E C O N O M I C S B U L L E T I N

A poverty outreach index and its application to microfinance

Julia Paxton
Ohio University

Abstract

The Foster, Greer, and Thorbecke poverty index is modified to create a poverty outreach measure that incorporates both depth of outreach and scale. In an application to microfinance institutions, the use of this type of poverty outreach measure rejects the common notion that there is a necessary trade−off between client outreach and institutional sustainability. Banks and credit unions are found to have greater poverty outreach than smaller, subsidized non−governmental organizations that exclusively target the poor.

Initial research was supported by the World Bank. However, the opinions and conclusions drawn are the author's alone and cannot be attributed to the World Bank or its affiliated organizations. Helpful comments were provided by Harold Winter, the rural finance department at The Ohio State University, and an anonymous referee. Research assistance was provided by Carlos Garcia.
Citation: Paxton, Julia, (2003) "A poverty outreach index and its application to microfinance." *Economics Bulletin*, Vol. 9, No. 2 pp. 1−10
Submitted: April 9, 2003. **Accepted:** April 29, 2003.
URL: http://www.economicsbulletin.com/2003/volume9/EB−03I30002A.pdf

1. Introduction

The pioneering work of Sen (1973) has led to the development of dozens of poverty measures in the past three decades. In recent years, distribution sensitive, subgroup consistent poverty measures in the tradition of Foster, Greer, and Thorbecke (1984) have gained popularity. This paper uses the insights gained from the vast poverty measure literature and applies them in a novel way to the empirical measurement of poverty outreach in microfinance organizations (MFOs).

The desirability of any poverty measure is determined by its end use (Atkinson, 1987; Morduch, 1998). In the case of microfinance, a precise measure of depth of outreach is critical in determining policy. How do MFOs' depth of outreach compare across regions and by institutional type? Can MFOs have a deep outreach without being subsidized? When examining the depth of outreach of international development projects, the existing class of poverty measures has limited value since they do not take institutional scale into account (Paxton, 2002).

The purpose of this research is to develop a scale sensitive poverty outreach index through a modification of the Foster, Greer, and Thorbecke (1984) poverty measure. An application of the poverty outreach index to microfinance institutions reveals a completely different outreach ranking than traditional measures of outreach such as average loan size. Banks and credit unions are found to have greater poverty outreach than smaller, subsidized non-governmental organizations (NGOs) that target the poor. This casts doubt on the commonly accepted belief that the only way to reach the very poor is through small, subsidized NGOs.

2. A Poverty Outreach Index

The most commonly accepted poverty properties are Sen's focus, monotonicity, and transfer axioms. Given income space $D = \bigcup_{n=1}^{\infty} D^n$, discrete income distributions x = $(x_1, x_2, ...x_n)$, and a poverty line $z \in D$, Sen's axioms include:

Focus axiom:

P(x;z) = P(y;z) whenever $x \in D$ is obtained from $y \in D$ by an increment to a non poor person. The income distribution of the nonpoor is irrelevant.

Monotonicity axiom (weak):

P(x;z) > P(y;z) whenever $x \in D$ is obtained from $y \in D$ by a simple decrement to a poor person. Reducing a poor person's income increases the poverty level.

Transfer axiom (regressive):

P(x;z) > P(y;z) whenever $x \in D$ is obtained from $y \in D$ by a regressive transfer with at least the donor being poor. Income redistribution among the poor is relevant.

In addition to Sen's axioms, most poverty measures adhere to the nonpoverty growth axiom (Kundu and Smith, 1983) that states that poverty will decrease when the population of nonpoor grows. This axiom may not be desirable for an outreach measure. Imagine two banks in developing countries, each serving 1000 equally poor people below the poverty line. One bank also serves 10 million nonpoor clients while the other has no nonpoor clients. It can be argued that the depth of outreach to the poor is the same for the two banks[1]. This paper proposes a nonpoverty invariance axiom for measuring outreach.

Nonpoverty invariance axiom:

P(x;z) = P(y;z) whenever $x \in D$ is obtained from $y \in D$ by adding a nonpoor person from the population. The poverty measure is independent of the population size of the nonpoor.

A poverty measure that adheres to the nonpoverty invariance axiom will always satisfy the focus axiom but can violate the commonly accepted replication invariance axiom stating that the pooling of several identical populations will not affect the poverty level. A nonpoverty invariant poverty measure would increase under these circumstances since the total number of poor would increase.

Chakravarty, et. al. (2002) highlight the limitations of replication invariant poverty measures when performing empirical research on population growth. In developing countries with high population growth rates, it is common for the poverty rate to fall while the absolute number of people living in poverty increases. Under these conditions, poverty measures using the replication invariance axiom would point to a decrease in poverty, despite the fact that escalating number of poor is creating ever-increasing challenges to society. Using an axiomatic approach, they propose a new class of poverty measures in which researchers can choose parameters to emphasize the absolute number of poor versus the fraction of poor, depending on the research goals.

The Foster, Greer, and Thorbecke (1984) poverty measure is a poverty measure that meets Sen's axioms, nonpoverty growth, and replication invariance[2]. It can be expressed as the following:

$$F(x;z,a) = \frac{1}{n}\sum_{i=1}^{q}(1-\frac{x_i}{z})^a \qquad a \geq 0 \tag{1}$$

where n = population size

x_i = income of the ith household below the poverty line

q = number of households below the poverty line

z = poverty line

[1] In fact, the larger bank may fulfill a broader development goal by reaching the poor just above the poverty line and middle class and may be better diversified than small institutions.

[2] In addition to these axioms, other desirable properties are satisfied including continuity, decomposability, symmetry, subgroup consistency, and sensitivity to the poverty line threshold (Zheng, 1997).

One of the advantages of the measure is that it allows the researcher to weigh the relative importance of the poverty gap. When a =0, the measure reduces to the headcount ratio. At a =1, the measure is the headcount ratio (H) multiplied by the average income shortfall as a percentage of the poverty line (I) and the measure is no longer distributionally sensitive, thereby violating the transfer axiom. As $a \to \infty$, the measure supports the notion of Rawlsian maximin justice where the poorest person's welfare dictates society's poverty level.

A simple modification of (1) satisfies Sen's axioms,[3] eliminates adherence to the nonpoverty growth and replication invariance axioms, and allows for nonpoverty invariance. The proposed poverty outreach (PO) measure is given by:

$$PO(x;z,a) = \frac{Log(q)}{q}\sum_{i=1}^{q}(1-\frac{x_i}{z})^a \qquad a \geq 0 \qquad (2)$$

Rather than scaling the equation by the inverse population size which bounds the equation from 0 to 1, this modification scales the number of poor by Log base 10 divided by q, allowing for no upper bound. A simple way of satisfying the desired axioms is to use the Foster measure and eliminate the scaling factor of dividing by the population size, *n*. However, this modification is impractical from a practitioner's standpoint since the measure could range from 0 to infinity. The proposed nonlinear, concave function allows the index to compare very large and small institutions in a meaningful way while adhering to all of the specified axioms.

The distinction of the PO measure is highlighted when examining country poverty rankings. Traditional poverty measures focus on the average level of poverty and rank sub-Saharan African countries as the poorest countries in the world. The PO would shift the ranking to countries with a large population of poor. For example, the Foster measure using a =1 ranks Ethiopia and Sierra Leone as the two poorest countries in the world. The poverty outreach measure would rank India and Nigeria as the countries with the highest depth of poverty[4].

Similarly to the Foster measure, the researcher can adjust a in order to increase the importance of the relative poverty of the clients. For empirical work where scale is important, $0 \leq a \leq 1$. When a =0, the formula reduces to Log *q*. When a >0, both the number of poor and the extent of immiseration become important. At a =1 or whenever $(1-\frac{\bar{x}}{z})$ rather than $\sum_{i=1}^{q}(1-\frac{x_i}{z})$ is available, the measure reduces to[5]:

$$PO(x;z,a) = Log(q)(1-\frac{\bar{x}}{z})^a \qquad (3)$$

[3] as well as continuity, symmetry, subgroup consistency, decomposability, and poverty line sensitivity. The transfer axiom is satisfied for a >1.

[4] A complete ranking of countries using various indices is available from the author.

[5] If the distribution is not available, the measure will not fulfill the transfer axiom.

As a result of its additively separable form, the PO index maintains the subgroup consistency and decomposability axioms of the Foster index (Foster, 1984). Subgroup analysis may be useful in microfinance applications since some research has suggested that credit may be more appropriate for the working poor at or above the poverty line (Hulme and Mosely, 1996).

3. An Application to Microfinance

Microfinance has become an increasingly popular tool for poverty alleviation in developing countries for the past two decades. No consensus on measuring outreach has been reached.

Given data constraints, loan size is the most common proxy for depth of outreach. A possible correction referred to as "depth" is to divide the average annual loan size by the GNP per capita of the country. Loan size is an imperfect measure of depth of outreach since it may relate to the term or type of loan granted or to the lending methodology of the institution. By using average loan size as a proxy for depth of outreach, there is an implicit preference for institutions that give small average loans. Certain economic activities (such as informal commerce) require inherently smaller and more frequent loans than agriculture or other types of business and manufacturing activities. Therefore, using this proxy, any institution that targets the informal commercial sector will have "better" outreach than an institution targeting the rural poor with larger agricultural loans.

In an attempt to overcome the well-known problems associated with income based measures of welfare (Blackwood and Lynch: 1994, World Bank 2000), several microfinance outreach indices have incorporated a human needs approach to poverty measurement (Navajas, et al., 2000; Henry, et al. 2000). A composite index of client characteristics called a Depth of Outreach (DOI) index has been proposed as a measure of outreach for MFOs (Paxton and Cuevas, 1998)[6]. The PO index can accommodate these varying definitions of poverty.

The general problem with any of the currently used measures of outreach is that they are mean measures. As such, they can be misleading since they fail to provide information about the scale of operations and income distribution of clients.

In order to compare how the PO index ranks institutions differently than other depth of outreach indicators, data from 18 MFOs participating in the World Bank Sustainable Banking with the Poor (SBP) study were collected in 1997 and 1998[7]. The MFOs have varying degrees of sustainability and outreach and represent two major regions (Latin America and Africa) and three institutional types (credit unions, banks, and NGOs). For the PO, an absolute poverty line of $2/day adjusted for purchasing power parity (PPP) was used and a =0.1. By using an absolute poverty line, the African institutions tended to have a higher PO given the larger proportion of people under the international poverty line.

[6] The DOI sums the differences between the institutional average and the country averages for each category of people excluded from formal finance. A positive number indicates that the institution serves a clientele that is, on average, more rural, poor, female, and illiterate than the country average.

[7] In MFOs with insufficient databases, estimates of client incomes were ascertained from interviews with management.

Table 1 shows that NGOs have the smallest average client incomes, the smallest average loan size, the highest poverty gap, and the greatest depth of outreach using the DOI[8]. Because of indicators such as these, it is often assumed that NGOs are the most effective method of reaching the very poor. However, the ranking of institutional types by poverty outreach is reversed when using the PO index since it takes institutional scale into account. Since banks serve a large number of heterogeneous clients including some under the poverty line, they reach more poor clients than the NGOs in absolute numbers.

The interpretation of the PO index is clear when comparing a small NGO, CARE Guatemala, and a large credit union (now part of Megabanco), Cupocrédito. Using mean measures of outreach such as average loan size, average client income, and Depth of Outreach, CARE Guatemala dominates Cupocrédito. However, both institutions serve the same number of clients below the international poverty line. The PO index then ranks them based on which has the greater poverty gap (CARE Guatemala).

One of the most striking policy implications of the PO is that there is no longer a trade-off between outreach and institutional sustainability. Table 1 shows institutional sustainability measured by their dependence on external subsidies (Yaron's 1992 Subsidy Dependence Index (SDI)).[9] The correlation between depth of outreach and the SDI is positive using mean proxies for outreach (DOI (0.78), income/GNP per economically active person (0.20), and annualized average loan size (0.50)). However, using the PO index, no correlation is found (0.09).[10]

Setting a relative poverty line rather than an absolute poverty line can result in a negative correlation between poverty outreach and an MFO's dependence on subsidies[11]. These findings shed light on why some studies have highlighed the trade-off between outreach and sustainability (Conning, 1999; Paxton and Cuevas, 1998) while other studies have questioned it (Christen, Rhyne, and Vogel, 1995; Rhyne, 1998).

4. Conclusions

The shortcomings associated with current measures of institutional poverty outreach can be overcome by linking outreach measures to the well developed poverty measure literature. A modification of the Foster, Greer, and Thorbecke poverty measure creates a scale sensitive measure that satisfies Sen's axioms as well as a nonpoverty invariance axiom.

When applied to microfinance institutions, a new and meaningful ranking of MFOs is possible. Traditional measures of outreach imply that NGOs have the best outreach to the poor. By applying the PO index, it is possible to see that larger, more

[8] The Foster measure at α =0.1 also ranks the NGOs as having the highest poverty level. CARE Guatemala and CVECA rank the highest assuming n = the number of clients in the MFO.

[9] The SDI measures by what percentage interest rates charged to clients would have to be increased hypothetically in order to cover program costs and eliminate subsidies.

[10] These correlations do not include the outlier CARE Kenya.

[11] Hulme and Mosley (1996) report the percentage of clients under the official national poverty line for some of the largest, most sustainable MFOs in the world. Using average loan size as a proxy for outreach yields the commonly found positive correlation with dependence on subsidies (0.43). However, a negative correlation (-0.14) exists between the PO at α =0 (due to data constraints) and the SDI, suggesting that the most sustainable institutions also have the deepest poverty outreach.

heterogeneous institutions such as banks and credit unions actually serve a significant number of people below the poverty line.

The PO also sheds light on the relationship between outreach and sustainability. Donors have justified supporting small NGOs since they have the deepest outreach to the very poor. Using traditional proxies for depth of outreach, a positive correlation between depth of outreach and reliance on subsidies is found. However, when using the PO, this relationship was found to be either zero or negative. These findings suggest that self-reliant MFOs with scale economies may offer the most promise of reaching the largest number of poor.

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Table 1: Measures of Outreach and Sustainability

	Institutional Characteristics				Outreach Measures			
	No. clients	**No. clients below $2/day poverty line**	**Poverty gap as % of poverty line**	**SDI**	**Av. Loan (US$)**	**DOI**	**Av. Client income**	**PO index**
FINCA Costa Rica	7253	1088	0.11	1.39	1006	1.19	1100	2.43
CARE Guatemala	4090	3886	0.65	4.77	171	2.19	200	3.44
WWB Colombia	50,000	0	na	0.38	525	0.18	3,600	0.00
CARE Kenya	12,000	4800	0.09	19.00	33	0.28	550	2.88
K-REP	12,451	8093	0.20	1.40	350	0.28	375	3.33
Zambuko Trust	2,197	220	0.05	2.38	180	-0.10	700	1.75
PPPCR	10,000	8500	0.41	1.26	59	0.77	300	3.59
NGO AVERAGE	13,999	3798	0.25	4.37	332	0.68	975	2.49
Unión Popular	10,732	268	0.55	0.03	1079	-0.33	3888	2.29
Cupocrédito	387,846	3878	0.04	0.12	2199	0.22	4080	2.59
OSCUS	55,457	555	0.05	-0.03	954	0.43	2376	2.02
UPA	15,871	1111	0.52	-0.06	993	-0.58	2484	2.85
Solidarios	50,077	501	0.04	0.09	1746	-0.01	4080	1.95
Progreso	55,457	555	0.05	0.18	990	-0.36	3696	2.02
FECECAM	166,000	16600	0.16	0.70	408	-0.39	374	3.51
CVECA	21,495	19346	0.50	0.78	136	0.66	89	4.00
CREDIT U. AVERAGE	95,367	5351	0.24	0.23	1063	-0.05	2,633	2.65
Caja Social	1,159,204	2898	0.15	-0.06	505	-0.19	4,128	2.86
BancoSol	100,539	10,054	0.10	0.01	2171	-0.54	2,100	3.19
CMAC	400,000	4000	0.12	0.17	440	-0.35	4,380	2.91
BANK AVERAGE	553,248	40,787	0.12	0.04	1039	-0.36	3,536	2.99
LA Average	191,377	2399	0.21	0.58	1,065	0.15	3,009	2.38
Africa Average	37,357	9593	0.23	4.25	227	0.24	368	3.24

source: The World Bank, Sustainable Banking with the Poor, 1998.