No.76

Additivity, Bounds, and Continuity in Budget Distribution Problem

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December 2001

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January 2001

Summary

In this paper, we consider the budget distribution problems defined by Herrero et al. [1999]. We provide axiomatic characterizations of the rights-weighted solution, introduced by Bergantiños and Mendez-Naya [1999], and pseudo rights-weighted solution both of which are generalizations of the right-egalitarian solution due to Herrero et al.. The functional equation approach produces sharper results with simpler proofs.

Key words: Budget distribution problem; rights-egalitarian solution, rights-weighted solution, pseudo rights-weighted solution, additivity,

JEL Classification: C71, C74

1. Introduction

Herrero, Maschler, and Villar [1999, HMV] formulated a general notion of budget distribution problems.[2] A budget distribution problem deals with a situation that there is a budget to be distributed among a group of agents, each of whom has monetary claims. A distinguishing feature of the problem is this. The budget can be positive or negative, a claim can be negative, and the budget may be larger or smaller than the sum of the claims. Hence, the whole class of budget distribution problems is large enough to include the class of bankruptcy problems (O´Neill [1982] and Aumann and Maschler [1985]) and that of surplus sharing (Moulin [1987] and Chun [1988]). HMV proposed a solution, the rights-egalitarian solution, which determines the solution outcome of each budget distribution problem in two steps. First, give each agent what she claims. Second, split the net surplus (the budget minus the sum of the claims) equally among the agents. HMV provided axiomatic characterizations of the rights-egalitarian solution on the class of all budget distribution problems.

As the terminology suggests, the rights-egalitarian solution satisfies symmetry, the requirement that two agents with the equal claims should receive equal amount. Hence, the solution may be appropriate in contexts where no a priori discrimination

[1] I am grateful to Lionel W. McKenzie and William Thomson for helpful comments and encouragement. I also thank Lars Ehlers, Biung-Ghi Ju, Hyungjun Kim and Chun-Hsien Yeh for discussions and suggestions. The usual disclaimer applies. Correspondence: Tomoichi Shinotsuka, 3-5-21, Midori, Otaru, Hokkaido 047-8501 Japan. e-mail: shino@res.otaru-uc.ac.jp

[2] In the terminology coined by HMV, a distribution problem defined here is called an allocation problem. We have changed the terminology since resource allocation problems in economics typically involve the distribution of many goods and services while the problems here deal with the distribution of a single good.

allowed . On the other hand, there are situations in which discrimination among agents may be necessary (Moulin [2000, p.645]). Hence, axiomatic studies of budget distribution problems without requiring symmetry are of some importance. From this perspective, a generalization of the rights-egalitarian solution by Bergantiños and Mendez-Naya [1999, BM] is interesting. BM proposed the rights-weighted solution by introducing agents´ exogenous shares of net surplus. BM showed that the rights-weighted solution on the class of all budget distribution problems is the unique solution satisfying full additivity and maximum and minimum aspiration (MMA). Full additivity says that agents receive the same amount whether the solution is applied to two budget distribution problems separately, or whether the solution is applied to the sum of the problems. MMA is composed of two parts. First, each agent should receive at least as much as she claims when there is more than enough, i. e. the budget is (weakly) larger than the sum of the claims. We call this requirement claim lower bound (CLB). Second, every agent should not receive more than his claim when there is not enough, i.e. the budget is (weakly) smaller than the sum of the claims. We call this requirement claim upper bound (CUB).

In this note, we provide further results on the rights-egalitarian solution and its weighted generalizations.. First, we show that the rights-weighted solution on the class of all budget distribution problems is the unique solution satisfying full additivity and either one of CLB and CUB. Clearly, this result is sharper than that of BM. Second, we investigate how tight this axiomatization is by replacing the bounds axiom with compatibility, a slightly weaker axiom used extensively by HMV. We find out that this weakening leads to a failure of the characterization result. Third, we also show that replacing the bounds axiom with continuity delivers an axiomatization of the pseudo rights-weighted solution, a further generalization of the rights-weighted solution. Fourth, we also consider smaller domains such as the class of surplus sharing problems and that of bankruptcy problems.

2. Notation and definitions

Let N be a finite set of agents. The set N is fixed throughout this note. For simplicity, let N = $\{1,...,n\}$. We call a pair (B, **c**) a **budget distribution problem** if (B, **c**) $\in \mathbb{R} \times \mathbb{R}^N$. We call B and **c** the **budget** and **claims vector**, respectively. Henceforth, we use boldface to denote vectors in $\mathbb{R}^N$. A budget describes a given amount of money to be allocated among the agents. Let $\mathcal{A}$ be the set of all budget distribution problems. If a budget distribution problem (B, **c**) satisfies (B, **c**) $\in \mathbb{R}_+ \times \mathbb{R}^N_+$ and $B \leq \sum_{i\in N} c_i$, we call it a **bankruptcy problem**. Let $\mathcal{B}$ be the set of all bankruptcy problems. If a budget distribution problem (B, **c**) satisfies (B, **c**)$\in \mathbb{R}_+ \times \mathbb{R}^N_+$ and $B \geq \sum_{i\in N} c_i$, we call it a **surplus-sharing problem**. Let $\mathcal{S}$ be the set of all surplus sharing problems. Let $\mathcal{D} \subset \mathcal{A}$. A solution on $\mathcal{D}$ is a map F : $\mathcal{D} \longrightarrow \mathbb{R}^N$ such that for all (B , **c**) $\in \mathcal{D}$, budget balancedness holds, i.e. B $=\sum_{i\in N}$ F_i(B , **c**) , where F(B, **c**) = (F_1(B , **c**),..., F_n(B , **c**)). The **rights-egalitarian solution** selects for all (B , **c**) $\in \mathcal{D}$ and for all j $\in$N, $(B - \sum_{i\in N} c_i)/n + c_j$. This solution was introduced by HMV.

A solution F on $\mathcal{D}$ is called a **rights-weighted solution** if there exists $\boldsymbol{\lambda} = (\lambda_i)_{i\in N} \in \mathbb{R}^N_+$ with $\sum_{i\in N} \lambda_i = 1$ such that for all (B, **c**) $\in \mathcal{D}$, F(B, **c**) = (B $- \sum_{i\in N} c_i)\boldsymbol{\lambda} +$ **c** . This solution was introduced by BM. The number λ_i is agent i ´s share of net surplus. If we do not insist on nonnegativity of weights, we obtain the following solution. A solution F on $\mathcal{D}$ is called a **pseudo rights-weighted**

solution if there exists $\boldsymbol{\lambda} = (\lambda_i)_{i\in N} \in \mathbb{R}^N$ with $\sum_{i\in N} \lambda_i = 1$ such that for all (B, **c**) $\in \mathcal{D}$, F(B, **c**) = (B $- \sum_{i\in N} c_i)\boldsymbol{\lambda} +$ **c** . Clearly, a rights-weighted solution is a pseudo rights-weighted solution but the converse does not always hold.

In this paper, we discuss the following axioms.

Full Additivity (FAD): For all (B, **c**) , (B´, **c**´) $\in \mathcal{D}$, if (B + B´, **c** + **c**´) $\in \mathcal{D}$, then
F(B + B´´, **c** + **c**´´) = F(B , **c**)+ F(B´ , **c**´).
Partial Additivity (PAD): For all B, B´$\in \mathbb{R}$, if (B, **0**) $\in \mathcal{D}$, (B´, **0**) $\in \mathcal{D}$, and (B + B´, **0**) $\in \mathcal{D}$, then
F(B + B´, **0**) = F(B , **0**)+ F(B´ , **0**).
Responsibility (RES): For all (B, **c**)$\in \mathcal{D}$, and all i $\in$N,
F(B, **c**) = $(0,\bullet\cdots,0 , c_i, 0,\cdots,0) +$ F(B $- c_i$, $(\mathbf{c}_{-i}, 0)$).

Compatibility (COM): For all (B, **c**) $\in \mathcal{D}$,
B $= \sum_{i\in N} c_i$ implies F(B, **c**) = **c**.

Claim lower bound (CLB): For all (B, **c**) $\in \mathcal{D}$,
B $\geq \sum_{i\in N} c_i$ implies F(B, **c**) $\geq$**c**.

Claim upper bound (CUB): For all (B, **c**) $\in \mathcal{D}$,
B $\leq \sum_{i\in N} c_i$ implies F(B, **c**) $\leq$**c**.

Maximum and minimum aspiration (MMA): Both CLB and CUB hold.

Continuity (CONT): For all **c**$\in \mathbb{R}^N$ with (B´, **c**) $\in \mathcal{D}$ for some B´,
B $\mapsto$F(B, **c**) is continuous at some $B_0 \in \mathbb{R}$.

Symmetry (SYM): For all (B, **c**) $\in \mathcal{D}$, and all i, j $\in$ N,
$c_i = c_j$ implies F_i(B, **c**) = F_j(B, **c**).

If a solution satisfies FAD, then agents are indifferent between solving two problems separately and solving the sum of the problems. Clearly, a similar interpretation is applicable to PAD. BM introduced FAD in discussing budget distribution problems. Moulin (1987) and Chun (1988) introduced additivity with respect to budget given an arbitrary claim vector in discussing surplus sharing problems. PAD is an adaptation of that axiom in the context of budget distribution problems. The axiom RES says that each agent is indifferent between solving a problem directly, and receiving her claims and then solving the problem with her claims deleted. The axiom COM requires that all agents should receive their claims if the sum of the claims is equal to the budget. HMV introduced RES and COM (along with other axioms). As HMV put it, COM is a fundamental property of social justice. In fact, HMV used COM to deliver axiomatic characterizations of the rights-egalitarian solution. It is easy to see that FAD and COM together imply RES. In an earlier draft, HMV discussed MMA. BM used this axiom for the axiomatizations of the rights-weighted solution and the rights-egalitarian solution. Clearly, MMA implies CLB and CUB. Either CLB or CUB implies COM. The converse does not hold. For this point, see example 1 in the next section.

3. Results

BM proved the following result.

Proposition 1(BM): A solution on $\mathcal{A}$ satisfies FAD and MMA if and only if it is a rights-weighted solution.

We prove a sharper result. Our proof is based on the functional equation approach and shorter than that of BM´s.

Proposition2: A solution F on $\mathcal{A}$ satisfies FAD and at least one of CLB and CUB if and only if it is a rights-weighted solution.

Proof. It is easy to prove that a rights-weighted solution on $\mathcal{A}$ satisfies FAD and both CLB and CUB. Conversely, let F be a solution on $\mathcal{A}$ satisfying FAD and at least one of CLB and CUB. First, by FAD, F(B, $\mathbf{c}$) = F(B $-\sum_{i\in N} c_i$, $\mathbf{0}$) + F($\sum_{i\in N} c_i$, $\mathbf{c}$). Let ϕ_i(x) = F_i (x, $\mathbf{0}$), where i $\in$N. Clearly, ϕ_i(x + y) = ϕ_i(x) + ϕ_i(y) for all x, y$\in$ $\mathbf{R}$. If CLB holds, ϕ_i(x) $\geq$0 for all x $\geq$0. If CUB holds, ϕ_i(x)$\leq$0 for all x $\leq$ 0. Therefore, by a well-known result in functional equation (see Eichorn [1978, Corollary 1.2.10], for example), there exists λ_i such that ϕ_i(x) = λ_ix for all x $\in \mathbb{R}$. If CLB holds, $\lambda_i = \phi_i(1) \geq 0$. If CUB holds, $\lambda_i = -\phi_i(-1) \geq 0$. Thus, $\lambda_i \geq$ 0.

Let $\boldsymbol{\lambda} = (\lambda_1,...,\lambda_n)$ and let $\beta(\mathbf{c}) = (\beta_1(\mathbf{c}),...,\beta_n(\mathbf{c}))$ = F($\sum_{i\in N} c_i$, $\mathbf{c}$) - $\mathbf{c}$. Then F(B, $\mathbf{c}$) = (B -$\sum_{i\in N} c_i)\boldsymbol{\lambda}$ + $\mathbf{c}$ +$\beta(\mathbf{c})$ for all (B, $\mathbf{c}$) $\in \mathcal{A}$. Note that if CLB holds, $\lambda_i \geq 0$, $\beta(\mathbf{c}) \geq 0$, and $\sum_{i\in N}\lambda_i = \sum_{i\in N} F_i(1,0) = 1$. If CUB holds, $\lambda_i \geq 0$, $\beta(\mathbf{c}) \leq 0$, and$\sum_{i\in N}\lambda_i = \sum_{i\in N} -\phi_i(-1) = \sum_{i\in N} -F_i(-1,0) = 1$.

Finally, $\sum_{i\in N}\beta_i(\mathbf{c}) = \sum_{i\in N} F_i(\sum_{i\in N} c_i,\mathbf{c}) - \sum_{i\in N} c_i. = \sum_{i\in N} c_i - \sum_{i\in N} c_i. =$ 0. Hence $\beta(\mathbf{c}) = 0$ if at least one of CLB and CUB holds. ■

What happens if we replace either one of CLB and CUB by a strictly weaker, still fundamental axiom, COM, in Proposition 2? To answer this question, we start with the following example.

Example: By a classical result due to Hamel [1905], there exists a discontinuous function f:$\mathbb{R} \to \mathbb{R}$ satisfying f(x + y) = f(x) + f(y) for all x, y $\in \mathbb{R}$. Then, by a well-known result (see Eichorn [1978, Theorem 1.2.9], for example), the graph {(x, y) | x $\in \mathbb{R}$, y = f(x)} is dense in $\mathbb{R}^2$. Define the function F on $\mathcal{A}$ by F_j(B, $\mathbf{c}$) = f(B $-\sum_{i\in N} c_i$) + c_j, for every j = 1,..., n - 1, F_n(B, $\mathbf{c}$) = $-$(n $-$ 1)f(B $-\sum_{i\in N} c_i$) + c_n +B $-\sum_{i\in N} c_i$. It is easy to check that F satisfies FAD. Since f (0) = 0, F satisfies COM. We show that F violates both CLB and CUB. Since the graph of f is dense in $\mathbb{R}^2$, there exist x > 0 and y < 0 such that f(x) < 0 and f(y) > 0. Let (B, $\mathbf{c}$) and (B´, $\mathbf{c}$´) be such that B - $\sum_{i\in N} c_i$ = x and B´ $-\sum_{i\in N} c_i$ ´= y. Then, B $-\sum_{i\in N} c_i > 0$ but F_j(B, $\mathbf{c}$) = f(B $-\sum_{i\in N} c_i$) + c_j< c_j. Also B´ $-\sum_{i\in N} c_i$ ´ < 0 but F_j(B, $\mathbf{c}$) = f(B´ $-\sum_{i\in N} c_i$ ´)+ c_j> c_j. Thus, there exists a non-linear solution that satisfies FAD and COM.

There are distinct features of the solution in Example 1. First, the solution is discontinuous everywhere. Second, it violates SYM. These observations naturally lead us to the following questions. What happens if we require CONT in addition to

FAD and COM? What happens if we require SYM in addition to FAD and COM? We answer these questions in the following two propositions.

Proposition 3: A solution on $\mathcal{A}$ satisfies FAD , COM, and CONT if and only if it is a pseudo rights-weighted solution.

Proof: It is easy to see that a pseudo rights-weighted solution on $\mathcal{A}$ satisfies FAD , COM, and CONT. To prove the converse, let F be a solution on $\mathcal{A}$ satisfying FAD, COM, and CONT. Define the functions $\phi_i(\cdot)$ and $\beta(\cdot)$ as in the proof of Proposition 2. By CONT, the function $\phi_i(\cdot)$ is bounded on some non-degenerate interval. Thus, again by the well-known result that we cited in the proof of proposition 2, there exists λ_i such that $\phi_i(x) = \lambda_i x$ for all x$\in \mathbb{R}$. However, we can no longer conclude that $\boldsymbol{\lambda}$ is nonnegative. But, thanks to COM, we still have $\sum_{i\in N} \beta_i(\mathbf{c}) = \sum_{i\in N} F_i(\sum_{i\in N} c_i, \mathbf{c}) - \sum_{i\in N} c_i. = \sum_{i\in N} c_i - \sum_{i\in N} c_i. = 0.$■

Proposition 4: A solution on $\mathcal{A}$ satisfies FAD, COM, and SYM if and only if F is the rights-egalitarian solution.

Proof: It is clear that the rights-egalitarian solution on $\mathcal{A}$ satisfies FAD, COM, and SYM. Conversely, let F be a solution on $\mathcal{A}$ satisfying FAD, COM, and SYM. First, by FAD, F(B, $\mathbf{c}$) = F(B $-\sum_{i\in N} c_i$, $\mathbf{0}$) + F($\sum_{i\in N} c_i$, $\mathbf{c}$). By SYM , F_j(B $-\sum_{i\in N} c_i$, $\mathbf{0}$) =(B $- \sum_{i\in N} c_i$)/n for all j $\in N$.
By COM, F($\sum_{i\in N} c_i$, $\mathbf{c}$) = $\mathbf{c}$. ■

Remark: Proposition 4 looks very similar to Proposition 2 in HMV. In Proposition 4, FAD takes the place of composition in Proposition 2 in HMV.

Corollary(BM): A solution on $\mathcal{A}$ satisfies FAD, MMA, and SYM if and only if F is the rights-egalitarian solution.

Proof: Since MMA implies COM, the conclusion immediately follows from Proposition 4. ■

The functional equation approach easily handles restricted domains such as $\mathcal{S}$ and $\mathcal{B}$.

Proposition 5: A solution on $\mathcal{S}$ satisfies FAD and CLB (resp. FAD and CONT) if and only if it is a rights-weighted solution (resp. a pseudo rights-weighted solution).

Proof: It is clear that a rights-weighted solution (resp. a pseudo rights-weighted solution) on $\mathcal{S}$ satisfies FAD and CLB (resp. FAD and CONT). To prove the converse, let F be a solution on $\mathcal{S}$ satisfying FAD and CLB (resp. FAD and CONT). Define the functions $\phi_i(\cdot)$ and $\beta(\cdot)$ as in the proof of Proposition 2. Then, $\phi_i(x + y) = \phi_i(x) + \phi_i(y)$ for all x, y$\geq$0. If CLB holds, $\phi_i(x) \geq 0$ for all x $\geq$0. If CONT holds, $\phi_i(x)$ is continuous at some x$\geq$0. By a well-known result in functional equations (see Eichorn [1978, Corollary 1.3.7], for example), there exists λ_i such that $\phi_i(x) = \lambda_i x$ for all x $\geq$0. The rest of the proof is almost identical to that of Proposition 2 and we omit it. ■

Proposition 6: A solution on $\mathcal{B}$ satisfies FAD and CUB (resp. FAD and CONT) if and only if it is a rights-weighted solution (resp. a pseudo rights-weighted solution).

Proof: Since the proof is very similar to that of Proposition 5, we omit it. ■

Now we restate Propositions 2, 3,5, and 6 by replacing FAD with PAD and RES.

Proposition 7: A solution on $\mathcal{A}$ satisfies PAD, RES, and at least one of CUB and CLB (resp. PAD, RES, and CONT) if and only if it is a rights-weighted solution (resp. a pseudo rights-weighted solution).

Proof: It is clear that a rights-weighted solution (resp. a pseudo rights-weighted solution) on $\mathcal{A}$ satisfies PAD, RES, CUB and CLB (resp. PAD, RES, and CONT). To prove the converse, let F be a solution on $\mathcal{A}$ satisfying PAD, RES, and at least one of CUB and CLB (resp. PAD, RES, and CONT). By RES, $F(B, \mathbf{c}) = \mathbf{c} + F(B - \sum_{i \in N} c_i, \mathbf{0})$. For each $i \in N$, let $\phi_i(x) = F_i(x, \mathbf{0})$. The rest of the proof is the same as that of Proposition 2. ■

Proposition 8: A solution on $\mathcal{S}$ (resp. a solution on $\mathcal{B}$) satisfies PAD, RES and CLB (resp. PAD, RES and CUB) if and only if it is a rights-weighted solution.

Proof: Since the proof is very similar to that of Proposition 7, we omit it. ■

References

Aumann R., Maschler, M.,1985. Game theoretic analysis of a bankruptcy problem from the Talmud. Journal of Economic Theory 36,
195-213.

Bergantiños G and Mendez-Naya L., 1999. The additivity property in allocation problems, Universidade de Vigo, mimeo.

Chun, Y., 1988. The proportional solution for rights problems. Mathematical Social Sciences 22, 151-246.

Eichorn W., 1978. Functional equations in economics (Addison-Wesley Publishing Company, Inc).

Hamel G, 1905. Eine Basis aller Zahlen und die unstetigen Lsungen der Functionalgleichung: $f(x+y) = f(x) + f(y)$. Mathematische Annalen 60, 459-462.

Herrero C, Maschler, and A Villar, 1999. Individual rights and collective responsibility: the rights-egalitarian solution. Mathematical Social
Sciences 37:59-77.

Moulin, H., 1987. Equal or proportional division of a surplus, and other methods. International Journal of Game Theory 16 (3), 161-186.

Moulin, H. 2000. Priority rules and other asymmetric rationing methods. Econometrica 68 (3), 643-684.

O´Neill B. A problem of rights arbitration from the Talmud. Mathematical Social Sciences 2 (4), 345-371.

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