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Social Choice, Health and Fairness

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Social Choice,
Health and Fairness

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September 2002

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Abstract

The main conceptual framework of classical social choice places preference conflicts between agents centre-stage. This paper develops the case for a second conception of social choice where entitlements are established through the integration of different, primitive classes of claim and supports the thesis with an examination of its application to health-care rationing. It begins by arguing that the axiomatic characterisation of dictatorship and its association with unfairness are both flawed. The paper then proposes that fair social choices integrate different types of claims and shows how non-linear programming can provide an optimisation framework for doing this. Four claims types are identified as particularly significant: consequences, de-ontological claims such as rights, contracts including social contracts and political mandates, and beliefs about procedural fairness. It is then shown how the existence of these claims helps make sense of objections to QALY maximisation, a hitherto predominant social welfare function in health economics. Throughout the paper, the emphasis is on the nature of theory required to structure empirical social choice whilst capturing, formally, ethical objections to a widely used social choice procedure.

Keywords: non-linear programming, fairness, QALY maximisation, empirical social choice

JEL Codes: D600, D630, H420, I100

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1   Introduction

Social choice and welfare economics view societal decision problems as conflicts between agents' preferences. The extent to which a pair of relatively simple but profound results (Arrow (1963) and Sen (1970)) have influenced thinking in political science and philosophy, as well as in economic theory, is a testament both to the fruitfulness of this perspective and to the intellectual stature of its developers. Notwithstanding the fact that these conflicts are often formidable, the restriction of theory to conflicts only between preferences finesses the possibility of modelling a wide class of social choice problems, not to mention the methods by which they are resolved.

Conflicts associated with health-care rationing illustrate the point. Health economists have argued for QALY maximisation as the appropriate version of welfare economics for health-care rationing and their arguments are increasingly influential with policy-makers. The idea behind this social welfare function is the desire to prioritise medical interventions according to the additional life expectancy, adjusted for quality, generated by those interventions.[2] Yet, as a policy experiment in the USA (Oregon State) shows, members of the public appear not to be persuaded by the claim that only QALY maximisation should ground their social choices in the health arena, Gould (1996). Nor are the citizens of Oregon alone. Evidence from voter surveys indicates that QALY maximisation is no more popular in other countries (for example, UK – Charney et al (1989), Dolan and Cookson (2000), Anand and Wailoo (2000); Australia – Nord et al (1995a and 1995b); Sweden – Johannesson and Johansson (1997) – to name but three). The message from many empirical investigations, as well as the corresponding literatures in economics and philosophy seems to be, not that preferences can be ignored, but rather that other sources of claim matter too.[3]

This paper develops the view that it makes sense to think of social choice as the integration of different types of claims. By making sense, I just mean that there is (a) a normative rationale for such a framework and (b) an accompanying formalisation. The position provides a contrast to the view that social choice is just about the aggregation of preferences, though it is capable of seeing preference aggregation as a special case. Preference aggregation may be all that is required in group choices that we come across everyday, for instance the choice of a family holiday location or the decision to pick a colour for a local community's football team. However, where formal politics, organisational rules or legal procedures provide a context in which decisions are made, what individuals happen to feel about an event (or how they would actually chose if the choice was theirs to make) is usually only one determinant of the social choice.

The approach developed in the paper contributes to our growing understanding of the role of fairness in economic analysis and activity (see for example particularly influential work by Kahneman et al (1986), Guth and Tietz (1990) and Rabin (1993)). In the Arrowvian framework, fairness is reflected in the non-dictatorship axiom, an assumption that tries to formalize the desire to

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[2] The units in which this variable is measured are QALYs. QALY maximisation is sometimes equated to health maximisation.

[3] Implicitly, this follows the argument in McGuire (1986) who, like others, argues that medical ethics should not be entirely individualistic.

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prevent giving one agent's preferences undue weight.[4] Fairness in the framework of this paper, by contrast, requires that non-preference claims are recognized and accorded due weight by the social choice procedure.

For reasons that I, and others working on foundations of decision theory have discussed extensively elsewhere, the approach taken here is to ask what concepts and techniques are needed to capture violations of conventional approaches to social choice.[5][6] Section 2 discusses the conception of social choice as preference aggregation, the problems of formulating unfairness, and Sen's contributions to, and criticisms of, that framework. Section 3 then explores the ability of non-linear programming to deal with some of informational deficiencies in the preference aggregation approach by supporting the integration of different types of claims in which preference is but one. In section 4, I show how the programming approach might be applied and indicate, at the same time, how it can deal with features of QALY maximisation that many find unacceptable.[7] Section 5 makes some further remarks on the formulation of social choice incorporating rights and consequences and reports evidence supporting a preference for equal rights over health gain maximisation. Section 6 summarizes and concludes.

2   Arrow, Sen and Fairness in Preference Aggregation

The contributions that Kenneth Arrow and Amartya Sen have made to social choice and welfare economics have been recognized, also, as major intellectual contributions to a range of other fields,

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[4] It is well understood that Pareto optimality, desirable as it may be under some situations, is not capable of handling inequitable improvements to utility. See also Kelsey (1988).

[5] Specifically, the approach taken here is not axiomatic though axiomatisations shed light on issues involved. What is, or should now be, clear is that axiomatic systems in economics do not to support unconditionally normative interpretations. The sea-change in axiom interpretation is well illustrated by the way in which many decision theorists no longer argue that rational preferences must satisfy transitivity or independence and therefore expected utility (see Anand (1987,1993a), Cubitt and Sugden (2001), Kelsey (1994), Fishburn (1999), McClennen (1987), Machina (1989), Sugden (1985)). These developments in decision theory can also be seen as a rejection of consequentialism.

[6] One of the curious features of social choice and welfare is that the informational bases of practice and theory are quite different. Theory has argued in the past that preferences are ordinal and that interpersonal comparisons of utility are illegitimate. Practice, especially in health and environmental economics has assumed that the values of health and life are cardinally measurable and interpersonally comparable. These differences have been so persistent that one can only infer that these assumptions serve to address different questions, or that they address the same questions under dissimilar constraints. For the most part, this paper concentrates on issues that are relevant both to empirical work and theory. Implicitly, I am suggesting that literatures based on axiomatic results may require additional kinds of theory to structure empirical work.

[7] It has been argued that Disability Adjusted Life Years (DALYs) represent an improvement over QALYs. However, this article takes a view similar to that found in Anand and Hanson (1998) in which the authors show that DALYs technically confound issues that are conceptually distinct. The point these authors make is important not least of all because those working on the interface between theory and policy analysis often attempt this elision. Daly and Cobb's (1994) work on 'green' national accounts, which attempts to embed a measure of inequality into the measure of wellbeing, is another example of a practical attempt to compound diverse issues into a single statistic.

particularly politics, philosophy and development. It is surprising, therefore, the degree to which researchers still differ in their readings of the nature, scope and limits of the respective contributions made. This section provides a reading that prepares ground for the technical discussion in section 3 by highlighting some crucial interpretative points about the conventional characterisation of fairness.

Arrow's theorem (1963) is usually described as showing that it is impossible to find a social welfare function that satisfies four conditions: Pareto optimality, unrestricted domain, independence of irrelevant alternatives and non-dictatorship. I say 'usually' because this description derives from a version due to Blau (1957) that corrects an error in the original, Arrow (1951), drops a non-imposition condition, and directs attention to the impossibility interpretation that was widely adopted. The theorem has been described as a paradox and rightly so because it raises questions not only about how the contradiction might be avoided, but also about what it means. I shall say more about meaning in due course. Whatever it means, it seems reasonable to think that the result is rather powerful because the conception of fairness it imposes on a social choice appears to be minimal.

Arrow (1979) himself thought that the independence of irrelevant alternatives requirement might be dropped because new options often provide information about existing options. In practical social choice problems, the observation is surely correct because information is typically incomplete. However, where options do satisfy Savage's (1954) 'materially-complete descriptions requirement', the paradox remains. This paper takes the view that the formulation of the dictatorship axiom combined with the exclusively preference based framework lies at the heart of the problem.

To see this, note that Arrow-Blau dictatorship holds if:

$$\exists i, \text{ s.t.} \forall a \wedge b : P_i ab \rightarrow Sab \qquad (1)$$

where i is an agent, Pi is the ith agent's preference relation and S the social ordering. In other words, the dictator's preference determines the social choice. Dictatorships might be efficient in some cases but rarely could it be argued they were fair too. However, the question here is what has (1) to do with dictatorship? On reflection, the relation seems weak as (1) appears to be neither a necessary nor a sufficient condition. Agents need not get their way on every occasion to be dictatorial. The dictator's threat is one of duress or disproportionate influence, so an agent might fail to get their way on all occasions and still have prevailed too much indicating that (1) is too strong to be a necessary condition for dictatorship. To see that it is not sufficient either, note that (1) implies the equation $p(Sab/P_i ab) = 1$ holds for all a and b. Statistically, co-relations are not causes. The axiom might be satisfied for some, possibly benign, reason other than the existence of a dictator. There could be an agent whose preferences happened to coincide with all social choices. This agent might be lucky or they might be the average woman in the street (a similar point is made by Tanguiane (1994) in his use of a representative agent). Moreover, luck and averageness become more plausible as the ratio of options to agents declines. If the electorate is large or if the number of options is small (because they are coarsely described or are the results of competitive processes involving coalitions), it is likely that many agents would make (1) true. Indeed, if all agents made (1) true, this could be a utopian outcome as Arrow (1963) himself recognizes. In short, even if social

choice were just about the aggregation of preference, we could not, in general, rely on the dictatorship axiom to characterize either necessary or sufficient aspects of unfairness.

Sen's developments of this debate are crucial.[8] Sen (1970) shows that an impossibility can be established using only three assumptions (Pareto Optimality, Unrestricted Domain and a condition known as Minimal Liberalism) together with a social choice rule that does not have to satisfy transitivity. This version gives rise to three points that merit mention here. First, discussions in decision theory, to which this paper has already referred, suggest that being able to drop transitivity and independence might be highly desirable from a normative perspective. Second, Sen's proof is simpler and in pure mathematics that is taken to be a significant gain: one might add that this later version appears to show more transparently what is going on and why. Third, and most importantly, from a foundational perspective, we are offered an interpretation which is not in need of resolution but is consistent with concerns about a deep economic problem. The conclusion Sen draws from the inconsistency result is that a conflict exists between freedom of choice, as reflected by minimal liberalism on the one hand, and efficiency, in the economic sense described by Pareto on the other. Efficiency and freedom are central to economics and the fact that they often conflict implies that economic systems are forced to make trade-offs between fundamental values. Freedom of choice, ideologists claim, delivers economic efficiency but Sen's result provides a model in which this is clearly not the case. Instead of concluding that capitalist democracy is a logical unicorn (as the post Blau interpretation has it), the impossibility of being a Paretian liberal suggests that societies have to balance giving people what they want against giving them choice.

Subsequently, Sen (1979, 1981, 1985) develops his analysis of the relations between freedom and efficiency by noting that preference aggregation has an inadequate information base. It cannot cope with problems of freedom because there is no recognition of claims like rights. A further contribution is made in pointing out that there are interaction terms between de-ontological claims and consequentialist ones. This interaction gives rise to the idea of a capability, the right to do or choose something and Sen suggests that valuable capabilities should lie at the heart of welfare analysis. Although I believe the capability concept is central to social choice, I want to explore a line of thought that arises following the introduction of rights into social choice but precedes the development of the capability concept. The issue is not a complicated one, but important nonetheless: if welfare economics has a deficient informational basis, then why only add in information on rights?

A list of claims that we might recognize could be long and descriptive. However, general philosophical considerations as well as specific policy debates suggest an intermediate position, one in which there are two classes of claim additional to consequences and rights. First, we might be concerned about claims on resources that are essentially contingent and contractual. There may be an explicit social contract between a population and its political representatives that commits the state, or there could be a contract that binds commercial organisations to deliver certain services. Second, there may be views about procedural fairness that influence, implicitly or otherwise, the weight assigned to different claims types and/or their sources. Legal systems provide an example, par excellence, in which conflict and uncertainty have driven the evolution of deep understandings

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[8] Opinions vary considerably - the perspective of this paper is primarily foundational.

about due process that are embodied in institutional life. If we add contractual and procedural considerations to consequentialist and rights based considerations, then we have an intermediate point between reducing everything to preference on the one hand, and producing a long redescription of reality on the other. In many cases, fairness demands that all of these building blocks are acknowledged and given due weight (a point to which I shall return in section 4), something that can be done using non-linear programming as the next sections shows.

3 Integration of Claims in a Non-Linear Programming Model

From work of Sen (1979) and others, particularly Suzumura and Xu (2000), it is known that use of cardinal information is essential to model (distributive) fairness in social choice. The need therefore, as Jorgenson (1997) suggests, is to investigate the practicalities of how this might be done. For many purposes, it seems reasonable to suggest that the social decision problem can be approximated by a non-linear programming problem of the following general form[9]:

$$\text{Max SW}(r, cq, ct, p) \quad (2)$$
$$\text{s.t.} \sum c \leq c^{\max}$$

where SW is a social welfare function dependent on rights that are met, r, consequences, cq, contractual claims, ct, and the decision procedure, p. The cost of delivering all services, $\sum c$, is constrained to be within budget, $c^{\max}$ and non-linearities may appear in the maximand, constraint, or both, depending on the conception of social welfare being pursued.

The traditional approach is different. Usually arguments of social welfare functions are the utilities of each individual in society in line with utilitarianism. If the value of consequences was measured in utilities, then (2) would be a generalisation of utilitarianism. The view that utilitarianism fails because it ignores rights has led to much debate involving economists and philosophers on how rights should be formulated.[10] Recent literature concentrates on formalisation within game theory but here I am interested only in showing that non-consequentialist claims can be formalized within a social welfare function framework. The issue has been discussed by Nozick (1974) who proposes that rights are inviolable[11] and that they should, therefore, be regarded as side-constraints though he mentions the alternative Nozick (op cit p29-30):

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[9] The use of general programming in economics has a long tradition, as use by Takayama (1985) to prove basic results in general equilibrium theory, illustrates but the author is not aware of any application to empirical social choice. The application to health is also discussed in Williams and Cookson (2000).

[10] See, for example, Gardenfors (1981), Gaertner et al (1992), Sen (1995) and Fleurbaey and Gaertner (1996).

[11] Legal theorist, Ronald Dworkin (1977) makes a similar point in *Taking Rights Seriously* - 'rights are trumps' though the motivation is rather different.

> The issue of whether a side-constraint view can be put in the form of the goal-without-side-constraint view is a tricky one… A careful statement delimiting "constraint views" would exclude these gimmicky ways of transforming side constraints into the form of an end-state view…

Mathematical issues aside, it seems that rights can be reflected in the maximand for a variety of reasons.[12] For example, the state might be concerned to ensure that everyone's rights to a minimum level of primary goods, or capabilities, or opportunities (to use concepts advocated by Rawls, Sen, and Roemer respectively). The social choice rule might be formulated as a variant of $Min \, \Sigma c_j \, st \, r_i^{min} \, \forall i$ where the state minimizes the total cost of j programs that deliver minimum rights entitlements to i citizens. This rule is an example of the side-constraint position to which Nozick refers, but if budgets are relatively small, then the solution may be an empty set. This accords with the Kantian position, that there is no right thing to do, though from other perspectives, the state might wish to recognize as many rights claims as possible. In that case, the social choice rule could be a variant of the following: $Max \, \# \left\{ i : r_i \geq r^{min} \right\} st \, \Sigma \, c_j \leq c^{max}$.13.[13] So it would seem, that the question of formulation depends not just on our conception of rights but also on how we want them to be reflected in the social choice procedure. Furthermore, and as Fleurbaey and Gaertner (1996) point out, there is an important distinction between outcome rights and process rights. A hospital might be concerned both that people are satisfied with the treatment they actually get (outcome) and that people in a locality have ready access to its emergency facilities (process). Its choice rule might be a variant of $Min \, f\left(\hat{t}, \# \left\{ i \in P : u_i \leq s^{min} \right\} \right)$ where $\hat{t}$ is an estimated waiting time, say, P the population of patients treated, u_i is the utility of the ith patient and s^{min} is a minimum level of patient satisfaction. So it would seem that both process and outcome rights might be reflected in the maximand.

In many countries there is a growing awareness of the role that public deliberation can, and should, play in the resolution of social choice problems. For example, a survey of Swiss voters by Frey et al (1996), showed that the location of hazardous waste disposal sites by willingness-to-pay measures or minimum reservation prices was less popular than resort to expert opinion, and that all three approaches were dwarfed in popularity by negotiation. Consultation might be thought of as a species of voting in which the aim is to specify a programme j from a set J, such that the votes (v) for it are maximized, $Max \sum_{j} \sum_{i} v$ However, there is a long tradition, following Socrates that does not regard all views as being of equal worth. In some cases, reasons for choices are sufficiently

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[12] The mathematical issue is addressed in a paper by Premoli and Ukovich (1992) who offer an approach that unifies constraint and objective space.

[13] A Kantian perspective might lead one to think that where the budget is low relatively, there is no fair thing to do except, of course, to change the constraint. The problem with such a position is that it will generate only very partial orderings of options: in many substantial social choice problems, rights are at risk. However, the absolutist approach has its uses. If the state treats you unjustly, the cost of this wrong is not just the value of the loss you suffer, but the fact that a rule governing the state's behaviour to all its citizens, has been violated. This perspective provides a reason for valuing the cost of a wrong at more than the actual harm caused.

distasteful that societies find ways of excluding them from consideration. This suggests the need for a multi-attribute elaboration (see for instance von Winterfeldt and Edwards (1986)) in which maximisation takes place on the basis of a set of attributes, A, excluding those attributes regarded unacceptable, U. The social choice rule might then take the form: $Max \sum_j \sum_i \sum_{a \in A \backslash U} o_{j.a}.w_a$, where $o_{j.a}$ is the jth's program score on the ath attribute, given weight, w_a.

All these points serve to underline the fact that although the utilitarian social welfare function has been predominant, there are (many) serious competitors. Maximisation can be interpreted in ways consistent with a much broader moral framework for social choice. The motivation for interpreting it thus is not only conceptual but can be found in the problems that arise when one tries to operationalize utilitarianism as attempted applications to health-care rationing indicate.

4 Integration of Claims vs. Preference Aggregation in Health

Limits of Utilitarian Social Choice in Health-Care Rationing

Compare the general approach of (2) with the social choice rule that has dominated the literatures on health care rationing, QALY maximisation. There are many versions of this rule but one that reflects the application at a macro level is given below:

$$Max \sum_{i=1}^{i=g} \overline{Q_i} \, st \, n_i \geq 0 \, \forall i \, and \, \sum_{i=1}^{i=g} c_i \leq c^{\max} \qquad (3)$$

Here, $\overline{Q_i}$ is the average QALY produced by patients treated in the ith group where there are g groups and n measures the size of the population or relevant group if indexed. Few researchers now think of QALY maximisation as more than a guide to decision-making at the individual level, though it remains a serious contender for social choice questions about funding between treatment categories. It is an example of what philosophers call rule-utilitarianism and a special case of the framework in (2). The former's maximand is univariate and the programming structure is linear, which raises the question as to whether we really need the generalisation implied by (2). A number of economists and many philosophers have argued, implicitly, that we do. The following three problems associated with attempts to apply welfare economics to health add another dimension to the general arguments discussed in social choice and moral philosophy.

Problem 1 arbitrary exclusion.

Where two patients are similar with respect to need and benefit equally in terms of quality of life but differ only by a small degree with respect to age, it is plausible to regard the difference in benefits as arbitrary. Conceivably one might take the view that small differences in expected outcomes are relevant in resource allocation problems like investment appraisal but not when it comes to

establishing entitlements affecting human life directly. In questions of health-care, both the 41 and 42 year old are in equal need and that should determine how they are treated. Where resource constraints are binding, economists have sometimes argued for assigning equal probabilities of treatment (see for instance Peyton-Young (1995)). If both potential patients come from different size groups, we should have to introduce a further non-linear constraint, $n_g / \sum_{i-1}^{i-g} n_g = p \forall g$, reflecting the fact that the probability of being selected for treatment, p, is the same for members of all groups. If people in different groups should be given similar chances of treatment, then the representation of equity as a constraint appears desirable and natural. However, it may be that we are concerned with the promotion of equity but regard the achievement of equal opportunities as an asymptotic goal pursued with the hope, but not the expectation, of exact achievement. In that case, the inclusion of a measure of inequality, such as a Gini coefficient, in the maximand, might be the preferred representation.

Problem 2: irrelevant causes

The assumption of irrelevant alternatives plays a major role in classical social choice but when one looks at foundational debates or empirical evidence, it is the irrelevance of reasons, rather than options, that stands out as being in need of characterisation. For example, suppose there is just one medical condition, M, and that society is divided into four groups where the groups are defined in terms of income and disability.

See Table 1

Assume the QALY gains from treatment are such that a > b > c > d. Then QALY maximisation yields a complete and transitive ranking of groups from which patients will be selected for treatment. From the set of people with M, first we select those who are able bodied and on high incomes, then those who are disabled and on high incomes and so on. Only if the budget is large enough will disabled people on low incomes be treated. It is perfectly possible to accept the general principle of a need for a ranking whilst arguing that differences associated with disability should be discounted. Further, it might be said that higher incomes leading to higher life-expectancies and therefore more QALYs should not give rise to differences in priorities for treatment, especially in public health systems funded from general taxation. Philosophies that encourage us to factor out both sources of QALY difference would have us ignore the contents of Table 1 for priority setting.

Suppose we find some way of normalising all the benefits in Table 1 so that they are equal and call this variable $\tilde{Q}$. We might then pursue the following rule:

$$Max \sum_{i=1}^{i=g} \tilde{Q}_i \ st \ n_i \geq 0 \forall i \ and \ \sum_{i=1}^{i=g} c_i \leq c^{max} \qquad (4)$$

Whilst (4) looks similar to (3) technically, it represents quite a different, and for many, a more acceptable social choice rule. Crucially, it reflects rights to equal priority by normalising the measure of consequence. If we want consequences to be important but need to factor out irrelevant sources of benefit or cost in order to respect rights, then modifying the maximand seems natural, if not

essential. Of course, once we do this, we step outside the boundaries of consequentialism and conventional welfare economics.

Problem 3: wrong kind of equity.

QALY maximisation has been criticized as being ageist. It gives priority to those who produce more QALYs and ceteris paribus, that favours the young; the question remains, is this unfair? Some health economists have suggested that this is precisely the kind of discrimination that we want to make. QALY maximisation gives equal weight to a QALY, wherever it is produced and this is consistent with the view that fairness requires impartiality. QALY maximisation is impartial in the sense that, had one patient been able to produce more QALYs than another, then that patient would have been given priority. However, the fact that you might have been given access to treatment, if you had been someone else, is likely to be of little comfort, given that you are who you are. The counterfactual might be true and yet irrelevant for some purposes of welfare assessment. Furthermore, there is no end to the counterfactuals that one might generate in favour of one's own position.

These problems illustrate three kinds of reasons why QALY maximisation is not regarded, by some, as a fair basis for rationing. These reasons (and many others) have been discussed widely, in various forms, and they are particularly strong in the case of health-care though it is plausible that similar issues arise in the allocation of a wide range of merit goods. However, cardinal measurement and interpersonal comparisons, though difficult, are not ruled out ab initio by advocates of QALY maximisation as they were by the 'new Paretian' theory. If we allow quantitative information and interpersonal comparisons then the application of non-linear programming to more general social choice rules in which the QALY is but one variable is a natural next step.

Programming and the Integration of Claims to Health

To explore the issues that arise when we apply the programming framework to the integration of claims, an example was constructed in which priority setting for 6 possible treatments is analysed (see Table 2).

See Table 2

Initially, two simple rules were compared: QALY maximisation (an example of consequentialism) and a rule that counts the number of patients treated (an example of a measure of rights based social choice procedure). Both rules were applied to the data in Table 2 using a programming routine (MAPLE) for different levels of budgetary expenditure. Each rule was evaluated in terms of its performance according to the proportion of maximum possible QALYs and patients treated with results that are summarized in Table 3.Table 3. Programming Results: Comparison of QALY Maximisation with Rights Maximisation

See Table 3

QALY maximisation and counting patients treated diverge at low levels of expenditure. In the example, between 72.2 percent and 90.6 percent of the maximum possible gains are achieved when 20 percent of the budget required to treat everyone, has been spent. This result is sensitive, of course, to the numbers in the example[14] and its relevance to real rationing problems depends also on the social choice perspective preferred. If one thinks of health in benefit-cost terms, then it is pertinent to note that just over 90 Percent of the maximum possible benefit is obtained for 20 percent of the total possible budget. On the other hand, if one is concerned about minimising rights violations then one might look for a much higher level of 'success' which in turn suggests a much higher level of expenditure is needed. For example, treating 95 percent of patients requires just under 80 percent of the maximum possible budget to spent. In any case, it is somewhat surprising that once 40 percent of the maximum possible budget is spent, QALY maximisation and counting heads perform identically. This shows that despite the completely different foundations on which consequentialism and rights rely, the social choice rules to which they give rise can generate identical resource allocations even at relatively moderate expenditure levels.

So what does happen at lower expenditure levels when rules diverge? A further three social choice welfare functions were constructed to allow further comparisons. Rule 3 was a simple 50:50 compromise between QALY maximisation and counting numbers of patients treated, the sort of rule that one emerge where there is support for both claims types. (Recall that Sen's interpretation of the impossibility of being a Paretian liberal is that we have to trade efficiency and rights off against each other. Rule 3 represents this trade-off in a linear fashion.) Rule 4 represents a modification of this 'compromise' rule in which two constraints have been added: it was assumed that cardiac surgery and hip replacements were maximized as these related to those parts of the population most likely to vote. Rule 4 is a rule that reflects political economy concerns. Finally, Rule 5 is another variant of the basic compromise rule in which it has been assumed that there is a binding social contract to provide older cohorts with health-care (including residential care) throughout the life-course. These rules were then used to generate resource allocations at 20% of the maximal budget.

Table 4 summarizes the results. Rules 1 and 2 correspond to QALY maximisation and head counting as above. Despite the broad similarity in terms of overall outcomes, we can see that there are substantial impacts on the priority given to some treatments. For example, 'cardiac surgery' is dropped in favour of 'neo-natal care' when one shifts from head counting (Rule 2) to QALY maximisation (Rule 1). Rule 3, the compromise between Rules 1 and 2, leads, to the same distribution as Rule 1. Rule 4, designed to attract active voters, by contrast, produces the same results as Rule 2 - the counting heads approach. Rule 5 was intended to show what happens when there is a contractual commitment to a particularly expensive form of treatment: in this case 'residential care' crowds all other interventions out.

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[14] The example is designed to be plausible but no more.

See Table 4

In some cases, then, rights-based and consequentialist approaches arrive at similar allocations. Although there is a relatively small number of general approaches to the ethical foundations of social choice, the number of specific choice rules is boundless. Even from this example, it is apparent that different rules within a moral approach can lead to very different allocations, a point that further underlines the value to philosophy that examining moral codes more quantitatively offers. All of the rules embody fairness though Rules 2 to 5 do so in a non-consequentialist fashion.

5 Further Remarks

It might be asked whether these concerns are empirically significant.[15] One piece of evidence that indicates a positive answer to this question derives from a questionnaire concerning priority setting. [16] In a series of questions, respondents were asked whether they would give priority to people needing treatment at 40 years of age, compared with groups of patients needing treatment at ages varying from 41 years to 80 years. It was hypothesized that attitudes would be heterogenous but that three groups would be found: strict QALY maximizers who always preferred treating the younger group; strict egalitarians who would support equal entitlements and reject QALY maximisation regardless of the age difference; and a third group of 'switchers' who would be egalitarian when the difference was small, but maximize QALYs when the difference was large.

Confirmatory cluster analysis was used to generate three groups as indicated in Table 5. Clusters are statistically different and by far the largest group comprises those who support equality of entitlement regardless of the differences in benefit (cluster 2). The hypothesized cluster of strict QALY maximizers did not appear. The remaining clusters (1 and 3) both comprise respondents who support QALY maximization when the benefit difference is very large but shift to the equal rights position as the QALY difference declines. So the sample effectively comprises two types: those who might only be concerned about rights, and those who trade-off rights and consequences, but only if the consequential gain is very large. Maximizers of health consequences are so few in number that they might be regarded as statistical outliers. Of course, ways can always be found to discount empirical evidence but these questions were designed to investigate the previously specified rights-efficiency trade-off issue in an economically significant context. The fact that responses show so little support for welfarist welfare economics should not be lightly be passed over and suggests further evidence is warranted.

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[15] Empirical work in social choice attracts growing interest largely through the work of Wulf Gaertner and colleagues (see for instance Gaertner et al (2001)). The approach in this paper leads on to the estimation of functions, which complements the testing of axioms approach adopted by other researchers.

[16] Survey design is reported extensively in Anand and Wailoo (2000).

See Table 5

A second issue on which comment is merited concerns formulation. Going beyond preferences introduce primitives that are unnecessary, it might be argued. It has been claimed by advocates of consequentialism that if rights are important, then they should be incorporated into state descriptions, Hammond (1993). In fact, one can show that such an incorporation is always possible Anand (1993b), so the question is whether this is desirable. One of the reasons for trying to bring health economics and social choice together as this paper does is to suggest that the answer should depend on an accommodation between empirical phenomena and the available raw material for theory construction. From that perspective, the integration of claims indicates a kind of theory that is particularly useful for structuring empirical work. It is no less general or abstract than aggregation of preferences but it is more explicit about other kinds of moral claim (it has more 'grip' on the phenomena).[17] It points to a conceptually richer and more naturalistic characterisation of fairness than has emerged from previous axiomatic work and it highlights the fact that cardinal interpersonal comparisons have to made, even if individual utilities cannot provide the basis for doing so.

If this discussion appears to argue for a return to the social welfare function approach due to Bergson (1938) we do not need to view the programming approach as iterating towards a precisely defined function. Individuals' preferences for personal choices do not appear to satisfy the completeness axiom and there is no reason to suppose that preferences for social options will be any better defined. However, it is still possible to view the construction of a social welfare function as an aid towards making a sensible social choice. Such a view has found favour in decision analysis following Philips' (1984) work on what he calls 'requisite decision modelling', a term reflecting the idea that constructing models of choices can aid deliberation without there ever being a final, accurate model of the group preference.

6   Concluding Overview

Conventional social choice owes much to Arrow's account of it as the aggregation of preferences. Though Sen simplifies, generalizes and makes less paradoxical the impossibility result, his questioning of the informational adequacy of the underlying ordinal and preference framework is particularly significant. This paper has shown how changing the informational basis of social choices naturally leads to an 'integration of claims' perspective and that this can be seen as a generalisation of the preference aggregation approach. The newer perspective suggests that fairness is associated with the acknowledgement of different claim types, not just the prevention of dictatorship with respect to preferences, important though this is.

Non-linear programming offers a formal, optimisation framework from which to develop empirical social choice as the analysis to health-care rationing illustrates. Rights, consequences, social contracts and views about due process all appear to be legitimate claim forms in health-care priority

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[17] The motivation emphasized in this paper is ontological. However, consistent with this approach is an epistemological justification: different claims simply reflect the fact that there are different ways of articulating a claim.

setting and they can be accommodated within a programming framework. Moreover, the problems of consequentialist welfare economics, as revealed by attempts to apply QALY maximisation, shed light on theoretical issues. The trade-off between efficiency maximisation and other sorts of claims highlighted by the impossibility of being a Paretian liberal is central to problems of resource allocation in health even when cardinal information is used. Any prescriptive theory of resource allocation should build on this insight: 'integration of claims' is an example of such an approach.

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Key to Rules

1. $Max \sum Q \; st \; \sum c \le c^{\max}$ Consequences)

2. $Max \sum R \; st \sum c \le c^{\max}$ (Rights)

3. $Max \sum \frac{1}{2}(Q + R) \; st \sum c \le c^{\max}$ (Consequences and Rights)

4. $Max \sum \frac{1}{2}(Q + R) \; st \sum c \le c^{\max}, CS = CS^{\max}, HR = HR^{\max}$ (Consequences, Rights and Process)

5. $Max \sum \frac{1}{2}(Q + R) \; st \sum c \le c^{\max}, RC = RC^{\max}$ (Consequences, Rights and Social Contract)

Table 1   **Average QALY Gained from Treatment**

	High Income	Low Income
Able Bodied	a	c
Disabled	b	d

Table 2 **Data for Example**

Treatment	QALY gain	Cost/Treatment £	Potential Patients
IVF (In Vitro Fertilization)	81	2000	10
NNC (Neo-Natal Care)	80	5000	20
VAC (Vaccination)	75	5	100
CS (Cardiac Surgery)	35	4000	15
HR (Hip Replacement)	20	1500	15
RC (Residential Care)	10	20000	20
All Treatments			180

Table 3 **Programming Results: Comparison of QALY Maximisation with Rights Maximisation.**

	Max $\sum Q$		*Max* $\#\{i : i \text{ is treated}\}$ $(\sum R)$	
Percentage of maximum budget needed to treat all patients	**Percentage of maximum QALYs**	**Percentage of all possible patients actually treated**	**Percentage of maximum QALYs**	**Percentage of all possible patients actually treated**
0	0	0	0	0
20	90.6	72.2	86.1	79.7
40	98.3	90.0	98.3	90.0
60	98.9	93.3	98.9	93.3
80	99.4	96.7	99.4	96.7
100	100	100	100	100

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Table 4   Programming Results: Distribution of Treatments Results at 20% of Maximal Budget

Treatment	Rule 1	Rule 2	Rule 3	Rule 4	Rule 5
IVF	10	10	10	10	0
NNC	20	3.52	20	3.52	0
VAC	100	100	100	100	0
CS	0	15	0	15	0
HR	0.07	15	0.07	15	0
RC	0	0	0	0	6.03

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Table 5   **Numbers of Respondents Strictly Preferring QALY Maximisation when Comparing Treatment between a 40 Year-old Group and Other Groups.**

	Total Cluster Size	Age of Comparison Group when Needing Treatment				
		80 years	**70 years**	**60 years**	**50 years**	**41 years**
Cluster 1	175 (35)	7 (20%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Cluster 2	460 (92)	0 (0%)	1 (1.09%)	0 (0%)	1 (1.09%)	1 (1.09%)
Cluster 3	85 (17)	16 (94.12%)	15 (88.24%)	5 (29.41%)	0 (0%)	0 (0%)

Notes

1. A non-parametric multi-population test (Kruskal-Wallis) shows cluster medians are different at the $p<0.001$ level. The usual note of caution when applying statistical tests to outputs of patterning techniques applies.

2. Cluster sizes indicate number of responses in clusters: figures in parentheses indicate number of respondents in each cluster.

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