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On the Concept of Equity in Opportunity

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On the Concept of Equity in Opportunity

Hyun H. Son

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August 2011

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Abstract

Measuring the equity of opportunity in a given society is an essential ingredient in the formulation of policies and programs that promote inclusive growth. In this paper, equity of opportunity is defined and measured through the theoretical framework of the social opportunity function, a concept similar to the social welfare function. The functional and graphical distribution of opportunity is discussed through the generalized Lorenz curve and the Bonferroni curve, while complete ranking of distributions is achieved through their related numerical indices: the concentration index and the Bonferroni index of opportunity, respectively. The concepts of relative and absolute measures of equity of opportunity are then introduced and a social opportunity index that considers both the amount and distribution of opportunity is developed. These measures are used to analyze changes in the opportunities for health care and education in the Philippines from 1998 to 2007.

I. Introduction

It is now widely accepted that economic growth is necessary, but may not be sufficient, to achieve economic development. Economic growth creates opportunities that enhance well-being. For instance, it generates employment whose wages allow people to consume goods and services. Yet, economic opportunities are not always equally available to all; various circumstances and market failures bar the poor from availing of them and, as a result, they generally partake less of the economic pie.

Economic growth can directly create opportunities through market operations. More importantly, however, it generates resources in the form of tax revenues, fees, and fines, which governments use to create opportunity, particularly in education, health, housing, and so on. How equitably people are able to avail of these opportunities is indeed an important policy issue. We need to measure the equity of opportunity before the government can formulate policies and programs that facilitate the full participation of those who are less well off. In this paper, we define and measure equity of opportunity through the social opportunity function, which is similar to the concept of the social welfare function.

The paper consists of two parts. Sections II to VII describe the theory and methodology of measuring opportunity, and Section VIII discusses empirical results.

II. The Social Opportunity Function

The concept of a general social welfare function was introduced by Bergson in 1938 and subsequently developed by Samuelson in 1947. Suppose there are n individuals in a society arranged in ascending order of their incomes, that is, $x_1, x_2, x_3, \dots, x_n$ with the 1st individual being the poorest and the n th individual the richest. Given this, we may define a general social welfare function as

$$W = W(X) = W(x_1, x_2, x_3, \dots, x_n) \quad (1)$$

where $X = (x_1, x_2, x_3, \dots, x_n)$ is an ordered income distribution, which defines a specific ordering of the society.

Son (2011) discussed the relationship between the generalized Lorenz curve and social welfare functions: if the generalized Lorenz curve of distribution X_1 is higher than the generalized Lorenz curve of distribution X_2 at all points, then we can say unambiguously that social welfare implied by distribution X_1 will always be higher than social welfare implied by distribution X_2 . This relationship holds under the fairly general conditions that the social welfare function is (i) increasing, (ii) symmetric, and (iii) quasi-concave in individual incomes. The generalized Lorenz curve can be drawn using data on household income or consumption that are widely available from household surveys. Based on such data, we can infer, using the Lorenz curve, which social ordering is welfare-superior to another without having to know the form of the social welfare function.

Similar to the idea of the social welfare function, we may define a social opportunity function as

$$O = O(y_1, y_2, y_3, \dots, \dots, y_n) \quad (2)$$

where y_i is the opportunity enjoyed by the i th person in society whose income is x_i , i varies from 1 to n . Opportunities can be defined in terms of access to various services such as health or educational services or access to job opportunities in the labor market. The main objective of government policy is to maximize the social opportunity function to enhance social well-being.

The average opportunity for the population is defined as

$$\bar{y} = \frac{1}{n} \sum_{i=1}^n y_i \quad (3)$$

This is the average opportunity available, but it does not tell us how it is distributed across the population. To determine how equitable or inequitable opportunity is, we need to know the social opportunity function as defined in equation (2). In practice, we cannot know the social opportunity function exactly, which raises the question of how to measure equity or inequity of opportunity in a society. Just as the social welfare function is related to the generalized Lorenz curve (discussed in Son 2011), below we discuss the relationship between the social opportunity function and the concentration curve.

III. Concentration Curve

As discussed in Son (2011), the Lorenz curve describes the distribution of a single variable such as income or consumption in a society. Mahalanobis (1960) generalized the concept of the Lorenz curve to describe the consumption patterns of different commodities. Later, Kakwani (1977 and 1980) provided a more general and rigorous treatment of concentration curves in a study of relationships among the distributions of different economic variables. In this paper, we use many of Kakwani's results to define and measure equity of opportunity.

Suppose $y(x)$ is an individual opportunity function, which is the opportunity enjoyed by an individual with income x . If x is a random variable with probability density function $f(x)$, then the average opportunity enjoyed by the whole society is given by

$$\bar{y} = \int_0^{\infty} y(x)f(x) dx = \int_0^1 y_p dp \quad (4)$$

where $dp=f(x)dx$ and y_p is the opportunity enjoyed by an individual at the p th percentile, with p varying from 0 to 1. Equation (4) is similar to equation (3) but expressed as a continuous distribution. Let us define $C(p)$ as the proportion (or share) of opportunity enjoyed by the bottom p proportion of individuals in the population arranged in ascending order of income and as given by

$$C(p) = \frac{1}{\bar{y}} \int_0^p y_r dr \quad (5)$$

where y_r is the opportunity enjoyed by an individual at the r th percentile. The function $C(p)$ is called the concentration curve. It has the following properties (Kakwani 1980):

- (a) If $p = 0$, $C(p) = 0$
- (b) If $p = 1$, $C(p) = 1$
- (c) $C'(p) = \frac{y(x)}{\bar{y}} \geq 0$ and $C''(p) = \frac{y'(x)}{\bar{y}f(x)}$
- (d) $C(p) < p$ for all p if $y'(x) > 0$ for all x and $C(p) \geq p$ for all p if $y'(x) \leq 0$ for all x

$C'(p)$ is the first derivative of $C(p)$ with respect to p and is always nonnegative because the opportunity function $y(x)$ cannot be negative. This implies that the concentration curve increases with p ; i.e., the curve is sloping upward. $C(p) = p$ is the egalitarian line where everyone in society enjoys the same opportunity.

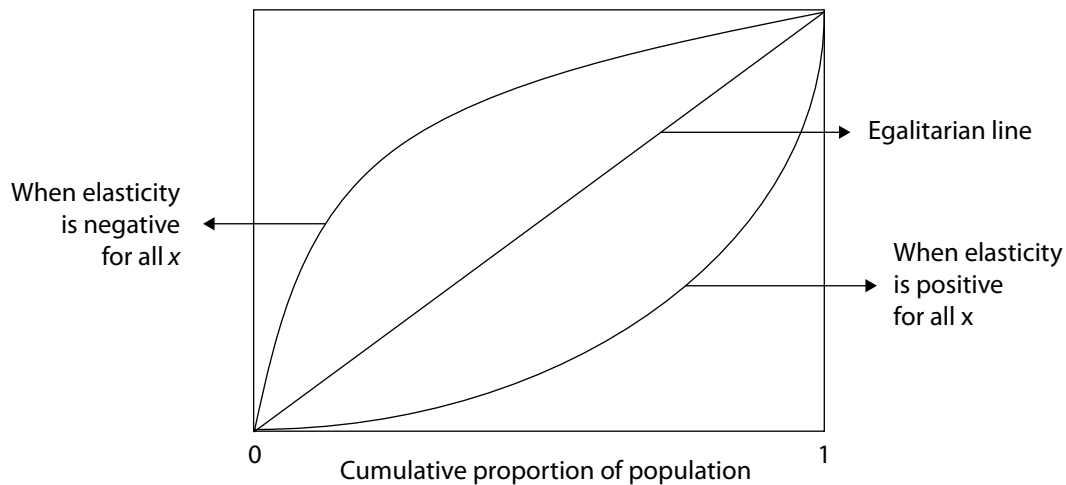
The second derivative of the concentration curve, $C''(p)$, is positive (negative) if $y'(x)$ is positive (negative). If $y'(x) > 0$ for all x , the concentration curve is convex to the p -axis, implying $C(p) < p$ for all p . In this case, the concentration curve lies below the egalitarian line. On the other hand, if $y'(x) < 0$ for all x , then the concentration curve is concave to the p -axis; thus, $C(p) > p$ for all p implies that the concentration curve lies above the egalitarian line. If $y'(x) = 0$ for all x , the concentration curve coincides with the egalitarian line. Like the Lorenz curve, the concentration curve is represented in a unit square (Figure 1), but there is one difference between the two: while the Lorenz curve always lies below the egalitarian line, the concentration curve can either lie above or below the egalitarian line or can cross it several times.

IV. Defining Equity of Opportunity

Let us define the elasticity of the individual opportunity function as

$$\vartheta(x) = \frac{x}{y} \frac{dy(x)}{dx} \quad (6)$$

This elasticity can be either negative or positive. If the elasticity is 0 for all x , this means that each individual enjoys the same opportunities irrespective of income. In reality, however, the rich tend to enjoy greater opportunity than the poor. If $\vartheta(x) > 0$ for all x , this suggests that as the income of an individual increases, he/she has greater access to opportunity. This situation may be referred to as inequitable opportunity. If elasticity is negative for all x , then as an individual's income increases, his/her access to opportunity decreases. Putting this differently, poorer people have greater access to opportunity than richer people. This may be characterized as equitable or pro-poor opportunity. The magnitude of elasticity in equation (6) can measure the degree of equity (or inequity) in society; the larger (smaller) the elasticity, the greater the inequity (equity) of opportunity.

Figure 1: Two Hypothetical Concentration Curves

Source: Author's representation.

Kakwani (1977) proved that the elasticity has a one-to-one relationship with the concentration curve; the lower (higher) the elasticity, the higher (lower) the concentration curve. This is a very powerful result. Suppose Y_1 and Y_2 are two distributions of opportunity. Distribution Y_1 will be more equitable (inequitable) than distribution Y_2 if the concentration curve for Y_1 is higher (lower) than the concentration curve for Y_2 . If the two concentration curves cross, then we cannot say if one distribution is more equitable or inequitable than the other. Thus, like the Lorenz curve, the concentration curve provides a partial ranking of the opportunity distributions.

A complete ranking of distributions can be obtained with the concentration index. The concentration index measures the deviation of the concentration curve from the egalitarian line. It is defined as one minus twice the area under the concentration curve:

$$C = 1 - 2 \int_0^1 C(p) dp \quad (7)$$

The concentration index lies between -1 and $+1$. A value of 0 implies that all individuals enjoy the same opportunity irrespective of their income, while a value of 1 implies perfect inequity of opportunity where only the richest person in society has access to opportunity. Similarly, if the concentration index is -1 , then the poorest person enjoys all opportunity. The values of the concentration index indicate which opportunity distribution is more equitable or inequitable than the other. The concentration index is a measure of inequity of opportunity; therefore, a measure of equity of opportunity can be defined as $E = (1 - C)$; the larger the value of E , the more equitable will be opportunity. E is equal to 1 if all individuals enjoy the same opportunities. This could be the benchmark: as such, opportunity is equitably (inequitably) distributed if E is greater (less) than 1 .

V. Bonferroni Concentration Curve

Son (2011) discussed the Bonferroni curve to describe income distribution. We may now generalize this curve to describe the distribution of opportunity across individuals' incomes. When all individuals are ranked in ascending order of income, we can construct a conditional mean of opportunity enjoyed by the bottom p proportion of the population. Suppose \bar{y}_p is the mean opportunity enjoyed by the bottom p proportion of the population and \bar{y} is the mean opportunity enjoyed by all individuals in the population. Given these definitions, the Bonferroni concentration curve is defined as¹

$$C_B(p) = \frac{\bar{y}_p}{\bar{y}} \quad (8)$$

Note that $\bar{y}_p = 0$ if $p = 0$ and $\bar{y}_p = \bar{y}$ if $p = 1$. The relationship between the concentration curve and the Bonferroni concentration curve can be derived as

$$C_B(p) = \frac{C(p)}{p} \quad (9)$$

The higher the curve, the more equitable will be the distribution of opportunity. Suppose Y_1 and Y_2 are two distributions of opportunity, distribution Y_1 will be more equitable (inequitable) than distribution Y_2 if the Bonferroni concentration curve for Y_1 is higher (lower) than the Bonferroni concentration curve for Y_2 . If the two Bonferroni concentration curves cross, then we cannot say unambiguously if one distribution is more equitable or inequitable than the other. Therefore, the Bonferroni curve, like the Lorenz curve, provides partial rankings of distributions of opportunity.

Figure 2 depicts two hypothetical Bonferroni concentration curves. The horizontal line at $C_B(p) = 1$ is the egalitarian line when everyone in society avails of the same opportunities. The curve above the egalitarian line provides equitable opportunity while the curve below the egalitarian line provides inequitable opportunity.

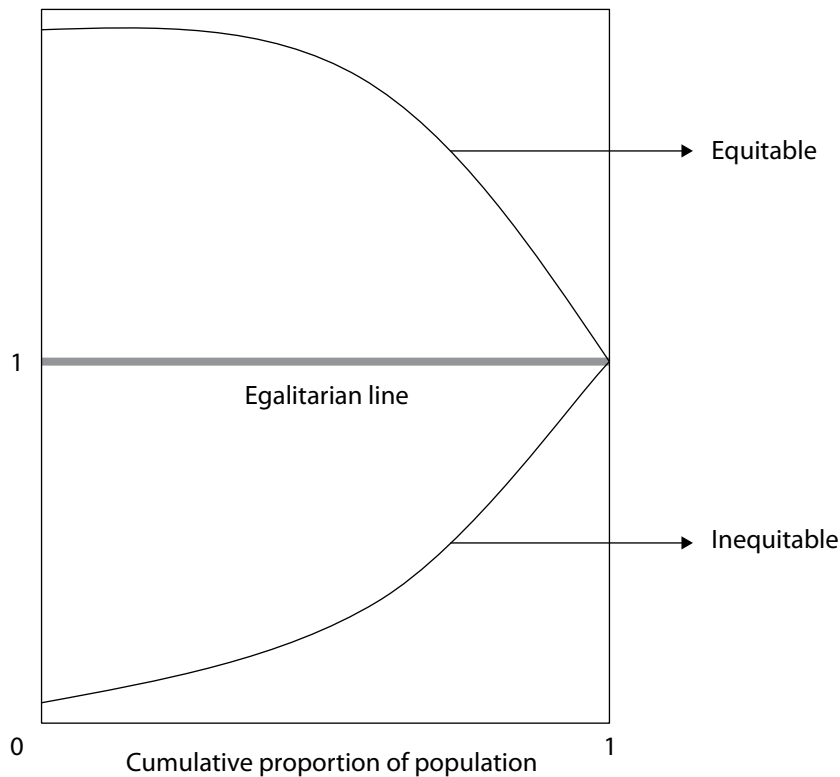
A complete ranking of distributions is provided by the Bonferroni equity index proposed by Ali and Son (2007), which is defined as the area under the Bonferroni concentration curve:

$$E_B = \int_0^1 C_B(p) dp = \int_0^1 \frac{C(p)}{p} dp \quad (10)$$

¹ Ali and Son (2007) applied the Bonferroni concentration curve in defining and measuring inclusive growth. They were not aware, however, that their proposed opportunity curve was in any way related to the Bonferroni curve. This relationship between the two curves has recently been established by Silber and Son (2010). Similar to Ali and Son's (2007) idea, Barros et al. (2009) developed an index called the human opportunity index. While the former was based on the Bonferroni index, the latter was based on the Dissimilarity index. It should be noted that Ali and Son's (2007) measure was proposed earlier than the measure by Barros et al. (2009).

which is equal to 1 if all individuals in the society enjoy the same opportunities, in which case $C(p) = p$. There will be an extreme concentration of opportunities when the richest person enjoys them all, in which case $C(p) = 0$ for all p , which on substituting in equation (10) gives E_B equal to 0. If opportunities are concentrated mostly among individuals at the bottom of the income distribution, then $C_B(p) > 1$ for all p , which from equation (10) implies $E_B > 1$; the larger the value of E , the more equitable is opportunity. $E_B=1$ is thus the benchmark that can be used to distinguish between equitable and inequitable distributions of opportunity. Using this benchmark, it can be said that opportunities are equitably (inequitably) distributed if E_B is greater (less) than 1.

Figure 2: Two Hypothetical Bonferroni Concentration Curves



Source: Author's representation.

VI. Relative and Absolute Measures of Equity of Opportunity

Equity in the distribution of opportunity may be measured in both the relative and absolute sense. If equity measures remain unchanged when the opportunity enjoyed by each person is altered by the same proportion, then such measures are called the relative measures of equity in opportunity. The concentration curve measures relative

equity because the curve remains unchanged when opportunities are increased or decreased by the same proportion. Similarly, the equity indices E and E_B discussed in the previous sections are relative measures of equity. Alternatively, following Kolm (1976), we may define absolute measures of equity of opportunity as those that show no change when the opportunities enjoyed by everyone are increased or decreased by the same absolute amount. Since richer people generally enjoy greater opportunity than poorer people, an equi-proportional increase in all opportunity must decrease equity because the rich will enjoy greater absolute opportunity than the poor. The relative measures of equity will show no change in equity, but the absolute measures of equity will show a decrease in equity as expected. Thus, absolute measures of equity of opportunity may be more appealing from the perspective of justice and fairness.

To measure absolute equity, we begin by introducing an absolute equity curve:

$$\vartheta(p) = 2\bar{y}(C(p) - p) = 2p(\bar{y}_p - \bar{y}) \quad (11)$$

It can be seen that when the opportunities enjoyed by all are increased or decreased by the same absolute amount, the curve $\vartheta(p)$ does not change; the higher the curve, the more equitable the opportunities. The area under this curve is the measure of absolute equity of opportunity and is given by

$$E^* = \bar{y}(E - 1) \quad (12)$$

where E is the relative measure of equity, derived above, based on the concentration curve. Note that opportunity is absolutely equitable (inequitable) if E^* is positive (negative).

Similar to the absolute equity curve defined in equation (11), we may also define an absolute Bonferroni equity curve as

$$\omega(p) = \bar{y}[C_B(p) - 1] = (y_p - \bar{y}) \quad (13)$$

It can be seen that when the opportunities enjoyed by all persons in society are increased or decreased by the same absolute amount, the curve $\omega(p)$ does not change; the higher this curve, the more equitable the opportunities. The area under the curve provides an alternative measure of absolute equity of opportunity. This area is given by

$$E_B^* = \bar{y}(E_B - 1) \quad (14)$$

where E_B is the relative measure of equity, derived above, based on Bonferroni's concentration curve. Note that opportunity is absolutely equitable (inequitable) if E^* is positive (negative).

VII. Social Opportunity Index

We have introduced two basic ideas in this study: (i) the average opportunity available to the population and (ii) the equity of opportunity. Efficiency relates to an increase in average opportunity, while equity pertains to how opportunity is distributed. Note that there could be a trade-off between the two. Suppose a government in partnership with the private sector makes a large investment in higher education, which provides opportunities for people to enhance human capital. As a result, average opportunity in the economy has increased, but at the same time the poor cannot access these opportunities because of high costs of tertiary education. In this case, equity has become lower and we have a trade-off between equity and efficiency. Thus, we need to consider this trade-off between efficiency and equity in opportunity in our analysis. We attempt to address this issue by means of the social opportunity function defined above.

The general social opportunity function defined in equation (2) may be rewritten as

$$O = O(y_1, y_2, \dots, y_n) = O(\bar{y}, E) \quad (15)$$

which implies that a social opportunity function is a function of two factors: (i) the average opportunity available to society and (ii) equity of opportunity (i.e., how opportunity is distributed). If the opportunity function defined in equation (15) is known, then the trade-off between efficiency and equity will also be known. Since the opportunity function is not known, we need to develop a proxy indicator that captures its basic properties.

The social opportunity function should be an increasing function of its arguments. If the opportunity of at least one person increases then the social opportunity function must also increase. This is a very basic property that is generally easy to accept. This implies that the social opportunity function O is an increasing function of \bar{y} : if we expand the average opportunity available to society without reducing equity, the social opportunity function must increase. On the other hand, we may also increase the social opportunity function by making opportunity more equitable. To bring equity into consideration, we require a social opportunity function that satisfies the transfer principle: any transfer of opportunity from a poorer (richer) person to a richer (poorer) person must decrease (increase) the social opportunity function. This property implies that the social opportunity function must be quasi-concave.² Thus, two basic properties of a social opportunity function include: (i) it is an increasing function of its arguments and (ii) it is quasi-concave.

As noted in Son (2011), the generalized Lorenz curve has a one-to-one relationship with the social welfare function: if the generalized Lorenz curve of distribution X_1 is higher than the generalized Lorenz curve of distribution X_2 at all points, then we can say unambiguously that the social welfare implied by distribution X_1 will always be higher than

² Quasi-concavity is a mathematical property of a general function with many arguments. For a detailed discussion on this see Kakwani (1980).

the social welfare implied by distribution X_2 . This result holds for a wide range of social welfare functions that are increasing and quasi-concave in individual incomes. Similar to the idea of the generalized Lorenz curve, we may propose a generalized concentration curve defined as

$$C(\mu, p) = \bar{y}C(p) \quad (16)$$

We can then show that the generalized concentration curve has a one-to-one relationship with the social opportunity function: if the generalized concentration curve of the distribution of opportunity Y_1 is higher than that for Y_2 at all points, then we can say unambiguously that the social opportunity function implied by distribution Y_1 will be always higher than the social opportunity function implied by distribution Y_2 . This result holds for all social opportunity functions that are increasing and are quasi-concave in individual opportunity. This result may have an important policy implication. Suppose a government wants to improve access to health care through a targeted program of providing health insurance to its population, and it wants to know how this insurance program is performing over time. We can say that the health insurance program is improving over time if the social opportunity function derived from the program has increased over the period. However, we cannot evaluate the program unless we have knowledge of the social opportunity function. Since there is a one-to-one relationship between the social opportunity function and generalized concentration curve of opportunity, we may be able to evaluate the program by calculating the generalized concentration curves of opportunity for each period. If the entire generalized concentration curve shifts upward over time, then we can unambiguously conclude that the program has expanded opportunity.

This suggests that by looking at the generalized concentration curves of two distributions of opportunity, we can judge which distribution provides greater social opportunity than the other, provided the two generalized concentration curves do not intersect. If they intersect, we cannot say which distribution is opportunity-superior. In such cases, we propose a proxy social opportunity index, which is obtained by twice the area under the generalized concentration curve:

$$\varphi = 2 \int_0^1 \bar{y} C(p) dp = \bar{y}E \quad (17)$$

where $E = (1 - C)$ is the relative measure of equity of opportunity, with C being the concentration of opportunity: opportunity is relatively equitable (inequitable) if E is greater (less) than 1. This equation shows that our proposed social opportunity index is the product of average opportunity and relative equity index of opportunity. This equation can also be written as

$$\varphi = \bar{y} + E^* \quad (18)$$

where $E^* = \bar{y}(E - 1)$ is the absolute equity index of opportunity: opportunity is absolutely equitable (inequitable) if E^* is greater (less) than 0.

Similar to the idea of the generalized concentration curve, we may define the generalized Bonferroni concentration curve as

$$C_B(\bar{y}C_B(p)) = \bar{y}C_B(p) = \frac{\bar{y}C(p)}{p} \quad (19)$$

We can then show that the generalized Bonferroni concentration curve has a one-to-one relationship with the social opportunity function: if the generalized Bonferroni concentration curve of distribution of opportunity Y_1 is higher than that for Y_2 at all points, then we can say unambiguously that the social opportunity function implied by distribution Y_1 will be always higher than the one implied by distribution Y_2 . This result holds for all social opportunity functions that are increasing and quasi-concave. This leads to a definition of a new social opportunity index, which we call the Bonferroni social opportunity index as equal to the area under the generalized Bonferroni concentration index defined as

$$\varphi_B = \bar{y} E_B \quad (20)$$

where E_B is the Bonferroni relative equity index defined in equation (10). This equation shows that the Bonferroni social opportunity index is the product of average opportunity available to society and the Bonferroni equity index. The government may increase social opportunity either by growth in average opportunity or by increasing the equity of opportunity (that is, by increasing opportunity for the poor).

Equation (20) can also be written as

$$\varphi_B = \bar{y} + E_B^* \quad (21)$$

where $E_B^* = \bar{y}(E_B - 1)$ is the Bonferroni absolute equity index of opportunity as defined in equation (14): opportunity is absolutely equitable (inequitable) if E_B^* is greater (less) than 0.

We have now proposed two social opportunity indices, one based on the generalized concentration curve and the other on the generalized Bonferroni concentration curve.

Which of the two indices should we use in practice? To answer this, we write the two opportunity indices as the weighted average of individual opportunities as

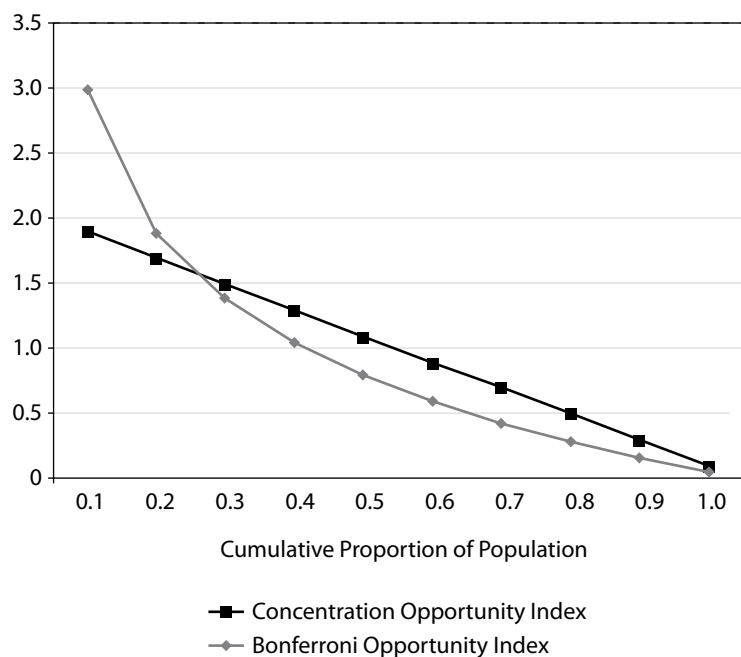
$$\varphi = 2 \int_0^1 y_p (1 - p) dp \quad (22)$$

and

$$\varphi_B = - \int_0^1 y_p \ln(p) dp \quad (23)$$

The opportunity indices differ with respect to the weight given to individual opportunities. Note that weights in φ decrease monotonically at a constant rate while weights in φ_B decrease monotonically at an increasing rate: the Bonferroni weight function declines more steeply than the concentration weight function. Since the total weights add up to 1, this implies that the Bonferroni index gives greater weight to the opportunities of individuals at the bottom of the welfare distribution than the concentration index (Figure 3). From this, we may conclude that the Bonferroni opportunity index is more egalitarian than the concentration opportunity index. If the policy focus is to provide greater opportunities to people at the bottom of the welfare distribution, then they should adopt Bonferroni's opportunity index for evaluating their policies.

Figure 3: Weighting Functions for Concentration and Bonferroni Opportunity Index



Source: Author's representation.

VIII. Empirical Illustration

To illustrate their application to research and policy making, the proposed methodologies outlined in the previous sections are applied to the Philippines. For this purpose, we use data from the Annual Poverty Indicator Survey (APIS) conducted in 1998 and 2007, obtained from the National Statistics Office in Manila. The APIS is a nationwide household-level survey designed to provide poverty indicators at the provincial level.

APIS gathers information on various aspects of well-being for all of the Philippines's 78 provinces, including the cities and municipalities of Metro Manila. It provides detailed information on demographic and economic characteristics; health status and education of family members; awareness and use of family planning methods; housing, water, and sanitation conditions and families; availability of credit to finance family business or enterprise; and family income and expenditures. The APIS conducted in 1998 and 2007 collected such information from more than 38,000 households and 190,000 individuals across the Philippines.

The purpose of this empirical analysis is to determine how equitable the delivery of education and health services is in the Philippines. Also to be determined is how much equity has changed in education and health between 1998 and 2007.

A. Utilization and Equity of Education

All school-age children must attend school, irrespective of their economic circumstances. If, somehow, children belonging to poor households are less likely to attend school, we may say that there is inequity in the education system. To determine this, we calculate equity indices for school attendance for three age groups: (i) primary age 6–11 years; (ii) secondary age 12–17 years; and (iii) tertiary age 18–24 years (Table 1).

As can be seen in Table 1, 90.91% of children aged 6–11 attended a primary school in 1998, rising to 94.38% in 2007. This suggests that the opportunity for primary-aged children has expanded over the decade. If all children in the primary school age group attended school, the relative equity index would equal 1. However, our estimate shows that the relative concentration equity index was 0.96 in 1998, even though it increased to 0.98 by 2007. Inequity in attendance is also evident from the negative value of the absolute equity index, -3.3 ; inequity in attendance contributes to a loss of social opportunity of 3.3 percentage points, resulting in a social opportunity index equal to 87.65%.

Table 1: Equity in School Attendance in the Philippines

	Primary Age (6–11 years)		Secondary Age (12–17 years)		Tertiary Age (18–24 years)	
	1998	2007	1998	2007	1998	2007
Average attendance (%)	90.91	94.38	80.46	79.53	27.75	23.89
Concentration opportunity index	87.65	92.11	75.56	74.43	21.70	18.20
Bonferroni opportunity index	85.50	90.04	72.88	71.92	19.49	16.12
Relative concentration equity index	0.96	0.98	0.94	0.94	0.78	0.76
Relative Bonferroni equity index	0.94	0.95	0.91	0.90	0.70	0.67
Absolute concentration equity index	–3.3	–2.3	–4.9	–5.1	–6.0	–5.7
Absolute Bonferroni equity index	–5.4	–4.3	–7.6	–7.6	–8.3	–7.8

Source: Author's calculations.

School attendance among children aged 12–17 was only 80.46% in 1998 and decreased to 79.53% in 2007. The relative concentration equity index for secondary school was estimated at 0.94 in 1998, holding steady in 2007. The relative Bonferroni index was even lower, being 0.91 in 1998 and holding steady in 2007. Thus, equity in opportunity for secondary school enrollment showed no significant improvement in almost a decade.

Attendance for those in the tertiary-age cohort is sharply lower, at only 27.75% in 1998 and 23.89% in 2007. The relative equity index for tertiary education was estimated at 0.78 in 1998 and decreased further to 0.76 in the subsequent period, suggesting that attendance in tertiary education is low and is highly inequitable. More interestingly, the results reveal that while relative equity declined during 1998–2007, absolute equity improved over the same period. This suggests that relative and absolute equity may not always move in the same direction, and there can be different policy implications depending on whether equity is defined in relative or absolute terms.

B. Utilization and Equity of Health Care Services

Table 2 shows the utilization and equity of health care services in the Philippines. The results suggest that in 1998–2007, about 42%–45% of people with illnesses sought treatment in a health care facility such as hospitals, clinics, rural health units (RHU), *barangay* health stations (BHS), or other health care facilities. If people with no illnesses are included in the analysis, the utilization rate is estimated at 18.91% and 11.71% of the population in 1998 and 2007, respectively. Interestingly, the proportion of people who sought treatment in a health care facility, irrespective of illness, declined during 1998–2007, as seen from the decline in the average utilization rate over the decade.

Furthermore, overall health care services in the Philippines appear to be inequitable in the sense that they are largely utilized by those at the top end of the income distribution. This is evident from the results in Table 2, which shows that the opportunity index—irrespective of whether the concentration or Bonferroni index is used—is less than the average utilization rate throughout the period, and that the equity index measured by

either index is less than the benchmark value of 1. When equity is evaluated based on the Bonferroni social welfare function, inequity in utilization of health care becomes more pronounced because those at the bottom of the income distribution get a greater weight than when concentration-based social welfare is used. Inequity in utilization is also reflected in higher negative values of the absolute equity Bonferroni index than its counterpart concentration index. For example, in 2007 inequity in utilization contributed to a loss of social opportunity of 6.27 and 8.45 percentage points, resulting in concentration and Bonferroni social opportunity indices equal to 41.64% and 40.23%, respectively.

Table 2: Equity in Utilization of Any Health Facility, 1998–2007

	Utilization when Sick		Utilization when Sick or not Sick	
	1998	2007	1998	2007
Average utilization (%)	45.44	42.16	18.91	11.71
Concentration opportunity index	41.64	35.89	17.33	10.06
Bonferroni opportunity index	40.23	33.71	16.72	9.46
Relative concentration equity index	0.92	0.85	0.92	0.86
Relative Bonferroni equity index	0.89	0.80	0.88	0.81
Absolute concentration equity index	-3.80	-6.27	-1.57	-1.65
Absolute Bonferroni equity index	-5.21	-8.45	-2.19	-2.25

Source: Author's calculations.

Table 3 presents selected types of health care facilities utilized by sick individuals during 1998–2007. Filipinos with illnesses heavily sought treatment at government hospitals, RHUs, and BHSs: in 2007, almost 64% of the sick sought medical treatment. Aside from public health facilities, people also utilized private hospitals and private clinics. The quality of health services provided by private facilities is often better than public facilities and is thus likely to be used mainly by the rich. Although figures are not presented here, this study found that health services provided by private hospitals and private clinics tend to be highly inequitable and became increasingly more inequitable over 1998–2007. People also tend to utilize government hospitals more than private facilities: the values of concentration and the Bonferroni opportunity index are far greater for government hospitals than for private hospitals and clinics. Moreover, the value of the equity index for both concentration and Bonferroni indices suggests that poor Filipinos more often seek treatment in government hospitals than in private facilities, as expected.

Unfortunately, the quality of health care in government hospitals remains inferior compared to private facilities, especially in the National Capital Region. This is particularly disconcerting since a large share of the national government's health budget is spent on hospitals in the National Capital Region. People who cannot afford private health care are the main users of public health care services. Compared to government health care, clients rank private health care as superior on all aspects of quality, such as service, facilities, personnel, medicine, and convenience. Government health care facilities

cater to the poor because of low treatment costs, cheaper medicines and supplies, and flexibility in settling bills.

Table 3: Equity in Utilization of Selected Health Facilities when Sick, 1998–2007

	Government Hospital		Rural Health Unit		Barangay Health Station	
	1998	2007	1998	2007	1998	2007
Average utilization (%)	9.15	12.78	11.14	8.33	5.44	6.08
Concentration opportunity index	8.52	11.33	13.23	9.36	6.79	7.16
Bonferroni opportunity index	7.85	10.04	14.19	9.62	7.34	7.98
Relative concentration equity index	0.93	0.89	1.19	1.12	1.25	1.18
Relative Bonferroni equity index	0.86	0.79	1.27	1.15	1.35	1.31
Absolute concentration equity index	-0.62	-1.44	2.08	1.03	1.35	1.08
Absolute Bonferroni equity index	-1.29	-2.74	3.04	1.29	1.90	1.90

Source: Author's calculations.

As expected, people at the lower end of the income distribution are more likely to utilize health care services provided by RHUs and BHSs. This is evident in the value of the opportunity index being greater than the average utilization rate, and becomes even clearer with the equity index being greater than 1. Further, the equity index derived from the Bonferroni social welfare exceeds the benchmark value of 1 and, at the same time, is greater than the index based on the concentration social opportunity index.

While government hospitals are classified as tertiary health care facilities, both RHUs and BHSs are categorized as primary health care facilities. RHUs and BHSs are supposed to provide preventive health care, first aid, and treatment for minor illnesses and accidents. Despite access to primary health care, however, a sizable proportion of Filipinos still prefer to seek these treatments in government hospitals; thus, government hospitals end up providing the same services as primary facilities. It is therefore critical to ensure that primary health care is delivered efficiently so that, through prevention, it can lower the incidence of diseases such as diarrhea, bronchitis, influenza, pneumonia, and tuberculosis. Preventive health care services do a lot more in the long run to protect health and require less funding than curative medical treatment. It will also reduce the burden on tertiary public facilities, which are often more expensive to operate than primary facilities.

Tables 4 and 5 pertain to health care use by the elderly who are ill. Table 4 suggests that 52% and 56% sought treatment in a health care facility in 1998 and 2007, respectively. Moreover, Table 5 shows that they mostly sought treatment in government hospitals, private hospitals, and private clinics, at almost 88% in 2007, with only 12% using RHUs and BHSs. While the proportion of the elderly with illnesses who sought treatment in a health care facility increased over the decade, its equity declined over the same period. The results reveal that overall, health care services used by the elderly with illnesses

are inequitable, with the degree of inequity worsening between 1998 and 2007. Inequity in utilization contributed to a loss of social opportunity of 6.39 percentage points in 1998 and 9.14 in 2007. As a result, the social opportunity index was equivalent to 46.03% and 46.52% in the respective periods. As would be expected, the loss of social opportunity becomes even larger when the Bonferroni social welfare is used. These findings call for policies, such as providing free health care cards, which can help the elderly, particularly among the poor, to access health care when needed.

Table 4: Equity in Utilization of Any Health Facility among Elderly when Sick, 1998–2007

	1998	2007
Average utilization (%)	52.42	55.67
Concentration opportunity index	46.03	46.52
Bonferroni opportunity index	43.35	41.81
Relative concentration equity index	0.88	0.84
Relative Bonferroni equity index	0.83	0.75
Absolute concentration equity index	-6.39	-9.14
Absolute Bonferroni equity index	-9.07	-13.85

Source: Author's calculations.

As noted earlier, the elderly, when ill, mostly sought treatment in hospitals or private clinics during 1998–2007 (Table 5). One would expect that health care services provided by private hospitals and clinics to be used mainly by the rich elderly, but it is somewhat disconcerting to see that even government hospitals are inequitable. On the other hand, government hospitals are found to be less inequitable relative to private health care. Moreover, the equity index for government hospitals has increased over the period while the corresponding figure for its private counterpart has decreased. In particular, inequity in utilization of private hospitals contributed to a loss of social opportunity of 6.97 percentage points, leading to the social opportunity index equal to just 8.88% in 2007. Given that private hospitals provide better quality health care, the elderly, including the poor, should be able to seek treatment in any health care facility with adequate quality whenever needed.

Table 5: Equity in Utilization of Selected Health Care by Sick Elderly, 1998–2007

	Government Hospital		Private Hospital		Private Clinic	
	1998	2007	1998	2007	1998	2007
Average utilization (%)	13.29	19.10	12.47	15.85	16.01	14.05
Concentration opportunity index	11.98	18.01	8.06	8.88	12.46	9.25
Bonferroni opportunity index	10.69	16.19	7.20	6.74	10.85	7.20
Relative concentration equity index	0.90	0.94	0.65	0.56	0.78	0.66
Relative Bonferroni equity index	0.80	0.85	0.58	0.43	0.68	0.51
Absolute concentration equity index	-1.30	-1.09	-4.41	-6.97	-3.55	-4.80
Absolute Bonferroni equity index	-2.60	-2.91	-5.27	-9.11	-5.16	-6.85

Source: Author's calculations.

IX. Conclusion

Measuring the amount and distribution of opportunities is of utmost importance to researchers and policy makers alike. Researchers need to measure opportunity in order to determine progress in human development and distill lessons that can be applied in similar settings. On the other hand, policy makers need to measure opportunity to formulate policies and programs that can help share the economic pie among the largest number of people, especially the poor. However, measuring opportunity is difficult—even if one can assign a numerical value to opportunity for every individual, mapping these values into a measurement of the opportunity available in society is fraught with value judgments. For instance, how should we weight the opportunities for the rich relative to the poor? Should all people be equal, or should we give preferential weight to those who have less in life? In other words, what social welfare function and, by extension, social opportunity function should we use to map individual opportunities into a measurement of its distribution in society?

The beauty of the discussion in the previous sections is that it is possible to measure and compare distributions of opportunity across societies and across time even if we do not know the form of the social opportunity function. Using the properties of the generalized Lorenz curve and the Bonferroni curve as well as their related indices—that is, the concentration curve and the Bonferroni index of opportunity—it is possible to measure the distribution of opportunities in a society and compare them across societies or over time. This is an important result because by using these measures we can determine whether one distribution is more equitable than another, or whether a policy intervention will worsen inequality. We can track progress in improving equity in opportunity over time, and it would be possible to find policies or programs that were successful in improving opportunities for the underprivileged.

These measurements, however, are still relative measures of opportunity: an equiproportional increase in the opportunity of all individuals will not change the values of the concentration or Bonferroni indices. In other words, given that the rich are already endowed with greater opportunity than the poor, a 10% increase in everyone's opportunities will not be seen as a deterioration of equity, even if the magnitude of increase was actually greater for the rich. To account for this anomaly, this paper developed absolute measures of equity based on the concentration and Bonferroni curves that will reflect the above situation as a deterioration of equity. These are then incorporated into the social opportunity index, which considers both efficiency (that is, the average amount of opportunity available to everyone) and equity (that is, distribution) of opportunity in society.

Again, the beauty of the social opportunity index is there is no need to make value judgments on the relative weights of efficiency or equity in the social opportunity function—a reliable and comparable index of efficiency and equity is obtained even

if the functional form is unknown. However, there is an important difference between using the social opportunity indices implied by the concentration and Bonferroni curves: while weights for individuals decrease with income for both indices, weights for the concentration-based social opportunity index decrease at a constant rate, compared to those for the Bonferroni-based index that decrease at an increasing rate. Thus, one may consider the Bonferroni-based social opportunity index to be more pro-poor.

Applying the above methodologies to Philippine data, the paper finds that access to education remains inequitable at all levels, with richer children more likely to attend school than the poor. Moreover, this inequity becomes more severe for older children—tertiary level education is the most inequitable because poorer children may not even get to finish primary or secondary school. Overall, equity in education did not change between 1998 and 2007, but interestingly, relative and absolute measures of equity for tertiary education moved in opposite directions during this time. Similarly, access to health care remains inequitable, particularly access to private health facilities that provide superior quality. Poorer Filipinos are thus left to utilize primary health care facilities, as can be seen in the highly equitable (that is, pro-poor) utilization of these facilities. Access to government hospitals, although still inequitable, is at least more equitable than access to private facilities. The paper also finds that health care opportunities in the Philippines generally became more inequitable during 1998–2007.

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About the Paper

Measuring the equity of opportunity in a given society is an essential ingredient in the formulation of policies and programs that promote inclusive growth. Hyun H. Son defines and measures equity of opportunity through the theoretical framework of the social opportunity function, a concept similar to the social welfare function. The measures proposed in the study are used to analyze changes in the opportunities in education and health care in the Philippines from 1998 to 2007.

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