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# Does Gibrat's law hold among urban social economy enterprises? A research note on Montreal social economy.

Marie Bouchard
*UQAM*

Damien Rousselière
*AGROCAMPUS OUEST*

## Abstract

Our paper extends previous researches by taking into account the multidimensional dynamic of social economy: volunteering, employment and income. We estimate a Cragg's model with a simultaneous growth equations system and a hurdle equation on the two waves of the Montreal survey on social economy. Our main empirical results are twofold: First we highlight an average decrease in income and employment (although with an increase in volunteering) for the whole population. Second, our model allows us to reject the Gibrat's Law for our urban social economy enterprises population. It is as if there is an apparent convergence effect with three different growth trajectories for the various organizational forms of the social economy. The largest organizations seem to suffer more from the crisis than the smaller ones, even if the latter are more exposed to the hazard of disappearing.

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**Contact:** Marie Bouchard - bouchard.marie@uqam.ca, Damien Rousselière - damien.rousseliere@agrocampus-ouest.fr.

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## 1. Introduction

Gibrat's Law is also known as the law of proportional effects: for a given enterprise, the growth of size (measured in turn over, employment or any relevant variable) is independent of initial size. Since the seminal paper of Robert Gibrat (1931), there is an overwhelming literature both theoretical and empirical (e.g. Chesher (1979), Reid & Xu (2012) or Sutton (1997)….). A question naturally arises: does Gibrat's Law hold also among social economy enterprises, which encompass cooperatives, mutual and nonprofit organizations (Bouchard & Rousselière 2015)? This question is all the more pertinent, as we know the specificities of the organizations and especially the ambiguity about their exact objectives (e.g. Soboh et al. (2009) for agricultural cooperatives, Burdin & Alves (2016) for workers cooperatives, Jegers (2008) for nonprofit organizations).

To our knowledge, our research is the first test on a whole population of social economy, as previous researches only address some specific components of the social economy. Fulton et al. (1995) studied the case of some of the largest agricultural cooperatives in the USA and Canada, suggesting the holding of Gibrat's Law. Kamshad (1995) and Arcelus et al. (2014) for workers cooperatives, Gagliardi (2009) and Goddard & Wilson (2002, 2005) for credit unions, and Backus & Clifford (2013) and Armsworth et al. (2012) for associations and nonprofit organizations found mixed evidence. As noted because of the ambiguity of performance for social economy (Bagnoli & Megali, 2011), various indicators had been used. Most of the studies had focused on the growth of revenues or turn over (e.g. Gagliardi, 2009). Goodard & Wilson (2005) used the growth of membership and Arcelus et al. (2014) that of revenues (wages) of the workers. The latter also use various alternative indicators in independent analyses and don't take into account the possibility of a correlation.

Therefore the mains contributions of this short research note are both methodological and empirical. At the methodological level, our paper extends previous researches on survival analysis by taking into account the multidimensional dynamic of social economy: volunteering, employment and income. We estimate a Cragg's model (1971) with a simultaneous growth equations system and a hurdle equation on the two waves of the Montreal survey on social economy (2007 and 2012). The Cragg's model allows us to test the presence of selection bias due to survivor bias (Shermer, 2014). This extension of the standard growth model may be therefore of interest more broadly for research on enterprises dynamics.

Our main empirical results are twofold: First we highlight an average decrease in income and employment (although with an increase in volunteering) for the whole population. Second, our model allows us to reject the Gibrat's Law for our urban social economy enterprises population. On the contrary, it is as if there is a convergence effect (regression toward the mean) and a decrease in the heterogeneity of the social economy. Using organizational forms framework (Hsu & Hannan, 2005), we highlight three different growth trajectories suggesting the largest organizations seem to suffer more from the crisis (than the smaller ones). The Cragg model estimated allows us to highlight two different processes at play for the social economy: one for the survival and the other for growth.

## 2. Empirical Strategy

### *2.1. Database*

Our study focuses on data from the social economy of Montreal drawn from two rounds of surveys, one conducted in 2007 and the other in 2012. In total there are 702 responding organizations from a representative random sample of 990 organizations and an exhaustive population of 3,584 social economy organizations. The empirical strategy was to lower respondent burden in order to increase the response rate. It came at the cost of lowering the number of questions. The variables were constructed using organizational forms framework (Hsu & Hannan, 2005) (see our previous papers Bouchard & Rousselière 2011, 2016). The methodology is described in the appendix.

In order to take account of the dual nature of the social economy, a dual classification system has been developed. The first concerning the principal economic activity is based on the North American Industry Classification System (NAICS) for grouping social economy institutions into seven broad categories, with a focus on economic activities in which the social economy is already established by Bouchard et al. (2008b)[1]. A second classification was needed that would identify those organizations whose social mission differs from their practiced economic activity.

### *2.2.A two-part multidimensional growth model*

The standard growth equation used in Gibrat's Law tests is extended in two dimensions. On one hand, we have to take into account potential sample bias known as the survivor bias: growth is only observed for organizations that are sufficiently efficient to survive (Evans, 1987). On the other hand, as highlighted by the previous literature review, we have to address the problem of the multidimensional growth of social economy based on its plurality of objectives.

The proposed methodology is therefore an estimation of simultaneous equations system (generalized Heckman) using full information maximum likelihood (Yen, 2005). It is also a special case of the more general framework of "multilevel multiprocess (survival) model" (Bartus & Roodman, 2014). We use the CMP (conditional mixed process) framework proposed by Roodman (2011) which relies on a performant maximum likelihood simulation algorithm for system of simultaneous equations.

[1] These sectors are: 1000 (natural resources, manufacturing, processing and construction), 2000 (trade, finance, insurance), 3000 (home and rental), 4000 (recreation, tourism, accommodation, catering), 5000 (health and social services), 6000 (arts, culture and communication) and 7000 (other services).

We have therefore a system of 4 equations:

$$\begin{cases} ln\, Y_{i,2012} = \alpha_i + \sum_{j=1}^{3} \beta_{ij}\, ln\, Y_{j,2007} + \sum_{k=1}^{K} \eta_{i,k} V_{k,2007} + \sum_{m=1}^{M} \zeta_{i,m} C_m + \epsilon_i \\ if \sum_{s=1}^{S} \gamma_s Z_s + \mu \geq 0 \\ ln\, Y_{i,2012} = 0\ otherwise \end{cases} \quad (1)$$

With i={1,2,3}, $Y_1$ the income, $Y_2$ the numbers of employees, $Y_3$ the number of volunteers, $C$ a vector of $M$ time-invariant control variables, $V$ a vector of $K$ time-varying variables (with value fixed at the origin) and $Z$ a vector of $S$ variables for the selection equation. Note that the $\beta_{ij}$ are of particular interest as they can be interpreted as the impact of a given outcome *j* measured in 2007 on the outcome *i* measured in 2012. As we use a log log model, the impact is simply express in percentage of the outcome *i* for 1% increase of the given outcome *j*.

We have also $\rho_{ij}$ the correlation between $\epsilon_i$ and $\epsilon_j$ and $\rho_{\mu i}$ the correlation between $\epsilon_i$ and $\mu$. $\rho_{\mu i} = 0$ leads to a generalized version of the Cragg's model (Cragg, 1971) and $\rho_{\mu i} 0$ leads to a generalized version of the Heckman model (Heckman, 1979). Note also that in Arcelus et al. (2014) the implicit hypothesis is $\rho_{ij} = 0$ (i.e. that the outcome equations can be estimated independently).

The previous system can also be conceived as a log transformation of a traditional production function (Evans, 1987) and more precisely an extension of Reid & Zu (2012) with three outcome (growth) equations and one selection (survival) equation. Various tests show that estimations are robust to various exclusion conditions in the survival equation. We also note that the correlations between the residuals of the selection equation and the outcome equations are not significantly different from zero. Therefore a simpler lognormal Cragg's model with the constraint $\rho_{\mu i} = 0$, based on the assumption of conditional independence (Wooldridge 2010), will have a better fit (with no difference for the parameters of interest). This model will be considered as the benchmark model. The generalized Heckman is reported in the appendix (table 5) as a robustness check. In the appendix (table 6), we provide also a comparison with alternative specifications (independent equations with or without sample selection). Interestingly depending on the covariates, not taking into account survivorship bias and multiple objectives will overestimate or underestimate the corresponding parameter.

Following the first analysis of Bouchard & Rousselière (2016), we estimate therefore a survival analysis with spatial heterogeneity based on Harvey (1976)[2]. We have therefore:

$$\widehat{\lambda_i} = g(\frac{\gamma Z_i}{\sigma_i}) \quad (2)$$

[2] Contrary to Bouchard & Rousselière (2016) who estimate a heteroskedastic Cloglog, our model is for technical reasons a heteroskedastic probit, in order to estimate inverse Mills ratio (Wooldridge 2010). Note that our model differs slightly from other heteroskedastic hurdle model (e.g. Aristei & Pieroni 2008) as heteroscedasticity is account for in the hurdle equation (and not in the outcome equations)

With $\sigma_i = \exp(\sum \varsigma_i W)$ and the function probit $g = \phi(.)$.

The Cragg's model helps us to calculate the three elasticities of interest (Wooldridge, 2010): $\beta_{ij}$ is simply the conditional (on survival) elasticity of $E(Y_{i,2012} | Y_{i,2012} > 0, Y_{j,2007})$ and $\beta_{ij} + \gamma_i \lambda$ the unconditional elasticity of $E(Y_{i,2012} | Y_{j,2007})$ with $\lambda$ the inverse Mills ratio[3].

## 3. Results

### *3.1.Toward a convergence effect?*

The descriptive statistics highlight some interesting points (see table 1). First the decreasing of revenues is on average 13% for the whole population and 10% for the survival population. The decreasing of employment was only 4% (and 2% for the survival population). Finally the huge growth of volunteering (87.8%) was essentially due to some outliers (organizations belonging to "recreation, tourism, accommodation, catering" and "arts, culture and communication"). In order to investigate the heterogeneity of the population, we estimate a Zipf regression (Axtell, 2001) and a standard Gini Index, which are two measures of the inequality of an outcome distribution (Naldi 2003). The Zipf function $f_r \sim r^{\alpha}$ gives the relation between the rank $r$ of an observation and its frequency $r^{\alpha}$. The parameter $\alpha$ is estimated by maximum likelihood using a right truncated zeta distribution[4]. The Gini index bears a monotonic relationship to Zipf's parameter (Naldi 2003). Both Zipf regression $\alpha$ parameter and gini index vary from 0 to 1, with a higher value reflecting an increase in the heterogeneity.

**Table 1 : Evolution of the heterogeneity of outcome variables between 2007 and 2012**

| | Year | Mean | s.e. | ZIPF | | Gini | |
|---|---|---|---|---|---|---|---|
| | | | | $\alpha$ | s.e. | coef. | s.e. |
| Income | 2007 | 806,111 | 68,897 | 0.781 | 0.002 | 0.606 | 0.029 |
| | 2012 | 701,898 | 37,160 | 0.658 | 0.003 | 0.524 | 0.017 |
| Employment | 2007 | 24.59 | 2.38 | 0.836 | 0.004 | 0.637 | 0.030 |
| | 2012 | 23.60 | 1.80 | 0.773 | 0.004 | 0.572 | 0.025 |
| Volunteering | 2007 | 27.36 | 4.83 | 1.045 | 0.004 | 0.715 | 0.047 |
| | 2012 | 51.37 | 6.84 | 0.913 | 0.003 | 0.663 | 0.043 |

*Note: coef.: coefficient, s.e.: standard errors. N=702*

We underline a decreasing of the heterogeneity of social economy for each outcome variable (as shown by the evolution of the estimated coefficients for a given outcome between 2007 and 2012)[5]. This univariate methodology first suggests a convergence toward the mean that has to be confirmed with a multivariate econometric model (more precisely the interpretation of the $\beta_{ij}$ of the Cragg model).

[3] In our case, as we have a very low average inverse mills ratio (with $\bar{\lambda} = 0.006$) (due to a high predicted probability of survival), conditional and unconditional probability are very close. Therefore only conditional probabilities are reported

[4] We estimate the parameter $\alpha$ using the zipffit package for stata developed by Alexander Koplenig. Baixeries et al. (2013) provide a detail discussion of the nature of the right-truncated zeta distribution.

[5] A nice byproduct is that we also highlight that the Zipf Law ($\alpha = 1$) holds only for volunteering.

Results of the estimation of the Cragg's model are reported in Table 2. The cross-equation correlations $\rho_{ij}$ are positive and significant: the three outcome variables are linked, even once controlled by a set of covariates. This is an empirical justification of our Cragg's model.

**Table 2: Results of the Cragg's Model**

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| VARIABLES | lnInc2012 | lnEmp2012 | lnVol2012 | Survival |
| lnInc2007 | 0.352*** | 0.141*** | -0.032 | 0.056 |
| | (0.041) | (0.047) | (0.080) | (0.133) |
| lnEmp2007 | 0.180*** | 0.293*** | 0.032 | 0.105 |
| | (0.033) | (0.044) | (0.078) | (0.083) |
| lnVol2007 | -0.082*** | -0.061*** | 0.198*** | -0.046 |
| | (0.023) | (0.023) | (0.046) | (0.066) |
| N members of the board of directors | 0.013** | 0.002 | 0.022 | 0.090*** |
| | (0.006) | (0.009) | (0.016) | (0.032) |
| % Women of the board | 0.001 | 0.003** | 0.006** | -0.004 |
| | (0.001) | (0.001) | (0.003) | (0.004) |
| Female manager | -0.088 | -0.037 | 0.039 | 0.340 |
| | (0.063) | (0.068) | (0.146) | (0.224) |
| % full time employees | 0.004*** | 0.001 | 0.004* | 0.007** |
| | (0.001) | (0.001) | (0.002) | (0.003) |
| % subsidies and contracts with public entities | -0.018*** | -0.005 | -0.018** | 0.024** |
| | (0.004) | (0.004) | (0.007) | (0.010) |
| % Subsidies and contracts squared | 0.000*** | 0.000 | 0.000 | -0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| 1. Natural resources, manufacturing, processing and construction | Ref. | Ref. | Ref. | Ref. |
| 2: Trade, finance, insurances | -0.487*** | -0.433** | 0.501 | 0.382 |
| B | (0.146) | (0.179) | (0.327) | (0.385) |
| 3: Housing and rental | -0.575*** | -0.357** | 1.263*** | 1.592** |
| | (0.121) | (0.150) | (0.250) | (0.728) |
| 4: Recreation, tourism, accommodation and food services | -0.471*** | -0.281* | 1.830*** | 0.214 |
| | (0.158) | (0.149) | (0.379) | (0.303) |
| 5: Health care and social services | -0.331*** | -0.268** | 0.895*** | 1.485*** |
| | (0.095) | (0.121) | (0.248) | (0.570) |
| 6: Arts, culture, communications | -0.536*** | -0.125*** | 1.451*** | 1.627** |
| | (0.123) | (0.139) | (0.273) | (0.795) |
| 7: Other services | -0.423*** | -0.368*** | 1.094*** | 0.996* |
| | (0.088) | (0.113) | (0.224) | (0.524) |
| Decreasing Revenue in 2007 | Réf. | Réf. | Réf. | Réf. |
| Stable Revenue in 2007 | -0.079 | 0.059 | 0.267 | 0.760*** |
| | (0.066) | (0.072) | (0.182) | (0.194) |
| Increasing Revenue in 2007 | 0.147** | 0.123 | 0.417** | 0.952*** |
| | (0.065) | (0.081) | (0.190) | (0.307) |
| Age | 0.004 | 0.004 | -0.001 | 0.049* |
| | (0.004) | (0.004) | (0.010) | (0.025) |
| Age squared | 0.000 | 0.000 | 0.000 | -0.000* |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| N SEO in a 1km radius | -0.002 | -0.000 | -0.002 | -0.013*** |
| | (0.001) | (0.001) | (0.002) | (0.005) |
| (N SEO in a 1km radius) squared | 0.000 | -0.000 | 0.000 | 0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Legal Status | | | | |
| Coop | Réf. | Réf. | Réf. | Réf. |

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| VARIABLES | lnInc2012 | lnEmp2012 | lnVol2012 | Survival |
| Association and NonProfit Organization | 0.240** | -0.019 | -0.299 | -0.272 |
| | (0.100) | (0.111) | (0.205) | (0.227) |
| Community Association and NonProfit Organization | 0.069 | 0.041 | 0.142 | 0.174 |
| | (0.063) | (0.060) | (0.168) | (0.336) |
| Social Mission | -0.188*** | 0.028 | 0.169 | 0.085 |
| | (0.066) | (0.063) | (0.133) | (0.137) |
| Intercept | 2.740*** | 1.614*** | 1.256*** | 1.872 |
| | (0.222) | (0.240) | (0.418) | (1.276) |
| Variance | | | | |
| N SEO in a 1km radius | | | | -0.001 |
| | | | | (0.005) |
| (N SEO in a 1km radius) squared | | | | 0.000 |
| | | | | (0.000) |
| $\ln(\sigma)$ | -0.344*** | -0.244*** | 0.462*** | |
| | (0.041) | (0.036) | (0.022) | |
| rho_1j | | 0.555*** | 0.311*** | |
| rho_2j | | | 0.348*** | |

*Note : Poststratified standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. N=702.*

We underline a positive effect of past revenue on revenues, but at the rate less than proportional: smaller Social Economy Organizations (SEO) grow at a systematically higher rate than do their larger counterparts. As mentioned previously, our log-log specification allows to directly interpret the parameter of log transformed explanatory variables as elasticity. Therefore the conditional (on survival) elasticity of income is 0.352. Because of the high proportion of survival SEO and of the small effect of past income on survival, conditional elasticity and unconditional elasticity are slightly identical. We have the same results for volunteering ($elasticity = 0.198$) and employment ($elasticity = 0.293$). It is as if the Gibrat's Law doesn't seem to hold among our population of SEO. One should note that the growths of employment and income depend also on past level of other outcomes, while this relation is not significant for volunteering. We underline also inertia for the growth. The organizations that had reported stable revenues in 2007 (in comparison to previous years) had an increase of 12.1% in income[6], 8.6% in employment and 38.0% in volunteering.

Concerning other control variables, age doesn't seem to have a significant effect on growth, although it impacts positively the probability of survival. The growth of volunteering occurs essentially in sectors 4000 and 6000, while the growth of employment and income is higher for sector 1000. Finally the level of subsidies and contracts (with public entities) seems to have a mixed effect: negative on income and volunteering and positive on survival.

### *3.2.Growth of the various organizational forms*

An extension of this previous point is to study the specific evolution of the various organizational forms of the social economy. A typology of the organizational forms of the social economy has been estimated by Rousselière & Bouchard (2011, 2016) within the same sample. Drawing from organizational ecology, the authors established four models:

[6] We use the "nearly unbiased" estimator of semi-elasticity proposed by Van Garderen & Shah (2002), which is $\hat{p} = 100\left(\exp(\hat{c} - \frac{1}{2}\hat{V}(\hat{c})) - 1\right)$ with $\hat{V}(\hat{c})$ the estimated variance of $\hat{c}$.

- The social economy of volunteers, which corresponds to 33.2% of the sample in question. Corresponding first to associations and nonprofit organizations (NPOs), these organizations are essentially financed by subsidies and other sources (in particular contributions) and to a lesser degree by market sources. On average, this type of model has less paid jobs and more volunteers.
- The professional social economy (31.6%), which corresponds to large organizations (mainly associations and NPO). It relies heavily on public resources and has a significant number of employees and volunteers.
- The social market economy (11.9%), which is defined by a large share of resources from the market and a large number of employees. It has a large share of cooperatives.
- The emerging and hybrid social economy (23.3%), which corresponds to small and young organizations that are financed by a mix of resources. The share of cooperatives in this model is higher than the overall average of the sample.

Using the descriptive statistics provided in the article, we apply this typology to our sample[7]. We use our previous model to estimate survival probability and growth in 2012, conditional on "representative" 2007 situation (see table 7). The evolution of the various outcomes is reported in table 3, using delta method (Williams, 2012).

**Table 3: Evolution of the various outcomes between 2007 and 2012**

| | Survival | Income | Employment | Volunteering |
|---|---|---|---|---|
| SE of volunteers | 0.971(0.018) | 15.8% | 3.6% | -48.1% |
| Professional SE | 0.996(0.005) | -46.4% | -48.3% | -50.0% |
| Market SE | 0.938(0.029) | -29.3% | -22.9% | 130.8% |
| Emerging SEO | 0.881(0.024) | 62.7% | 162.2% | 136.9% |

*Note : unconditional predictions of Cragg Model. Poststratified Standard errors in parentheses. N=702.*

Using this various organization forms allows us to highlight three different growth trajectories beneath an “apparent" regression toward the mean:

- A general decline of Professional SE (although with a highest survival), as it faces a decreasing of income (-46%), employment (-48%) and volunteering (-50%)
- A general growth of Emerging SE (although with a highest hazard).
- A hybridization and convergence the two models of SE of volunteers and market SE.

## 4. Discussion and conclusion

This short research note aims to test the well-known Gibrat’s Law in the context of an urban social economy population. To this end we had proposed an original model that takes into account survivorship bias and the multiple objectives of the social economy, two dimensions that were not, to our knowledge, simultaneously considered in previous works. A limit of our paper is that we have only two periods, therefore we are unable to decompose the effects of time (Age, Period, Cohort) and test the “shadow of death” hypothesis (which claims that exiters exhibit a lower current and pre-exit productivity performance than incumbents) on survival (Almus, 2004; Blanchard et al., 2014).

[7] Note that this approach results in taking the typology thus constructed as a given fact without taking account of the uncertainty of the classification. The latent class analysis developed in Rousselière and Bouchard (2011) is a fuzzy classification. Using a most likely class membership strategy may lead to underestimate the heterogeneity of each cluster (Goodman 2007). Classification quality indicators (calculation of entropy index), however, allow for an application of this approach (Asparouhov & Muthen 2014). This also leads to interpret the result as being a prediction for an *average individual* of each category.

Gibrat's Law seems to be rejected, with a hypothesis of convergence and "regression toward the mean" (Hart, 2000), although with three different growth trajectories beneath this "apparent" convergence. Smaller SEOs grow faster than larger ones, with only marginally lower survival rates. We highlight an overall decrease in income, but an increase in volunteering and finally a continuity (a small decreasing) in employment. This result suggests a possible switch between employment and volunteering. We also show that volunteering is negatively correlated with income and employment growth. This partial interchangeability between paid staff and volunteering has been already underlined in the literature (Handy et al. 2007). As volunteering is usually a part-time activity, a small decrease in employment has to be compensated by an even more important increase in volunteering. This is also coherent with previous studies on the resilience of social economy currently challenged by the economic crisis (Costa & Carini, 2016). SEOs have a stabilizing effect on employment with respect to shocks (Delboni and Reggiani, 2013; Alves et al., 2016).

It is as if the largest SEO suffer more from the financial crisis of 2007-2008, which had affected largely the Canadian social economy, than the littlest, even if the latter are more exposed to the hazard of disappearing (Bouchard & Rousselière, 2016). This general decline of Professional SE (although with a highest survival) is consistent with the fact that the largest organizations which are the most resilient organizations may also face declining revenues (especially from public funds), postpone new hiring but also face greater difficulty in managing their volunteers (Lessans Geller et al., 2010). We find negative impact of subsidies on growth in a context of economic crisis. As the investment capacity of the SEO is correlated to a larger public support (as shown by Ogura & Yi 2017), a decrease in public subsidies may therefore threaten their future development. We also underline a general increase of Emerging SE (although with a highest hazard). This is an empirical corroboration of Santarelli & Vivarelli (2007) proposition that smaller entrants should be characterized by both higher failures rates and higher growth rates (conditional on survival). Finally we observe a convergence between market SE and SE of volunteers for the evolution of the various growth outcomes, suggesting that on one hand market SE may response to financial stress by an increasing reliance on volunteers and on the other SE of volunteers may increase hires in order to scale-up their activities, following normative isomorphism (Verbruggen et al., 2011).

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## Appendix

### Table 4: Descriptive statistics of the covariates

| | Min | Max | Mean | Standard deviation |
|---|---|---|---|---|
| Ln(Employment2007) | 0 | 7.075 | 2.202 | 0.046 |
| Ln(Income2007) | 0 | 8.139 | 3.556 | 0.043 |
| Ln(Volunteer2007) | 0 | 7.601 | 1.626 | 0.057 |
| Ln(Employment2012) | 0 | 6.545 | 2.381 | 0.036 |
| Ln(Income2012) | 0 | 7.354 | 3.424 | 0.044 |
| Ln(Volunteer2012) | 0 | 8.294 | 2.548 | 0.061 |
| Survival | 0 | 1 | 0.924 | 0.009 |
| Age | 0 | 156 | 19.108 | 0.197 |
| N members of the board of directors | 0 | 55 | 7.204 | 0.098 |
| % women on the board of directors | 0 | 100 | 42.680 | 1.007 |
| Gender of the chair of the board 0=male 1=female | 0 | 1 | 0.470 | 0.017 |
| % full-time employees | 0 | 100 | 31.427 | 0.987 |
| % Subsidies and contracts | 0 | 100 | 47.989 | 0.901 |
| Revenue growth category | | | | |
| decreasing | 0 | 1 | 0.149 | 0.011 |
| stable | 0 | 1 | 0.580 | 0.016 |
| increasing | 0 | 1 | 0.271 | 0.014 |
| Classification by type of activity | | | | |
| 1: Natural resources, manufacturing, processing and construction | 0 | 1 | 0.009 | ----- |
| 2: Commerce, finance, insurance | 0 | 1 | 0.029 | ----- |
| 3: Housing and rentals | 0 | 1 | 0.194 | ----- |
| 4: Recreation, tourism, accommodation and food services | 0 | 1 | 0.094 | ----- |
| 5: Health care and social services | 0 | 1 | 0.292 | ----- |
| 6: Arts, culture, communication | 0 | 1 | 0.172 | ----- |
| 7: Other services | 0 | 1 | 0.210 | ----- |
| Number of social economy enterprises (1km radius) | 0 | 375 | 111.214 | 2.757 |
| Cooperative | 0 | 1 | 0.210 | ----- |
| Association and Non-Profit Organization | 0 | 1 | 0.790 | ----- |
| Community Association and Non-Profit Organization | 0 | 1 | 0.253 | ----- |
| Social mission | 0 | 1 | 0.434 | 0.013 |

*Note: The standard deviations are obtained using post-stratification. They are, by nature, unavailable for the variables of the sectors and legal status as these variables contribute to post-stratification. N=702.*

**Table 5: Robustness check: Generalized Heckman**

| VARIABLES | (1) lnInc2012 | (2) lnEmp2012 | (3) lnBen2012 | (4) Survival |
|---|---|---|---|---|
| ln Inc2007 | **0.355*** ** | **0.146*** ** | -0.031 | -0.016 |
| lnEmp2007 | **0.181*** ** | **0.292*** ** | 0.043 | 0.117 |
| lnVol2007 | **-0.078*** ** | **-0.052** ** | **0.212*** ** | -0.051 |
| Ln(Age) | | | | **0.587*** |
| N members of the board of directors | 0.012 | 0.005 | **0.038** ** | **0.093*** |
| % Women of the board | 0.001 | **0.003** ** | **0.006** ** | -0.006 |
| Female manager | -0.113 | -0.064 | 0.034 | 0.378 |
| % full time employees | **0.003** ** | 0.000 | 0.005 | 0.007 |
| % subsidies and contracts | **-0.020*** ** | -0.008 | **-0.018*** | 0.026 |
| % Subsidies and contracts squared | **0.000*** ** | 0.000 | 0.000 | -0.000 |
| 2: Trade, finance, insurances | **-0.549*** | **-0.872** ** | 0.044 | 0.082 |
| 3: Housing and rental | -0.657 | -0.883 | 0.860 | 1.158 |
| 4: Recreation, tourism, accommodation and food services | -0.485 | **-0.619*** | **1.482*** ** | 0.003 |
| 5: Health care and social services | -0.396 | -0.709 | 0.501 | 1.268 |
| 6: Arts, culture, communications | -0.599 | -0.587 | **1.130** ** | **1.414*** |
| 7: Other services | **-0.563*** | **-0.811*** | 0.734 | 0.863 |
| Stable Revenue in 2007 | -0.107 | 0.042 | 0.255 | **0.761** ** |
| Increasing Revenue in 2007 | 0.083 | 0.106 | **0.423*** | **1.155*** ** |
| N SEO in a 1km radius | -0.001 | 0.000 | -0.002 | -0.009 |
| (N SEO in a 1km radius) squared | 0.000 | -0.000 | 0.000 | 0.000 |
| Association and NonProfit Organization | **0.215*** | -0.061 | **-0.425*** | -0.599 |
| Community Association and NonProfit Organization | 0.019 | 0.035 | 0.253 | 0.209 |
| Intercept | **2.943*** ** | **2.252** ** | **1.610*** | **-1.976*** |
| $\ln(\sigma)$ | **-0.322*** ** | **-0.233*** ** | **0.468*** ** | |
| rho_1i | | **0.561*** ** | **0.292*** ** | -0.439 |
| rho_2i | | | **0.338*** ** | -0.311 |
| rho_3i | | | | 0.217 |

*Note : Poststratified standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1. N=702.*

## Table 6: comparison of the parameters for various estimations strategies

| | Cragg model | | | independent outcome equations (with sample selection) | | | independent outcome equations without sample selection | | |
|---|---|---|---|---|---|---|---|---|---|
| VARIABLES | lnInc2012 | lnEmp2012 | lnVol2012 | lninc2012 | lnemp2012 | lnben2012 | lninc2012 | lnemp2012 | lnben2012 |
| lnInc2007 | 0.352*** | 0.141*** | -0.032 | 0.351*** | 0.144*** | -0.038 | 0.320*** | 0.144*** | -0.042 |
| | (0.041) | (0.047) | (0.080) | (0.040) | (0.045) | (0.074) | (0.055) | (0.048) | (0.071) |
| lnEmp2007 | 0.180*** | 0.293*** | 0.032 | 0.176*** | 0.288*** | 0.027 | 0.227*** | 0.298*** | 0.058 |
| | (0.033) | (0.044) | (0.078) | (0.032) | (0.042) | (0.072) | (0.050) | (0.044) | (0.070) |
| lnVol2007 | -0.082*** | -0.061*** | 0.198*** | -0.076*** | -0.056** | 0.205*** | -0.094*** | -0.067*** | 0.174*** |
| | (0.023) | (0.023) | (0.046) | (0.022) | (0.022) | (0.043) | (0.028) | (0.024) | (0.042) |
| N members of the board of directors | 0.013** | 0.002 | 0.022 | 0.014** | 0.004 | 0.029** | 0.029*** | 0.014* | 0.039*** |
| | (0.006) | (0.009) | (0.016) | (0.006) | (0.009) | (0.015) | (0.009) | (0.008) | (0.014) |
| % Women of the board | 0.001 | 0.003** | 0.006** | 0.001 | 0.003*** | 0.006** | 0.000 | 0.002* | 0.005* |
| | (0.001) | (0.001) | (0.003) | (0.001) | (0.001) | (0.003) | (0.001) | (0.001) | (0.002) |
| Female manager | -0.088 | -0.037 | 0.039 | -0.085 | -0.044 | 0.039 | 0.000 | 0.022 | 0.096 |
| | (0.063) | (0.068) | (0.146) | (0.062) | (0.064) | (0.135) | (0.079) | (0.067) | (0.136) |
| % full time employees | 0.004*** | 0.001 | 0.004* | 0.004*** | 0.001 | 0.004* | 0.006*** | 0.002** | 0.006*** |
| | (0.001) | (0.001) | (0.002) | (0.001) | (0.001) | (0.002) | (0.001) | (0.001) | (0.002) |
| % subsidies and contracts with public entities | -0.018*** | -0.005 | -0.018** | -0.018*** | -0.006 | -0.019*** | -0.006 | 0.002 | -0.007 |
| | (0.004) | (0.004) | (0.007) | (0.004) | (0.004) | (0.007) | (0.006) | (0.005) | (0.008) |
| % Subsidies and contracts squared | 0.000*** | 0.000 | 0.000 | 0.000*** | 0.000 | 0.000 | 0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| 1. Natural resources, manufacturing, processing and construction | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. | Ref. |
| 2: Trade, finance, insurances | -0.487*** | -0.433** | 0.501 | -0.569*** | -0.835*** | -0.027 | 0.114 | -0.300 | 0.449 |
| | (0.146) | (0.179) | (0.327) | (0.152) | (0.219) | (0.394) | (0.310) | (0.253) | (0.298) |
| 3: Housing and rental | -0.575*** | -0.357** | 1.263*** | -0.650*** | -0.794*** | 0.720** | 0.569** | 0.070 | 1.491*** |
| | (0.121) | (0.150) | (0.250) | (0.126) | (0.199) | (0.356) | (0.272) | (0.229) | (0.248) |
| 4: Recreation, tourism, accommodation and food services | -0.471*** | -0.281* | 1.830*** | -0.510*** | -0.624*** | 1.353*** | -0.006 | -0.235 | 1.462*** |
| | (0.158) | (0.149) | (0.379) | (0.140) | (0.192) | (0.415) | (0.304) | (0.234) | (0.365) |
| 5: Health care and social services | -0.331*** | -0.268** | 0.895*** | -0.408*** | -0.629*** | 0.400 | 0.662*** | 0.151 | 1.031*** |
| | (0.095) | (0.121) | (0.248) | (0.100) | (0.169) | (0.326) | (0.243) | (0.206) | (0.233) |
| 6: Arts, culture, communications | -0.536*** | -0.125*** | 1.451*** | -0.607*** | -0.499*** | 1.015*** | 0.519** | 0.287 | 1.702*** |
| | (0.123) | (0.139) | (0.273) | (0.127) | (0.185) | (0.352) | (0.262) | (0.219) | (0.253) |
| 7: Other services | -0.423*** | -0.368*** | 1.094*** | -0.503*** | -0.745*** | 0.613* | 0.435* | -0.045 | 1.155*** |
| | (0.088) | (0.113) | (0.224) | (0.092) | (0.165) | (0.317) | (0.243) | (0.204) | (0.217) |
| Decreasing Revenue in 2007 | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. |
| Stable Revenue in 2007 | -0.079 | 0.059 | 0.267 | -0.091 | 0.059 | 0.213 | 0.222** | 0.255*** | 0.491*** |
| | (0.066) | (0.072) | (0.182) | (0.058) | (0.067) | (0.170) | (0.113) | (0.087) | (0.169) |
| Increasing Revenue in 2007 | 0.147** | 0.123 | 0.417** | 0.114* | 0.141* | 0.401** | 0.464*** | 0.360*** | 0.727*** |
| | (0.065) | (0.081) | (0.190) | (0.060) | (0.075) | (0.179) | (0.116) | (0.099) | (0.174) |
| Age | 0.004 | 0.004 | -0.001 | 0.004 | 0.003 | -0.001 | 0.018*** | 0.013*** | 0.014 |
| | (0.004) | (0.004) | (0.010) | (0.004) | (0.004) | (0.009) | (0.005) | (0.004) | (0.008) |

| | Cragg model | | | independent outcome equations (with sample selection) | | | independent outcome equations without sample selection | | |
|---|---|---|---|---|---|---|---|---|---|
| Age squared | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | -0.000 | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| N SEO in a 1km radius | -0.002 | -0.000 | -0.002 | -0.002* | 0.000 | -0.002 | -0.003** | -0.001 | -0.002 |
| | (0.001) | (0.001) | (0.002) | (0.001) | (0.001) | (0.002) | (0.001) | (0.001) | (0.002) |
| (N SEO in a 1km radius) squared | 0.000 | -0.000 | 0.000 | 0.000 | -0.000 | 0.000 | 0.000*** | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Legal Status | | | | | | | | | |
| Coop | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. |
| Association and NonProfit Organization | 0.240** | -0.019 | -0.299 | 0.255*** | -0.070 | -0.433** | 0.178 | -0.089 | -0.419** |
| | (0.100) | (0.111) | (0.205) | (0.098) | (0.105) | (0.179) | (0.132) | (0.109) | (0.174) |
| Community Association and NonProfit Organization | 0.069 | 0.041 | 0.142 | 0.073 | 0.037 | 0.203 | 0.103 | 0.073 | 0.243 |
| | (0.063) | (0.060) | (0.168) | (0.057) | (0.057) | (0.157) | (0.088) | (0.074) | (0.158) |
| Social Mission | -0.188*** | 0.028 | 0.169 | -0.213*** | -0.001 | 0.085 | -0.126 | 0.040 | 0.121 |
| | (0.066) | (0.063) | (0.133) | (0.063) | (0.060) | (0.125) | (0.084) | (0.070) | (0.125) |
| Intercept | 2.740*** | 1.614*** | 1.256*** | 2.816*** | 2.040*** | 1.882*** | 0.697** | 0.549* | 0.220 |
| | (0.222) | (0.240) | (0.418) | (0.228) | (0.272) | (0.475) | (0.339) | (0.280) | (0.367) |
| $\ln(\sigma)$ | -0.344*** | -0.244*** | 0.462*** | -0.344*** | -0.244*** | 0.462*** | 0.068** | -0.063** | 0.520*** |
| | (0.041) | (0.036) | (0.022) | (0.041) | (0.036) | (0.022) | (0.033) | (0.028) | (0.020) |

*Lecture : N=702, *** p<0.01, ** p<0.05, * p<0.1. Rho and survival equation not reported for Cragg model and independent outcome equations with sample selection.*

**Table 7: Predicted values for various organizational forms**

| | Predicted values | s.e |
|---|---|---|
| SE of volunteers | | |
| lnInc2012 | 3.212 | 0.069 |
| lnEm2012 | 2.442 | 0.068 |
| lnVol2012 | 2.841 | 0.140 |
| Professional SE | | |
| lnInc2012 | 4.349 | 0.077 |
| lnEm2012 | 3.178 | 0.083 |
| lnVol2012 | 2.926 | 0.172 |
| Market SE | | |
| lnInc2012 | 4.440 | 0.082 |
| lnEm2012 | 3.062 | 0.082 |
| lnVol2012 | 3.370 | 0.169 |
| Emerging SE | | |
| lnInc2012 | 2.854 | 0.062 |
| lnEm2012 | 1.994 | 0.069 |
| lnVol2012 | 2.837 | 0.110 |

*Note: s.e. poststratified standard errors (using Delta Method). N=702.*

***Description of the methodology***

Our study focuses on data from the social economy of Montreal drawn from two rounds of surveys, one conducted in 2007 and the other in 2012. The methodology used was similar to that of the national statistical institutes, as it considers issues related to sampling, the quality of data collection and problems concerning total or partial non-responses. Starting from an exhaustive population of 3,584 social economy organizations, a survey study (stratified by sector of activity) was conducted on a representative random sample of 990 organizations. This initial work has enabled a portrait of social economy institutions in the Montreal region (Bouchard et al., 2008a) and a typology of organizational forms (Bouchard & Rousselière, 2011). The same sample was again interviewed in 2012, at which point the existence of the organizations was also verified, which lead to a first survival analysis (Bouchard & Rousselière, 2016). In total there are 702 responding organizations[8]. Our final response rate is 71% and our sample rate 15% (702 respondants out of 3584 organizations). These rates are higher than national agency standards which are respectively 50% and 15% (Ardilly 2006).

We follow a complex survey design approach that takes sampling errors into account. Due to two specific problems (non-responses and partially missing responses), we combine two approaches: a post-stratification approach, to correct for the total non-response and the possible over-representation of certain strata; and an imputation approach, to process the partial non-response (Lumely, 2010; Levy & Lemeshow, 2008). Thus, the sample was stratified by three auxiliary variables: industry sector and post-stratified by sub-sector, age and legal status. These three variables are available for the census of the 3584 organizations. Using these auxiliary variables, we were able to compute sample weights in order to provide unbiased estimates. The comparison between corrected and uncorrected results is provided in table 8. If the difference is thin for the income equation, do not correcting for non-response lead to an underestimation of the coefficients in the employment equation, to an overestimation in the voluntary equation, and to a change in the significance of the coefficient in the survival equation.

As for the partial non-response, simply ignoring it may lead to an estimation bias in those cases where its absence is not merely random (Rubin, 1996). Thus, an initial analysis clearly shows that, for example, smaller organizations have the tendency to respond less to some questions than others. To overcome this problem, two main imputation methods are available: the simple, random forest, non-parametric imputation method; and the multiple imputation method. The multiple imputation method allows processing the uncertainty related to the imputation. Nevertheless, it poses a general problem with regard to computing time and limits potential secondary analyses. In particular, it supposes a more general imputation model than does the econometric model (Meng, 1994). In this study, preference is given to the random forest imputation method (Stekhoven & Bühlmann, 2012), which is flexible and non-parametric. Simulations have shown that this algorithm is efficient compared to alternative methods of imputation (Waljee et al., 2013), while being more parsimonious in terms of its underlying hypotheses.

[8] The credit union movement Desjardins and La Coop Fédérée (through its head office), which are integral parts of the social economy, were processed and handled differently in this survey due to their organizational features and specificities at the economic level. As such, they are not included in this sample.

## *Table 8. Comparison between corrected and uncorrected results*

| | Cragg model with post-stratification | | | | Cragg model with no correction | | | |
|---|---|---|---|---|---|---|---|---|
| VARIABLES | lnInc2012 | lnEmp2012 | lnVol2012 | survival | lninc2012 | lnemp2012 | lnben2012 | survival |
| lnInc2007 | 0.352*** | 0.141*** | -0.032 | 0.056 | 0.350*** | 0.180*** | -0.004 | 0.229 |
| | (0.041) | (0.047) | (0.080) | (0.133) | (0.034) | (0.039) | (0.080) | (0.199) |
| lnEmp2007 | 0.180*** | 0.293*** | 0.032 | 0.105 | 0.198*** | 0.309*** | 0.038 | 0.192* |
| | (0.033) | (0.044) | (0.078) | (0.083) | (0.030) | (0.035) | (0.072) | (0.117) |
| lnVol2007 | -0.082*** | -0.061*** | 0.198*** | -0.046 | -0.056*** | -0.051** | 0.187*** | 0.028 |
| | (0.023) | (0.023) | (0.046) | (0.066) | (0.018) | (0.020) | (0.042) | (0.096) |
| N members of the board of directors | 0.013** | 0.002 | 0.022 | 0.090*** | 0.020*** | 0.001 | 0.024 | 0.119* |
| | (0.006) | (0.009) | (0.016) | (0.032) | (0.008) | (0.009) | (0.018) | (0.063) |
| % Women of the board | 0.001 | 0.003** | 0.006** | -0.004 | 0.000 | 0.003** | 0.006** | -0.007 |
| | (0.001) | (0.001) | (0.003) | (0.004) | (0.001) | (0.001) | (0.003) | (0.007) |
| Female manager | -0.088 | -0.037 | 0.039 | 0.340 | -0.061 | -0.047 | 0.029 | 0.640 |
| | (0.063) | (0.068) | (0.146) | (0.224) | (0.059) | (0.068) | (0.139) | (0.431) |
| % full time employees | 0.004*** | 0.001 | 0.004* | 0.007** | 0.004*** | 0.000 | 0.002 | 0.002 |
| | (0.001) | (0.001) | (0.002) | (0.003) | (0.001) | (0.001) | (0.002) | (0.005) |
| % subsidies and contracts with public entities | -0.018*** | -0.005 | -0.018** | 0.024** | -0.016*** | -0.007* | -0.015* | 0.009 |
| | (0.004) | (0.004) | (0.007) | (0.010) | (0.003) | (0.004) | (0.008) | (0.014) |
| % Subsidies and contracts squared | 0.000*** | 0.000 | 0.000 | -0.000** | 0.000*** | 0.000* | 0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| 1. Natural resources, manufacturing, processing and construction | Ref. | Ref. | Ref. | Ref. | Réf. | Réf. | Réf. | Réf. |
| 2: Trade, finance, insurances | -0.487*** | -0.433** | 0.501 | 0.382 | -0.512** | -0.682*** | 0.293 | 0.462 |
| | (0.146) | (0.179) | (0.327) | (0.385) | (0.218) | (0.250) | (0.517) | (0.758) |
| 3: Housing and rental | -0.575*** | -0.357** | 1.263*** | 1.592** | -0.541** | -0.618** | 0.952* | 2.069* |
| | (0.121) | (0.150) | (0.250) | (0.728) | (0.212) | (0.243) | (0.502) | (1.176) |
| 4: Recreation, tourism, accommodation and food services | -0.471*** | -0.281* | 1.830*** | 0.214 | -0.362* | -0.350 | 1.138** | -0.107 |
| | (0.158) | (0.149) | (0.379) | (0.303) | (0.197) | (0.226) | (0.467) | (0.753) |
| 5: Health care and social services | -0.331*** | -0.268** | 0.895*** | 1.485*** | -0.385** | -0.530** | 0.379 | 1.755* |
| | (0.095) | (0.121) | (0.248) | (0.570) | (0.188) | (0.216) | (0.445) | (0.975) |
| 6: Arts, culture, communications | -0.536*** | -0.125*** | 1.451*** | 1.627** | -0.508** | -0.398* | 1.125** | 2.052* |
| | (0.123) | (0.139) | (0.273) | (0.795) | (0.200) | (0.230) | (0.474) | (1.133) |
| 7: Other services | -0.423*** | -0.368*** | 1.094*** | 0.996* | -0.459** | -0.647*** | 0.643 | 1.259 |
| | (0.088) | (0.113) | (0.224) | (0.524) | (0.186) | (0.213) | (0.440) | (0.833) |
| Decreasing Revenue in 2007 | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. |
| Stable Revenue in 2007 | -0.079 | 0.059 | 0.267 | 0.760*** | -0.108 | 0.013 | -0.087 | 0.782* |
| | (0.066) | (0.072) | (0.182) | (0.194) | (0.083) | (0.095) | (0.196) | (0.419) |
| Increasing Revenue in 2007 | 0.147** | 0.123 | 0.417** | 0.952*** | 0.060 | 0.103 | 0.055 | 1.121** |
| | (0.065) | (0.081) | (0.190) | (0.307) | (0.087) | (0.100) | (0.207) | (0.558) |
| Age | 0.004 | 0.004 | -0.001 | 0.049* | -0.001 | 0.001 | -0.001 | 0.057 |
| | (0.004) | (0.004) | (0.010) | (0.025) | (0.004) | (0.004) | (0.009) | (0.036) |
| Age squared | 0.000 | 0.000 | 0.000 | -0.000* | 0.000 | 0.000 | 0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.001) |
| N SEO in a 1km radius | -0.002 | -0.000 | -0.002 | -0.013*** | -0.001 | 0.000 | -0.005* | -0.010 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (0.001) | (0.001) | (0.002) | (0.005) | (0.001) | (0.001) | (0.002) | (0.010) |
| (N SEO in a 1km radius) squared | 0.000 | -0.000 | 0.000 | 0.000** | 0.000 | -0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Legal Status | | | | | | | | |
| Coop | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. | Réf. |
| Association and NonProfit Organization | 0.240** | -0.019 | -0.299 | -0.272 | 0.259*** | 0.064 | -0.015 | 0.006 |
| | (0.100) | (0.111) | (0.205) | (0.227) | (0.099) | (0.113) | (0.233) | (0.438) |
| Community Association and NonProfit Organization | 0.069 | 0.041 | 0.142 | 0.174 | 0.089 | 0.054 | 0.374** | 1.050 |
| | (0.063) | (0.060) | (0.168) | (0.336) | (0.072) | (0.082) | (0.170) | (0.719) |
| Social Mission | -0.188*** | 0.028 | 0.169 | 0.085 | -0.253*** | -0.016 | -0.043 | -0.092 |
| | (0.066) | (0.063) | (0.133) | (0.137) | (0.063) | (0.073) | (0.150) | (0.280) |
| Intercept | 2.740*** | 1.614*** | 1.256*** | 1.872 | 2.692*** | 1.805*** | 1.811*** | 3.113 |
| | (0.222) | (0.240) | (0.418) | (1.276) | (0.253) | (0.290) | (0.598) | (1.969) |
| Variance | | | | | | | | |
| N SEO in a 1km radius | | | | -0.001 | | | | 0.005 |
| | | | | (0.005) | | | | (0.008) |
| (N SEO in a 1km radius) squared | | | | 0.000 | | | | -0.000 |
| | | | | (0.000) | | | | (0.000) |
| $\ln(\sigma)$ | -0.344*** | -0.244*** | 0.462*** | | -0.389*** | -0.252*** | 0.474*** | |
| | (0.041) | (0.036) | (0.022) | | (0.028) | (0.028) | (0.028) | |
| rho_1j | | 0.555*** | 0.311*** | | | 0.557*** | 0.278*** | |
| rho_2j | | | 0.348*** | | | | 0.321*** | |

*Lecture : N=702, *** p<0.01, ** p<0.05, * p<0.1.*