Equality of Capabilities and the Weak Equity Axiom

Jun Matsuyama

Institute of Economic Research, Hitotsubashi University,
JSPS Research Fellowships for Young Scientists (PD)
Email: jun5513jp@yahoo.co.jp

Received October 23, 2013; accepted July 23, 2014

ABSTRACT

In this study, we develop a simple, two-person economy model based on the capability approach. We show that the two distribution rules of goods equalizing capabilities (i.e., the least disparity of capabilities and the largest value of an intersection of capabilities) satisfy the weak equity axiom (Sen, 1973) defined over our framework. The results suggest that equality of capabilities can deal appropriately with hard case issues (i.e., issues related to the treatment of the disabled). Finally, we present two examples that illustrate an optimal solution for each rule.

Keywords: weak equity axiom, capabilities, equality, distributive justice
JEL Classification: D31, D63, I31

1 Introduction

In his study titled "Equality of What?" Sen (1980) proposed the concept of capabilities as a basis for evaluating equality. In justifying the equality of capabilities normatively, Sen showed that the capability approach could deal appropriately with individual differences in hard case issues (i.e., issues related to the treatment of the disabled).

To Sen, the issue of hard cases was not new, and we find it mentioned in his early works. The weak equity axiom (WEA) was first introduced by Sen (1973) "to bring in egalitarian consideration into the form of the social welfare judgments" (p. 18).[1] Sen (1974) gives a weaker version of the original definition of the WEA, as follows:

If person i is worse off than person j whenever i and j have the same income level, then no less income should be given to i than to j in the optimal solution of the pure distribution problem (Sen, 1974, p. 302).

[1]The WEA is often employed in literature on inequality measurement (e.g., Shorrocks, 2004) and theory of distributive justice (e.g., Roemer, 2006). Roemer calls the WEA the priority (Axiom P).

Sen proposed a well-known pure distribution problem to show that equality of marginal utility, which is a type of utilitarian equity, ignores a distributional aspect, assuming that utility is measurable and interpersonally comparable. Then, such a utilitarian equity does not satisfy the WEA (e.g., see Sen, 1973, p. 20, Theorem 1.2; Sen, 1974, p. 303, Theorem 1). For example, consider Sen's pure distribution problem with a given total amount of income under a two-person economy consisting of individuals i and j. In this example, person i, who is handicapped, derives half as much utility as person j from any level of income. Then, the WEA requires that person i should receive more income than j, whereas equality of marginal utility would give more to j.

On examining his works subsequent to the 1980 study, we find that the issue of hard cases continues to be a central issue in Sen's arguments (e.g., Sen, 1985, 1992, 1999, 2004). Here, we are interested in answering the following question: How does equality of capabilities address hard cases in the pure distribution problem? While Sen often refers to the question (e.g., Sen, 1980, sec.4; Sen, 1992, ch. 5; Sen, 1999), he and his followers do not seem to deal with it theoretically. In the present study, we attempt to determine a resource allocation that is justified in the pure distribution problem under equality of capabilities.[2]

In considering the above research question, we have to provide a distribution rule for goods equalizing capabilities in order to determine the optimal solution in the capability framework developed in the next section. Following Sen's original motivation of including an egalitarian consideration when evaluating a distribution of capability sets, we consider two plausible distribution rules of goods equalizing capabilities. The first, with regard to the least disparity of capabilities, says that a society is just as long as it minimizes differences in capabilities. The second, with regard to the largest volume of intersection of capabilities, says that a society is just as long as it maximizes a "common capability" that can be accessed by all members of the society.

The remainder of the paper is organized as follows. In section 2, following Matsuyama and Mori (2011), we construct a simple, two-person economy model based on the capability approach. We consider the two distribution rules of goods equalizing capabilities: the least disparity of capabilities and the largest value of an intersection of capabilities. Then, we show that each distribution rule in the pure distribution problem satisfies the WEA.[3] In section 3, we present two

---

[2] Resource allocation models in the capability framework are discussed in, for example, Herrero (1996), Gotoh and Yoshihara (2003), and Matsuyama and Mori (2011).

[3] Sen (1973, 1974) considers an n-person economy. Then, the WEA is applied to persons i, j all else (i.e., $n - 2$ persons) being equal. When we consider an n-person economy in our setting, similar reasoning provides the same results as the two-person economy. Thus, the two-person economy model is enough to show the implications of the WEA in the capability-based framework.

examples that illustrate an optimal solution for each distribution rule of goods equalizing capabilities. Lastly, in section 4, we provide concluding remarks.

2 Equality of capabilities in the pure distribution problem

We consider a two-person economy, denoted as i, j. Only one commodity exists in our economy. The total amount of the good is $X \in \mathbf{R}_{++}$. Let $x_h \in \mathbf{R}_+$ be an amount of the good distributed to person $h(h = i, j)$. The sum of each x_h is the total amount of the good, that is, $X = x_i + x_j$. A feasible set of efficient allocations of X is defined as $S_X := \{(x_i, x_j) \in \mathbf{R}_+^2 \mid X = x_i + x_j\}$. Let k be the number of functionings. A functioning is defined by Sen (1985, p.10) as "an achievement of a person: what he or she manages to do or to be" by focusing on the multi-dimensionality of individual well-being. The functioning space is defined on the non-negative k-dimensional real space $\mathbf{R}_+^k$. The functioning of person h is denoted as $\mathbf{b}_h \in \mathbf{R}_+^k$. The concept of capability refers to "the freedom that a person has in terms of the choice of functionings" (Sen, 1985, p.9). We define the capability correspondence of person h as $C_h : \mathbf{R}_+ \twoheadrightarrow \mathbf{R}_+^k,\ x_h \mapsto C_h(x_h) \subseteq Y \subset \mathbf{R}_+^k$, where Y is a feasible set of functionings and is assumed to be a compact set.

Assumption 1
For $h = i, j$, a correspondence C_h has the following properties:

(i) continuous, compact-valued;
(ii) $\forall x, x' \ (x < x') : C_h(x) \subset C_h(x')$;
(iii) $C_h(0) = \{\mathbf{0}\}$.

Assumption 1-(i) means that a capability does not suddenly expand or shrink as the amount of the good changes, and it is bounded and closed. Assumption 1-(ii) means a kind of resource monotonicity. Here, the relationship "$\subset$" is defined as follows: $C_h(x) \subset C_h(x') := \exists \varepsilon > 0 \, \forall \mathbf{b} \in C_h(x) : U(\mathbf{b}; \varepsilon) \subset C_h(x')$, where $U(\mathbf{b}; \varepsilon)$ is an open ball with center $\mathbf{b}$ and radius ε. Assumption 1-(iii) means that a capability is a set that contains the null vector when a person has none of the good.

Assumption 2
For i, j,

$$C_i(x) \subset C_j(x) \forall x.$$

Assumption 2 means that for each amount of good, person i has a disadvantage with respect to his/her ability to convert the good to the corresponding capability when compared with person j.

In the capability approach, a person's capability set is interpreted as the freedom that he/she enjoys. Thus, in identifying the person who enjoys relatively greater freedom, we face a technical difficulty concerning the ranking of capability sets. Thus far, various metrics have been proposed.[4] Among them, one of the most intuitive and primitive ways is based on a set-inclusion relationship. For any C_i, C_j, if $C_i \subseteq C_j$, then this can be interpreted as "the degree of freedom that person *j* enjoys is at least as good as the degree of freedom person *i* enjoys." Clearly, the relationship is reflexive and transitive, but not complete. Analogously, the relationships $\subset$ and $=$ can be interpreted as "being greater than" and "being the same as," respectively. Then, the WEA in our framework is stated as follows:

If person *j* enjoys a greater degree of freedom than person *i* whenever *i* and *j* have the same amount of the good, then a lesser amount of the good than that given to *j* should not be given to *i* in the optimal solution of the pure distribution problem.

2.1 The least disparity of capabilities

Following Sen's original motivation of including an egalitarian consideration when evaluating a distribution of capability sets, we consider the two distribution rules of good equalizing capabilities. In this subsection, the least disparity of capabilities is considered. This rule says that a society is just as long as it minimizes the differences in capabilities in terms of a given measure. The idea of the least disparity of capabilities is motivated by Sen (1980) and Yoshihara (2004, sec.4).

Here, we introduce the Hausdorff metric to evaluate a distribution of capability sets, which is sometimes employed in existing literature (e.g., see Matsuyama and Mori, 2011). Let $\mathcal{C}$ be a family of compact sets. Given non-empty sets C, $C' \in \mathcal{C}$, we take an element $\mathbf{b} \in C$. We define the distance between $\mathbf{b}$ and C' as $d(\mathbf{b}, C') := \min_{\mathbf{b}' \in C'} d(\mathbf{b}, \mathbf{b}')$. Then, we define the distance between C and C' as $d(C, C') := \max_{\mathbf{b} \in C} d(\mathbf{b}, C')$. The Hausdorff distance between C and C' is defined as $h(C, C') := \max\{d(C, C'), d(C', C)\}$.

Let us define a set of an efficient allocation of S_X, in which the Hausdorff distance between capability sets is minimized, as $O_{l.d} := \{\mathbf{x} \in S_X | h(C_i(x_i), C_j(x_j)) \leq h(C_i(y_i), C_j(y_j))\ \forall \mathbf{y} \in S_X\}$. We denote two sets, $\{\mathbf{x} \in S_X | x_j \leq x_i\}$ and $\{\mathbf{x} \in S_X | x_i < x_j\}$, as S_X^* and S_{X*}, respectively. Then, we obtain the following proposition, which states that the least disparity of capabilities in the pure distribution problem satisfies the WEA.

---

[4] The literature on axiomatic characterizations of freedom measures is vast. Pattanaik and Xu (1990) provided one of the first contributions in this field. Barberá et al. (2004) and Dowding and Van Hees (2009) provide a comprehensive survey of this body of literature.

Proposition 1
Under Assumptions 1 and 2, $O_{l.d} \subseteq S_X^*$ holds.

Proof.
To begin with, a minimal distance between the two capability sets C_i and C_j exists owing to Assumption 1-(i) and the compactness of S_X. Then the minimal distance is defined as

$$h^* := h(C_i(x_i^*), C_j(x_j^*)) = \min_{(x_i, x_j) \in S_X} h(C_i(x_i), C_j(x_j)). \tag{1}$$

Thus, $O_{l.d} \neq \emptyset$ and, accordingly, we take $\mathbf{x}^* \in O_{l.d}$ arbitrarily. Suppose $\mathbf{x}^* \in S_{X^*}$. Take $\varepsilon > 0$ so that $(x_i^* + \varepsilon, x_j^* - \varepsilon) \in S_{X^*}$. Then, we obtain the following relationships:

$$C_i(x_i^* + \varepsilon) \subset C_i(x_j^* - \varepsilon) \,(\text{From Assumption 1-(ii)}) \tag{2}$$

$$\subset C_j(x_j^* - \varepsilon) \,(\text{From Assumption 2}). \tag{3}$$

Since Assumption 1-(ii), the continuity of d, and $C_i(x_i^* + \varepsilon) \subset C_j(x_j^* - \varepsilon)$ hold, there exist $\mathbf{b}_i^* \in C_i(x_i^* + \varepsilon)$ and $\mathbf{b}_j^* \in C_j(x_j^* - \varepsilon)$ such that $d(\mathbf{b}_j^*, \mathbf{b}_i^*)$ = $d(C_j(x_j^* - \varepsilon), C_i(x_i^* + \varepsilon))$. Then $d(\mathbf{b}_j^*, \mathbf{b}_i^*)$ < $d(\mathbf{b}_j^*, \mathbf{b}_i)$, for all $\mathbf{b}_i \in C_i(x_i^*)$, holds owing to Assumption 1-(ii). From $\mathbf{b}_j^* \in C_j(x_j^* - \varepsilon) \subset C_j(x_j^*)$ and $d(\mathbf{b}_j^*, \mathbf{b}_i^*) <$ $d(\mathbf{b}_j^*, C_i(x_i^*))$, we obtain

$$d^* = d(C_j(x_j^*), C_i(x_i^*)) > d(\mathbf{b}_j^*, C_i(x_i^*)) > d(\mathbf{b}_j^*, \mathbf{b}_i^*). \tag{4}$$

Note that if $C \subset C'$, then $h(C, C') = d(C', C)$. From this and equation (1), we also obtain

$$d^* \leq d(C_j(x_j^* - \varepsilon), C_i(x_i^* + \varepsilon)) = d(\mathbf{b}_j^*, \mathbf{b}_i^*). \tag{5}$$

From equations (4) and (5), we see that $d(\mathbf{b}_j^*, \mathbf{b}_i^*) \geq d^* > d(\mathbf{b}_j^*, \mathbf{b}_i^*)$, which is a contradiction. Therefore, $\mathbf{x}^* \in S_X^*$. Hence, $O_{l.d} \subseteq S_X^*$ holds. Q.E.D.

Remark 1
Proposition 1 can be interpreted as the following: Let person *i* be disadvantaged in comparison to person *j*. Then, person *i* receives at least as much of the good as person *j* does under the least disparity of capabilities. This means that a realized allocation, justified by the least disparity of capabilities in the pure distribution problem, is consistent with the WEA.

2.2 The largest value of intersection of capabilities

In this subsection, we consider the largest value of intersection of capabilities. This rule states that a society is just as long as it maximizes a "common capability" that can be accessed by all members of the society. The concept of a common capability is discussed extensively in related literature (e.g., Herrero et al., 1997; Gotoh and Yoshihara, 2003; Echávarri and Permanyer, 2008).

Let us define a set of an efficient allocation of S_X under the largest value of intersection of capabilities as $O_{l.v} := \{\mathbf{x} \in S_X | v(C_i(x_i) \cap C_j(x_j)) \geq v(C_i(y_i) \cap C_j(y_j))$ $\forall \mathbf{y} \in S_X\}$, where a function $v:\mathcal{C} \to \mathcal{R}$.

Assumption 3
A function v has the following properties:

(i) continuous;
(ii) $\forall C, C' \in \mathcal{C}: C \subseteq C' \Rightarrow v(C) \leq v(C')$.

Assumption 3-(ii) simply refers to a monotonicity concerning set inclusion.

Next, we obtain the following proposition, which states that the largest value of the intersection of capabilities in the pure distribution problem satisfies the WEA.

Proposition 2
Under Assumptions 1, 2, and 3, $O_{l.v} \subseteq S_X^*$ holds.

Proof.
The largest volume of an intersection of the two capability sets C_i and C_j is well defined, from Assumption 1-(i) and the compactness of S_X. Hence, $O_{l.v} \neq \emptyset$. Take $\mathbf{x}^{**} \in O_{l.v}$. Suppose $\mathbf{x}^{**} \in S_{X^*}$. Take $\varepsilon > 0$ so that $(x_i^{**} + \varepsilon, x_j^{**} - \varepsilon) \in S_{X^*}$. Then, the following relationships hold:

$$C_i(x_i^{**}) \subset C_i(x_i^{**} + \varepsilon) \subset C_i(x_j^{**} - \varepsilon) \subset C_j(x_j^{**} - \varepsilon) \subset C_j(x_j^{**}). \tag{6}$$

Thus, $v(C_i(x_i^{**}) \cap C_j(x_j^{**})) < v(C_i(x_i^{**} + \varepsilon) \cap C_j(x_j^{**} - \varepsilon))$, which is a contradiction. Therefore, $\mathbf{x}^{**} \in S_X^*$. Hence, $O_{l.v} \subseteq S_X^*$ holds. Q.E.D.

Remark 2
Similar to Proposition 1, Proposition 2 can be interpreted as follows: Let person i be disadvantaged in comparison to person j. Then, person i receives at least as much as of the good as person j does under the largest value of the intersection of capabilities. This means that a realized allocation, justified by the largest value of the intersection of capabilities in the pure distribution problem, is consistent with the WEA.

3 Examples

In this section, we provide two examples to illustrate how the corresponding allocations are realized for each distribution rule of good equalizing capabilities, as well as which person (i.e., i or j) enjoys the greater degree of freedom under the allocations in terms of a set-inclusion relationship. Example 1 shows that the optimal solutions for each distribution rule presented earlier coincide, and that the corresponding capability set for each person is equivalent. We extend the settings in Example 1 into a direction. In Example 1, we assume the same development path for each capability with respect to the amount of the good (we explain this later in the section). We then relax this assumption in Example 2. As a result, the optimal allocations for each distribution rule are no longer the same and, accordingly, the set-inclusion based evaluations concerning which person enjoys more freedom are different.

Example 1
We consider a pure distribution problem in which the total amount of good $X = 10$ is distributed to persons, i and j, and the number of functionings is two (i.e., $k = 2$). We define Y, C_i, and C_j as follows:[5]

$$\begin{aligned} Y &:= \left\{(b_1, b_2) \mid 0 \le b_1 \le 15, 0 \le b_2 \le 150\right\}, \\ C_i(x_i) &:= \left\{(b_1, b_2) \mid 0 \le b_1 \le \frac{3}{4}x_i, 0 \le b_2 \le \frac{3}{8}x_i^2\right\}, \\ C_j(x_j) &:= \left\{(b_1, b_2) \mid 0 \le b_1 \le \frac{3}{2}x_j, 0 \le b_2 \le \frac{3}{2}x_j^2\right\}. \end{aligned}$$

In what follows, we employ the valuation function ν, which assigns a volume to each capability set. Each capability for persons i and j is given as a rectangle, which is depicted in the (b_1, b_2) space (see Figure 1). As the amount of the good increases, each capability expands, while its northeast apex moves along $b_2 = \frac{2}{3}b_1^2$. Person i's capability, $C_i(x)$, is included in j's capability, $C_j(x)$, for all $x \in \mathbf{R}_{++}$.[6] First, the Hausdorff distance is given by the distance between the northeast apex of C_i and that of C_j, which is illustrated in Figure 2 by the solid line. Under the equal distribution $(5, 5) \in S_{10}$, the Hausdorff distance

---

[5]A similar analysis is developed in Matsuyama and Mori (2011).

[6]Strictly speaking, the examples are not consistent with Assumption 2 because, when persons i, j receive the same amount of the good (i.e., $(x_i, x_j) = (5, 5) \in S_X$ in the examples), the boundary of the capability of person i *over* the b_1-axis and the b_2-axis intersects the capability of person j. In order to escape the inconsistency, the definition of $\subset$ has to be strengthened as follows: $C_h(x) \subset^* C_h(x') := \exists \varepsilon\, \forall \mathbf{b} \in \partial C_h(x)$: $U(\mathbf{b}; \varepsilon) \subset C_h(x')$, where $\partial C_h(x) := \{\mathbf{b} \in C_h(x) \mid \nexists \mathbf{b}^* \in C_h(x) : \mathbf{b} < \mathbf{b}^*\}$. Since the Hausdorff distance and the volume of intersection do not depend on the definition of $\subset^*$, the results in our examples do not change, even after introducing the definition of $\subset^*$.

Figure 1. Capabilities for persons *i* and *j* in Example 1.

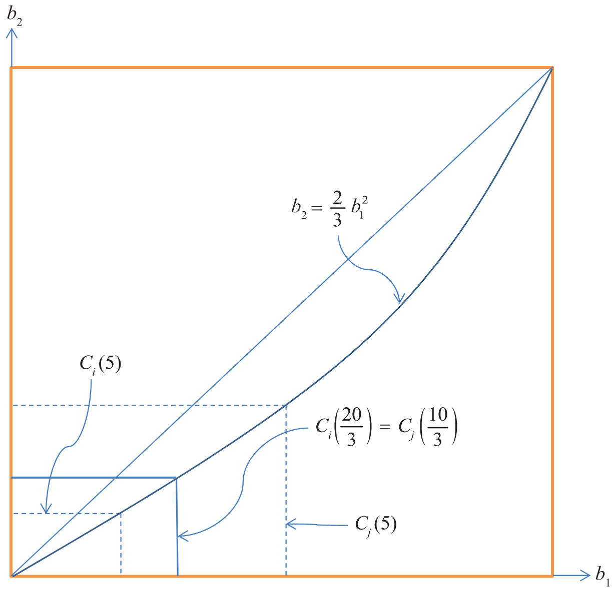
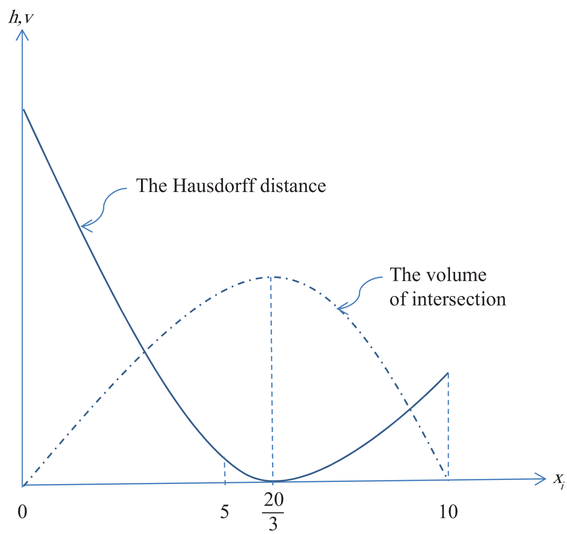


Figure 2. The Hausdorff distance and the volume of intersection in Example 1.



between $C_i(5)$ and $C_j(5)$ is about 28. The least distance is 0, which is achieved at $(x_i, x_j) = \left(\frac{20}{3}, \frac{10}{3}\right)$. Second, the volume of intersection is maximized at the same allocation (see the dot-and-segment line in Figure 2). Third, the corresponding capability sets associated with $\left(\frac{20}{3}, \frac{10}{3}\right)$ are equivalent (i.e., $C_i\left(\frac{20}{3}\right) = C_j\left(\frac{10}{3}\right)$). Based on the set-inclusion relationship defined here, person i enjoys the same degree of freedom as person j.

Example 1 assumes that the two capability sets, C_i and C_j, expand along the same development path. That is, $b_2 = \frac{2}{3} b_1^2$ as the amount of the good increases. Now, we consider a case in which the development paths of the capability of each person differ.

Example 2

We consider the same problem as that in Example 1. Here, Y, C_i, and C_j are given as follows:

$$Y := \{(b_1, b_2) \mid 0 \le b_1 \le 20, 0 \le b_2 \le 20\},$$
$$C_i(x_i) := \left\{(b_1, b_2) \mid 0 \le b_1 \le x_i, 0 \le b_2 \le \frac{3}{2} x_i\right\},$$
$$C_j(x_j) := \left\{(b_1, b_2) \mid 0 \le b_1 \le 2x_j, 0 \le b_2 \le 2x_j\right\}.$$

Figure 3. Capabilities for persons i and j in Example 2.

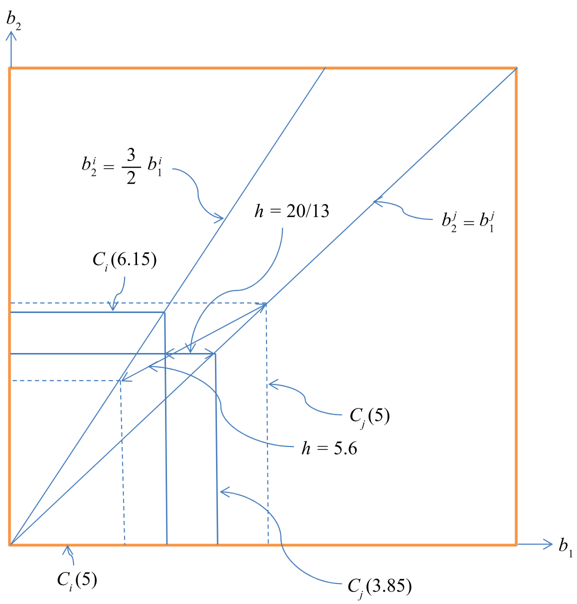


Figure 4. The Hausdorff distance and the volume of intersection in Example 2.

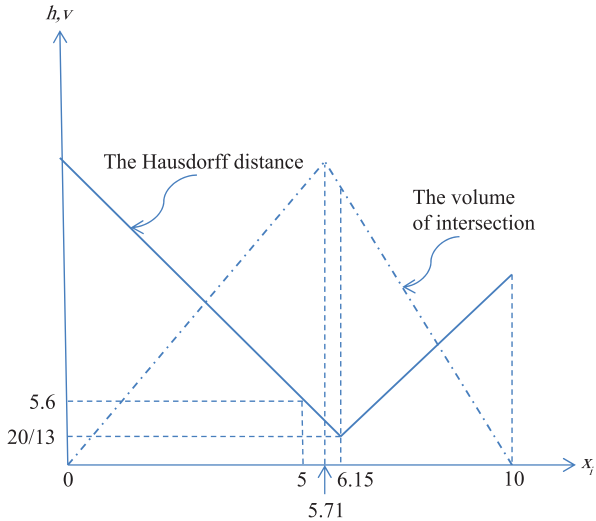


Table 1. The set-inclusion based evaluations.		
	Ex. 1	**Ex. 2**
I.d.	=	▷◁
I.v.	=	j

As shown in Figure 3, the capabilities of persons i and j expand, while their northeast apexes move along $b_2^i = \frac{3}{2} b_1^i$ and $b_2^j = b_1^j$, respectively. First, the Hausdorff distance is illustrated in Figure 4 by the solid line. Under an equal distribution, the Hausdorff distance between $C_i(5)$ and $C_j(5)$ is about 5.6, where $C_i(5) \subset C_j(5)$. The least distance is $\frac{20}{13}$, which is achieved at $(x_i, x_j) = (6.15, 3.85)$. Then, the following relationship holds: $C_i(6.15) \not\subset C_j(3.85)$ and $C_j(3.85) \not\subset C_i(6.15)$ (see Figure 3). We cannot determine which person enjoys the greater degree of freedom based on the set-inclusion relationship. Second, unlike in Example 1, the volume of intersection is not maximized at the same optimal allocation as that which gives the least Hausdorff distance (see the dot-and-segment line in Figure 4). Instead, the volume of intersection is maximized at $(x_i, x_j) = (5.71, 4.29)$. Then, the relationship $C_i(5.71) \subset C_j(4.29)$ holds and, accordingly, person j enjoys a greater degree of freedom than person *i*. Table 1 summarizes the set-inclusion-based evaluations that identify the person who enjoys a greater degree of freedom. The symbol "$\triangleright\triangleleft$" means "incomparable."

4 Concluding remarks

In this study, we developed a simple, two-person economy model based on the capability approach. We showed that allocations supported by each distribution rule of good equalizing capabilities are consistent with the WEA defined over our framework. The results suggest that equality of capabilities can include the issue of hard cases. We also provided two examples that illustrate how the corresponding allocations are realized for each distribution rule of good equalizing capabilities. The examples also illustrate which person (i.e., *i* or *j*) enjoys a greater degree of freedom under each allocation in terms of a set-inclusion relationship.

Finally, some issues remain open, from both analytical and philosophical points of view. The former includes detailed comparisons between the two distribution rules of good equalizing capabilities, as well as axiomatic characterizations of the two rules. The latter includes clarifying the differences between Rawls and Sen in terms of "hard cases" (Nussbaum, 2006, Ch.1 through 3). These tasks are left for future research.

Acknowledgment

The author would like to thank Kenji Mori and the seminar participants at Kyoto University and Tohoku University for useful discussions and valuable comments on this paper. This paper has also benefited from the helpful comments of two referees of this journal. This work was supported by Grant-in-Aid for JSPS Fellows, grant number 24·6104. The usual caveats apply.

References

Barberá, S., Bossert, W. and Pattanaik, P. K. (2004) "Ranking Sets of Objects," in Barberá et al. (ed.) *Handbook of Utility Theory, vol. 2 Extensions*, Kluwer Academic, Dordrecht.

Dowding, K. and Van Hees, M. (2009) "Freedom of Choice," in Anand, P. et al. (ed.) *Rational and Social Choice: An Overview of New Foundations and Application*, Oxford University Press, Oxford.

Echávarri and Permanyer (2008) "Ranking Profiles of Capability Sets," *Social Choice and Welfare*, 38, pp. 521–535.

Gotoh, R. and Yoshihara, N. (2003) “A Class of Fair Distribution Rules á la Rawls and Sen,” *Economic Theory*, 22, pp. 63–88.

Herrero, C. (1996) “Capabilities and Utilities,” *Economic Design*, 2, pp. 69–88.

Herrero, C., Iturbe-Ormaetxe, I., and Nieto, J. (1998) “Ranking Opportunity Profiles on the Basis of the Common Opportunities,” *Mathematical Social Science*, 35, pp. 273–289.

Matsuyama, J. and Mori, K. (2011) “Freedom and Achievement of Well-Being and Adaptive Dynamics of Capabilities,” *Metroeconomica*, 62 (3), pp. 494–511.

Nussbaum, Martha, C. (2006) *Frontiers of Justice: Disability, Nationality, Species Membership*, Harvard University Press, Cambridge.

Pattanaik, P. K. and Xu. Y. (1990) “On Ranking Opportunity Sets in Terms of Freedom of Choice,” *Recherches Economiques de Louvain*, 56, pp. 383–90.

Roemer, J. (2006) “Impartiality, Solidarity, and Distributive Justice,” in Sypnowich, C and G. A. Cohen (ed.) *The Egalitarian Conscience: Essays in Honour of G. A. Cohen*, Oxford University Press, Oxford.

Sen, A. K. (1973) *On Economic Inequality*, Oxford University Press, Oxford.

Sen, A. K. (1974) “Rawls versus Bentham: An Axiomatic Examination of the Pure Distribution Problem,” *Theory and Decision*, 4 (3–4), pp. 301–309.

Sen, A. K. (1980) “Equality of What?” MacMurrin, S. M. (ed.) *Tanner Lectures on Human Values*, vol. 1, Cambridge University Press, Cambridge.

Sen, A. K. (1985) *Commodities and Capabilities*, North-Holland, Amsterdam.

Sen, A. K. (1992) *Inequality Reexamined*, Oxford University Press, Oxford.

Sen, A. K. (1999) *Development as Freedom*, Anchor Books, a Division of Random House, Inc., New York.

Sen, A. K. (2004) “Disability and Justice,” *Keynote Speech, Second International Disability Conference*. World Bank, Washington.

Shorrocks, A. (2004) “Inequality and Welfare Evaluation of Heterogeneous Income Distributions,” *Journal of Economic Inequality*, 2, pp. 193–218.

Yoshihara, N. (2004) “Amartya Sen and Social Choice Theory,” in Esho, H. and K. Yamazaki (ed.) *The World of Amartya Sen—A Bridge between Economics and Development Studies—*, Koyo Shobo, Kyoto, Ch.2, pp. 51–82 (in Japanese).