R^2$ | 0.439 | 0.494 | 0.428 | 0.435 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*number of providers*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. This regression excludes markets at the top and bottom 5% of the distribution of population. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.10: Association between Market Size (in log) and Total Expenditures (in log), at Individual Producer Level

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.11*** | 0.094*** | -0.24** | -0.35*** |
| | (0.018) | (0.013) | (0.10) | (0.12) |
| N | 18850 | 18657 | 18850 | 18657 |
| $R^2$ | 0.046 | 0.055 | 0.011 | 0.010 |
| Daycare | 0.085*** | 0.079* | 0.071 | 0.021 |
| | (0.026) | (0.045) | (0.15) | (0.18) |
| N | 3492 | 3447 | 3492 | 3447 |
| $R^2$ | 0.137 | 0.163 | 0.136 | 0.072 |
| Food and Clothing Banks | 0.22*** | 0.20*** | 0.42 | 0.89*** |
| | (0.019) | (0.038) | (0.29) | (0.30) |
| N | 2034 | 2011 | 2034 | 2011 |
| $R^2$ | 0.190 | 0.203 | 0.183 | 0.146 |
| Housing | 0.15*** | 0.12*** | -0.12 | -0.36* |
| | (0.036) | (0.033) | (0.18) | (0.20) |
| N | 3568 | 3521 | 3568 | 3521 |
| $R^2$ | 0.079 | 0.110 | 0.023 | 0.031 |
| Seniors | 0.12** | 0.10*** | -0.56** | -0.70** |
| | (0.049) | (0.035) | (0.26) | (0.34) |
| N | 2121 | 2097 | 2121 | 2097 |
| $R^2$ | 0.057 | 0.080 | 0.034 | 0.035 |
| Disabled | 0.098** | 0.074* | -0.50*** | -0.78*** |
| | (0.044) | (0.038) | (0.19) | (0.22) |
| N | 4143 | 4115 | 4143 | 4115 |
| $R^2$ | 0.033 | 0.097 | 0.009 | 0.006 |
| Festivals and Performances | 0.15*** | 0.21*** | -0.12 | -0.065 |
| | (0.024) | (0.029) | (0.28) | (0.29) |
| N | 3492 | 3466 | 3492 | 3466 |
| $R^2$ | 0.057 | 0.081 | 0.029 | 0.000 |
| Producer Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*total expenditures*). These regressions are conducted with individual producers as the units of observation. The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.11: Association Between Market Population (in log) and Average Expenditures (in log), Controlling for the Average Share of Revenues from Government

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.24*** | 0.24*** | 0.089 | 0.087 |
| | (0.014) | (0.019) | (0.12) | (0.13) |
| N | 4151 | 4083 | 4151 | 4083 |
| $R^2$ | 0.116 | 0.122 | 0.091 | 0.088 |
| Daycare | 0.24*** | 0.25*** | 0.086 | 0.16 |
| | (0.025) | (0.031) | (0.17) | (0.17) |
| N | 903 | 894 | 903 | 894 |
| $R^2$ | 0.242 | 0.288 | 0.182 | 0.120 |
| Food and Clothing Banks | 0.24*** | 0.33*** | 0.26 | 0.0097 |
| | (0.036) | (0.043) | (0.40) | (0.48) |
| N | 460 | 447 | 460 | 447 |
| $R^2$ | 0.248 | 0.318 | 0.180 | 0.042 |
| Housing | 0.28*** | 0.32*** | 0.13 | -0.027 |
| | (0.028) | (0.043) | (0.11) | (0.13) |
| N | 909 | 891 | 909 | 891 |
| $R^2$ | 0.169 | 0.190 | 0.014 | 0.006 |
| Seniors | 0.26*** | 0.23*** | -0.28 | -0.11 |
| | (0.036) | (0.049) | (0.26) | (0.47) |
| N | 568 | 560 | 568 | 560 |
| $R^2$ | 0.144 | 0.151 | 0.077 | 0.029 |
| Disabled | 0.37*** | 0.28*** | 0.078 | -0.21 |
| | (0.033) | (0.052) | (0.21) | (0.23) |
| N | 890 | 883 | 890 | 883 |
| $R^2$ | 0.188 | 0.271 | 0.099 | 0.000 |
| Festivals and Performances | 0.17*** | 0.23*** | 0.28 | 1.01** |
| | (0.038) | (0.051) | (0.39) | (0.40) |
| N | 421 | 408 | 421 | 408 |
| $R^2$ | 0.112 | 0.150 | 0.098 | 0.089 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects and control for the average share of government funding in charities' revenues. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.12: Association Between Market Population (in log) and the Number of Providers (in log), Controlling for the Average Share of Revenues from Government

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.34*** | 0.38*** | 0.085 | 0.097* |
| | (0.027) | (0.025) | (0.053) | (0.058) |
| N | 4151 | 4083 | 4151 | 4083 |
| $R^2$ | 0.497 | 0.584 | 0.471 | 0.518 |
| Daycare | 0.32*** | 0.35*** | 0.072 | 0.025 |
| | (0.035) | (0.038) | (0.075) | (0.080) |
| N | 903 | 894 | 903 | 894 |
| $R^2$ | 0.460 | 0.536 | 0.440 | 0.269 |
| Food and Clothing Banks | 0.32*** | 0.42*** | 0.33** | 0.48** |
| | (0.036) | (0.038) | (0.14) | (0.20) |
| N | 460 | 447 | 460 | 447 |
| $R^2$ | 0.496 | 0.643 | 0.489 | 0.549 |
| Housing | 0.31*** | 0.34*** | 0.14** | 0.15*** |
| | (0.024) | (0.028) | (0.059) | (0.055) |
| N | 909 | 891 | 909 | 891 |
| $R^2$ | 0.512 | 0.601 | 0.083 | 0.103 |
| Seniors | 0.27*** | 0.31*** | 0.040 | 0.089 |
| | (0.050) | (0.050) | (0.10) | (0.19) |
| N | 568 | 560 | 568 | 560 |
| $R^2$ | 0.382 | 0.494 | 0.229 | 0.322 |
| Disabled | 0.41*** | 0.48*** | -0.026 | -0.050 |
| | (0.027) | (0.025) | (0.099) | (0.10) |
| N | 890 | 883 | 890 | 883 |
| $R^2$ | 0.601 | 0.691 | 0.116 | 0.055 |
| Festivals and Performances | 0.45*** | 0.47*** | 0.27 | 0.48** |
| | (0.050) | (0.042) | (0.17) | (0.22) |
| N | 421 | 408 | 421 | 408 |
| $R^2$ | 0.583 | 0.696 | 0.577 | 0.622 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*number of providers*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects and control for the average share of government funding in charities' revenues. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.13: Association Between Market Population (in log) and Median Expenditures (in log)

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.13*** | 0.14*** | -0.037 | -0.061 |
| | (0.013) | (0.019) | (0.12) | (0.13) |
| N | 5521 | 5338 | 5521 | 5338 |
| $R^2$ | 0.063 | 0.074 | 0.018 | 0.014 |
| Daycare | 0.18*** | 0.21*** | 0.055 | 0.082 |
| | (0.022) | (0.031) | (0.17) | (0.17) |
| N | 1214 | 1171 | 1214 | 1171 |
| $R^2$ | 0.216 | 0.282 | 0.172 | 0.166 |
| Food and Clothing Banks | 0.19*** | 0.28*** | 0.35 | 0.27 |
| | (0.033) | (0.040) | (0.26) | (0.29) |
| N | 635 | 614 | 635 | 614 |
| $R^2$ | 0.182 | 0.231 | 0.175 | 0.133 |
| Housing | 0.19*** | 0.23*** | 0.054 | -0.11 |
| | (0.027) | (0.041) | (0.13) | (0.12) |
| N | 1208 | 1161 | 1208 | 1161 |
| $R^2$ | 0.097 | 0.134 | 0.069 | 0.000 |
| Seniors | 0.13*** | 0.15*** | -0.13 | -0.065 |
| | (0.030) | (0.048) | (0.29) | (0.48) |
| N | 755 | 733 | 755 | 733 |
| $R^2$ | 0.049 | 0.057 | 0.001 | 0.003 |
| Disabled | 0.16*** | 0.059 | -0.16 | -0.33 |
| | (0.034) | (0.049) | (0.17) | (0.22) |
| N | 1181 | 1154 | 1181 | 1154 |
| $R^2$ | 0.082 | 0.199 | 0.004 | 0.002 |
| Festivals and Performances | 0.032 | 0.099** | 0.24 | 0.68 |
| | (0.030) | (0.046) | (0.36) | (0.42) |
| N | 528 | 505 | 528 | 505 |
| $R^2$ | 0.020 | 0.051 | 0.009 | 0.008 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*median expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.14: Association Between Market Population (in log) and Average Expenditures (in log), with Province and Year Fixed Effects

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.20*** | 0.22*** | -0.0077 | -0.053 |
| | (0.015) | (0.019) | (0.11) | (0.13) |
| N | 5521 | 5338 | 5521 | 5338 |
| $R^2$ | 0.133 | 0.142 | 0.027 | 0.011 |
| Daycare | 0.21*** | 0.18*** | 0.043 | 0.053 |
| | (0.023) | (0.028) | (0.17) | (0.18) |
| N | 1214 | 1171 | 1214 | 1171 |
| $R^2$ | 0.460 | 0.480 | 0.165 | 0.143 |
| Food and Clothing Banks | 0.26*** | 0.41*** | 0.42 | 0.25 |
| | (0.035) | (0.044) | (0.26) | (0.29) |
| N | 635 | 614 | 635 | 614 |
| $R^2$ | 0.289 | 0.371 | 0.227 | 0.165 |
| Housing | 0.25*** | 0.29*** | 0.063 | -0.088 |
| | (0.028) | (0.042) | (0.12) | (0.12) |
| N | 1208 | 1161 | 1208 | 1161 |
| $R^2$ | 0.261 | 0.267 | 0.101 | 0.000 |
| Seniors | 0.16*** | 0.20*** | -0.10 | -0.091 |
| | (0.036) | (0.050) | (0.28) | (0.47) |
| N | 755 | 733 | 755 | 733 |
| $R^2$ | 0.168 | 0.174 | 0.004 | 0.001 |
| Disabled | 0.28*** | 0.25*** | -0.038 | -0.24 |
| | (0.032) | (0.045) | (0.15) | (0.19) |
| N | 1181 | 1154 | 1181 | 1154 |
| $R^2$ | 0.376 | 0.393 | 0.021 | 0.000 |
| Festivals and Performances | 0.13*** | 0.21*** | 0.28 | 0.73* |
| | (0.044) | (0.053) | (0.36) | (0.42) |
| N | 528 | 505 | 528 | 505 |
| $R^2$ | 0.099 | 0.169 | 0.072 | 0.077 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.15: Association Between Market Population (in log) and Average Expenditures (in log), with Province, Year, and Province×Year Fixed Effects

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.20*** | 0.22*** | -0.063 | -0.066 |
| | (0.015) | (0.019) | (0.11) | (0.13) |
| N | 5521 | 5338 | 5521 | 5338 |
| $R^2$ | 0.137 | 0.147 | 0.003 | 0.003 |
| Daycare | 0.22*** | 0.18*** | 0.0063 | 0.084 |
| | (0.023) | (0.028) | (0.14) | (0.14) |
| N | 1214 | 1171 | 1214 | 1171 |
| $R^2$ | 0.486 | 0.509 | 0.238 | 0.283 |
| Food and Clothing Banks | 0.26*** | 0.42*** | 0.63** | 0.36 |
| | (0.035) | (0.044) | (0.30) | (0.31) |
| N | 635 | 614 | 635 | 614 |
| $R^2$ | 0.306 | 0.399 | 0.228 | 0.218 |
| Housing | 0.25*** | 0.29*** | 0.068 | 0.011 |
| | (0.029) | (0.043) | (0.12) | (0.12) |
| N | 1208 | 1161 | 1208 | 1161 |
| $R^2$ | 0.271 | 0.277 | 0.073 | 0.009 |
| Seniors | 0.16*** | 0.20*** | 0.046 | -0.27 |
| | (0.037) | (0.051) | (0.29) | (0.48) |
| N | 755 | 733 | 755 | 733 |
| $R^2$ | 0.203 | 0.210 | 0.066 | 0.002 |
| Disabled | 0.28*** | 0.25*** | -0.24 | -0.31 |
| | (0.032) | (0.046) | (0.15) | (0.19) |
| N | 1181 | 1154 | 1181 | 1154 |
| $R^2$ | 0.385 | 0.405 | 0.002 | 0.000 |
| Festivals and Performances | 0.13** | 0.20*** | 0.52 | 1.04** |
| | (0.045) | (0.055) | (0.38) | (0.50) |
| N | 528 | 505 | 528 | 505 |
| $R^2$ | 0.119 | 0.188 | 0.069 | 0.076 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.16: Association Between Market Population (in log) and Average Expenditures (in log), Only Local Charities

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.20*** | 0.21*** | -0.086 | -0.11 |
| | (0.014) | (0.019) | (0.14) | (0.16) |
| N | 4001 | 3946 | 4001 | 3946 |
| $R^2$ | 0.088 | 0.099 | 0.002 | 0.004 |
| Daycare | 0.22*** | 0.23*** | 0.089 | 0.19 |
| | (0.023) | (0.031) | (0.15) | (0.14) |
| N | 902 | 893 | 902 | 893 |
| $R^2$ | 0.208 | 0.266 | 0.168 | 0.073 |
| Food and Clothing Banks | 0.20*** | 0.26*** | 0.61 | 0.31 |
| | (0.035) | (0.049) | (0.46) | (0.44) |
| N | 464 | 453 | 464 | 453 |
| $R^2$ | 0.182 | 0.241 | 0.156 | 0.132 |
| Housing | 0.27*** | 0.31*** | -0.042 | -0.26 |
| | (0.028) | (0.041) | (0.24) | (0.27) |
| N | 869 | 854 | 869 | 854 |
| $R^2$ | 0.151 | 0.195 | 0.024 | 0.039 |
| Seniors | 0.16*** | 0.16*** | -0.42 | -0.43 |
| | (0.033) | (0.054) | (0.31) | (0.75) |
| N | 569 | 566 | 569 | 566 |
| $R^2$ | 0.058 | 0.074 | 0.040 | 0.006 |
| Disabled | 0.35*** | 0.26*** | -0.041 | -0.30 |
| | (0.036) | (0.055) | (0.26) | (0.27) |
| N | 821 | 815 | 821 | 815 |
| $R^2$ | 0.173 | 0.270 | 0.004 | 0.005 |
| Festivals and Performances | 0.11*** | 0.17*** | 0.068 | 1.01* |
| | (0.038) | (0.050) | (0.47) | (0.60) |
| N | 376 | 365 | 376 | 365 |
| $R^2$ | 0.048 | 0.090 | 0.044 | 0.049 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*average expenditures*). These regressions only include local charities, i.e., those that reported being active only in their local municipality. We omit 2011 data in which this information is unavailable. The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

Table F.17: Association Between Market Population (in log) and the Number of Providers (in log), Only Local Charities

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| All Six Sectors | 0.31*** | 0.35*** | 0.021 | 0.023 |
| | (0.024) | (0.022) | (0.038) | (0.043) |
| N | 6146 | 6059 | 6146 | 6059 |
| $R^2$ | 0.461 | 0.545 | 0.343 | 0.266 |
| Daycare | 0.31*** | 0.34*** | 0.029 | -0.00034 |
| | (0.031) | (0.034) | (0.068) | (0.078) |
| N | 1082 | 1070 | 1082 | 1070 |
| $R^2$ | 0.461 | 0.542 | 0.340 | 0.100 |
| Food and Clothing Banks | 0.30*** | 0.37*** | 0.31** | 0.34** |
| | (0.029) | (0.028) | (0.13) | (0.16) |
| N | 863 | 849 | 863 | 849 |
| $R^2$ | 0.459 | 0.590 | 0.459 | 0.502 |
| Housing | 0.29*** | 0.33*** | 0.0021 | 0.018 |
| | (0.023) | (0.026) | (0.070) | (0.074) |
| N | 1229 | 1207 | 1229 | 1207 |
| $R^2$ | 0.476 | 0.554 | 0.008 | 0.007 |
| Seniors | 0.24*** | 0.28*** | -0.019 | 0.013 |
| | (0.029) | (0.032) | (0.087) | (0.13) |
| N | 1001 | 989 | 1001 | 989 |
| $R^2$ | 0.377 | 0.461 | 0.240 | 0.014 |
| Disabled | 0.34*** | 0.44*** | -0.17 | -0.075 |
| | (0.023) | (0.024) | (0.11) | (0.11) |
| N | 1213 | 1202 | 1213 | 1202 |
| $R^2$ | 0.518 | 0.613 | 0.511 | 0.325 |
| Festivals and Performances | 0.39*** | 0.42*** | 0.15* | 0.17 |
| | (0.036) | (0.029) | (0.089) | (0.15) |
| N | 758 | 742 | 758 | 742 |
| $R^2$ | 0.516 | 0.629 | 0.509 | 0.473 |
| Market Fixed Effects | No | No | Yes | Yes |
| Controls | No | Yes | No | Yes |

Note: The outcome is ln(*number of providers*). These regressions only include local charities, i.e., those that reported being active only in their local municipality. We omit 2011 data in which this information is unavailable. The table shows the coefficients on ln(*population*), with standard errors in parentheses, clustered at the market level. All models include year fixed effects. Models with control variables also include: log of mean household income, share of population over 65 years old, share of population under 5 years old, share without a high school diploma, share with university degree, share of immigrants, unemployment rate, log of average rental price.
Significance levels: * 10% ** 5% *** 1%.

## Appendix G  Monte Carlo Simulation Code (Not for Publication)

Stata Code 1: Monte Carlo Simulation: Units of Observation are too small

```
clear

postfile simuls beta var n rej using simulsfile_toosmall, replace

quietly forvalues i=1/1000 {
        clear
        * Create a dataset of sub-markets
        * (unit of observation in hypothetical regression)
                set obs 10000
                gen pop = runiformint(50,125000)
        * Merger them in real markets
                gen id = _n
                gen market = round(id,2)
        * Calculate population of market
                bysort market: egen popmarket = total(pop)
                gen logpopmarket=log(popmarket)
        * Calculate average expenditure in market, with noise
                gen logavgexp_market = 10 + 0.25*log(popmarket)
                gen avgexp_market = exp(logavgexp_market) + 200000*rnormal()
        * Sub-markets all have the same charity size
        * since that variable is defined at the market level only
                gen logavgexp=log(avgexp_market)
                gen logpop = log(pop)
        * Regression at sub-market level
                capture reg logavgexp logpop
                if _rc==0 {
                        mat b=e(b)
                        mat v=e(V)
                        test _b[logpop]==0.25
                        gen rej = r(p)
                        post simuls (b[1,1]) (v[1,1]) (e(N)) (rej)
                }
                else {
                        post simuls (.) (.) (.) (.)
                }
}
postclose simuls

postutil clear
```

Stata Code 2: Monte Carlo Simulation: Units of observation are too large

```
clear

postfile simuls beta var n rej using simulsfile_toolarge, replace

quietly forvalues i=1/1000 {
        clear
        * Create a dataset of real markets
                set obs 1000
                gen pop = runiformint(100,250000)
        * Calculate average expenditure in the market, add noise
                gen logavgexp = 10 + 0.25*log(pop)
                gen avgexp = exp(logavgexp) + 200000*rnormal()
        * Arrange them in groups, our units of observation
        * (each group includes 2 markets)
                gen id = _n
                gen group = round(id,2)
        * Calculate population and average expenditure at the group level
                collapse (rawsum) pop (mean) avgexp [w=pop], by(group)
        * Regressions at group level
                gen logpop=log(pop)
                gen logavgexp=log(avgexp)
                capture reg logavgexp logpop
                if _rc==0 {
                        mat b=e(b)
                        mat v=e(V)
                        test _b[logpop]==0.25
                        gen rej = r(p)
                        post simuls (b[1,1]) (v[1,1]) (e(N)) (rej)
                }
                else {
                        post simuls (.) (.) (.) (.)
                }
}
postclose simuls

postutil clear
```