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Theoretical Aspects of Collective Decision Making - Survey of the Economic Literature

Abstract

The article aims at surveying the economic literature related to collective decision making. In order to do so it proposes a coherent framework allowing for a structured analysis of the factors influencing the works of a committee. These factors are divided into external (shaped outside of the committee e.g. by law) and internal ones (related to the composition of the committee and interactions between its members). The survey of the general economic literature related to collective decision making presented within the proposed framework yields interesting suggestions for further research, including the consequences for the shape of monetary policy committees.

1. Introduction

Since the decline of autocratic monarchies, more important state decisions are less often entrusted to individuals. This development is in line with the common knowledge that two heads are better than one, which was mathematically proven by Condorcet (1785) on the grounds of the then-emerging probability theory. Even if his analysis concerned juridical decision-making, one may assume that any important dilemma in human society could be delegated to a *committee*.

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Indeed, it is frequently remarked on that laws are usually (at least in peacetime) made by parliaments, juridical cases are settled by courts, and authorities on virtually all governance levels are collective bodies. Even sport competitions are usually evaluated by several referees[1]. More economic examples include supervisory boards of enterprises, boards of directors, editorial boards of scientific journals, as well as diverse economic councils or 'think tanks', which may play a significant role even if they are only of a consultative character.

The following section introduces a conceptual framework, allowing for an analysis of collective decision-making. It will be focused on the factors influencing the process and the efficiency of decision making, by dividing the factors into external and internal ones. These external and internal factors, in turn, will be covered in detail in sections 3 and 4. Most of the proposed factors are general enough to be investigated within a broad decision-making framework; others are specific to (or have been analyzed in depth with respect to) monetary policy making, and will be omitted as exceeding the scope of the present article. Further research steps, together with concluding remarks, are included in the final section.

2. Conceptual framework

In order to conceptualise the analysis of decision making in a committee and its determinants, a simple scheme is proposed: a committee obtains some information[2] (possibly divergent or differently interpreted by different members) and reaches a decision through a collective decision-making process. However, two groups of factors may influence its work and outcomes.

First, external determinants influence the committee and the process of reaching the decision. They represent structural and institutional characteristics shaped by laws regulating the framework of monetary policy making and include such elements as the organisational setup (number of committee members, decision-making rules, etc.), appointment process, and also possibly encompass external pressure (political pressure or "central bank bashing"[3] being the most common examples). Second, internal features, including preferences of the committee members and diverse interactions among members, clearly exert an effect on the quality and character of the decision-making activity. It seems

[1] This particularly concerns qualitative judgments.

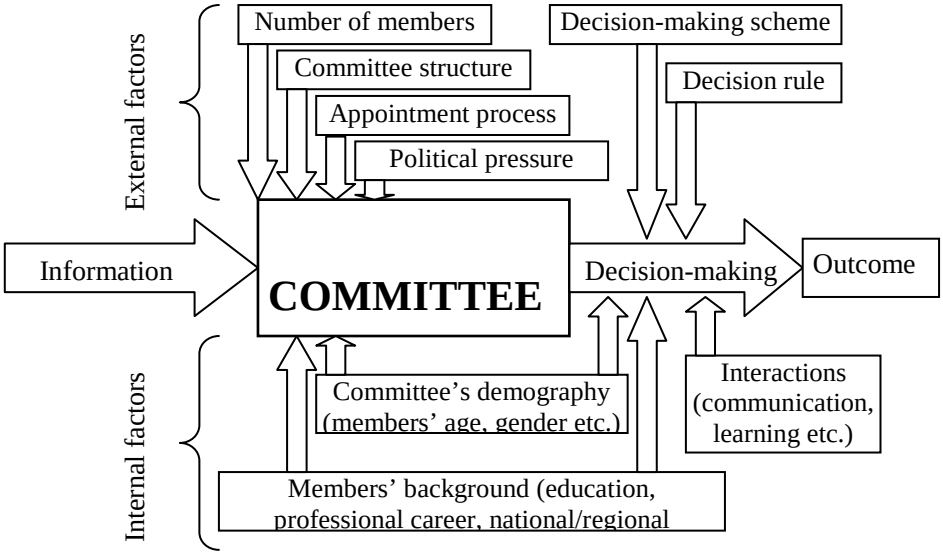
[2] Information may be considered as an input to the decision-making process.

[3] See e.g. Maier and Bezoen, 2004.

logical that the preferences of committee members are shaped by their personal experience and thus can be approximated by their demographic and social characteristics. At the same time, members' features (somehow aggregated) may be used to describe the committees themselves. This broad idea is visualised by Figure 1 below.

The simplicity and clarity of the illustration requires an omission of some interactions among internal and external factors. For instance, personal characteristics of (potential) committee members obviously influence their eligibility and, theoretically, the optimal number of members is related to the voting rule (more on this below).

Figure 1. Decision-making by a committee



Source: own elaboration.

Before turning to a deeper analysis of committees, a general rationale for group rather than individual decision-making will be presented and examined. Simple and intuitive reasons for leaving some important decisions to committees are that collegial decision-making allows for sharing experience, knowledge, as well as responsibility. Over two hundred years ago Condorcet (1785) argued that adding members to a jury increases the probability that the decision taken will be appropriate and that this probability tends to one as the number of jury members tends to infinity. This scope of research has continued, revealing that these findings are valid only upon fulfillment of fundamental premises, such as null cost of members' participation and information acquisition, sharing

a common objective, sincere and non-strategic voting, and no communication between committee members[4].

There are no general studies providing arguments for the superiority of collective decision-making in all contexts. In fact, within some domains (private spending being probably the most obvious example), individual decisions will be surely more efficient. However, as proved by Méon (2006), the decision making by committee (deciding by simple majority) stabilizes the potentially volatile preferences of its members.

Nevertheless, where some important stakes emerge and/or when a high degree of uncertainty exists, mankind tends (as mentioned in the introduction) to rely on collective decision-making. Some more precise arguments, within the specific context of monetary policy, will be given below in section 2. For now, let us assume that Condorcet's theorem works for small committees in a majority of decision-making fields (two heads are always better than one).

3. External factors

Following the scheme visualized in Figure 1, the factors influencing collective decision-making and external to the committee itself will be presented. These aspects might be shaped by the law (as usually concerns the number of members, committee structure, and or decision-taking rules) or might involve some other forms of external pressure, which is, however, usually proper for some specific kinds of committees. According to the general approach to collective decision-making followed in this section, the focus will be on the two probably most important external features of the committee's functioning: number of members and decision-taking rules (hereinafter sometimes referred to as ‘the decision rule’).

Number of members

The first question to be raised after admitting the superiority of committees over individuals in decision-making is the optimal size of the committee. Condorcet's jury theorem suggesting infinitely inflating the committees as a way of assuring efficient decision-making seems both idealistic and unrealistic. Referenda, which might be thought of as its direct application,

[4] An interesting and pedagogical explanation of Condorcet's ideas as well as the alternative voting schemes are presented in Moulin (1988, chapters 9-11) while some more in-depth insights are provided e.g. by Austen-Smith and Banks (1996). Nevertheless, as will become clear below, this stream of literature lies only at the margin of the subject tackled in this article.

are not very commonly used (except, perhaps, in Switzerland[5]). The reason is relatively simple – in reality the costs related to increasing the number of voters are non-null, and the marginal (decisional) return – understood as the increase in the probability of taking the right decision implied by adding a decision-maker – is usually decreasing. This is especially the case especially when decisional skills are equally distributed among members. Thus, introducing a positive marginal cost of adding a member to the committee limits the optimal number of its members. This intuitive result has been demonstrated e.g. by Berk and Bierut (2003).

Koriyama and Szentes (2009) confirmed that premise under a (reasonable) assumption of rapidly decreasing marginal value of an individual signal and an endogenous information acquisition. They show, however, that the losses generated by a committee which is too big are smaller than that of a committee which falls short of two members (as compared to the optimal size). This means that in the event of uncertainty about the optimal design of a committee, it is better (safer) to have too large a number of members than a too small a number of members.

Another mechanism potentially influencing the behavior of committee members relies on career concerns and reputation-building, where experts must compete for an opportunity to speak (Hahn 2012). Under such a setup, in a committee which is too large members may be reluctant to reveal their information. This, in turn, strongly limits the optimal size of the committee.

In reality, the above-mentioned costs of a bigger committee may take on a monetary form (e.g. salaries of the members or administration costs of their bureaus) or may be of a non-pecuniary nature. Berger (2002) has qualified the latter as "decision making costs" which might be understood as the time needed to improve the average accuracy of decisions.

Restraining the number of voters (and time of discussion), while limiting the informational losses caused by lowering the number of members is possible through diverse decision-making schemes, such as rotation or grouping members in constituencies[6]. Bosman *et al*. (2005) led an interesting laboratory experiment investigating how rotation schemes influence outcomes. This research was (as the authors admit) influenced by the rotational system at the Federal Open Market Committee (FOMC), but it seems that the adopted reform of the ECB (with its unequal rotation scheme) was an additional motivation. The authors

[5] For a deeper analysis of recent Swiss experience, see Kirchgässner (2007).

[6] A description of the main decision-making schemes applicable to central banking is presented in Stanek (2004) while discussing diverse propositions for preparing decision making of the ECB for the enlargement of the euro area.

compared behavior and outcome of a five-person committee, whose members care about their individual pay-offs but also the common goal (which is itself a weighted average of personal rewards), under three decision-making schemes. In the first one all members are allowed to participate, the second is an "equal" rotation scheme, where only three members are allowed to vote and rotate with equal frequencies, and under the third scheme one member was granted a permanent seat and other four members rotated with a constant (50%) frequency.

The main findings include the superiority of rotating (and thus smaller) committees in terms of speed of decision-making (and number of vetoes), at the cost of somewhat more frequent strategic voting behavior[7]. The rotation scheme marginally improved mean overall pay-off, however at the same time redistribution effects emerged (members earned more in rounds when they had voting rights). Thus, the pay-off variance also increased when the rotation scheme was applied. Interestingly, even if the applied decision rule was unanimity, the preferred outcome of the median voter was the result in about 60% of decisions.

Decision rule

If larger committees are believed to spend an especially long time to agree on a decision, this can even be aggravated when they reach it by consensus rather than by simple majority voting. This indicates that the optimal size and decision-taking rule for a committee might be linked.

These two imminent characteristics of the committee are modeled by Persico (2004), although the main focus is on the decision rule. He defines it (analogically to other related works) as the minimum number of votes required to validly adopt a decision. The designer, simultaneously with the decision rule, chooses the size of the committee. The optimal size is always bounded as the system designer, incurring a small cost (relatively to the social gain from a correct verdict) of adding a juror, always chooses the smallest committee leading to the optimal outcome (highest probability of taking a good decision).

In his dual (convict-acquit) model Persico finds that the optimal decision rule, yielding the highest probability of taking a good decision while providing incentives for all members to acquire information (and to vote informatively) depends on the quality of information. More precisely, the fraction of members

[7] Strategic - in contrast to sincere or naïve - voting refers to the situation when a voter supports a different option that he or she would choose alone. The reasons for such a situation may be diverse, e.g. expectations of other members' behavior or the signals they revealed. Gerling *et al.* (2005), following Austen-Smith and Banks (1996) also distinguishes between naive voting and informative voting, when the committee member votes according the information she has.

required to convict the defendant is close to the probability, when a juror obtains a correct signal[8]. Thus, the unanimity rule is efficient only if information is nearly perfect. Moreover the author proves that it is always better to enlarge a committee of size n deciding by unanimity by two members (the new committee counts $n + 2$ members) and change the decision rule allowing one member to dissent ($n + 1$ votes are required to convict).

One should note, however, that Persico's model does not allow for the exchange of information (or other form of interaction, learning etc.) between committee members. However, anecdotal evidence or minutes (where available) from prominent monetary policy committees (FOMC, ECB Governing Council, British Monetary Policy Committee, or Bank of Canada – see Macklem 2002) corroborate that meetings start usually with a "*tour d' horizon*" where all members present their views about the current economic situation. Nevertheless, these mechanisms are internal factors of decision making and thus will be analysed more deeply in the following section.

However, one of Persico's (2004) most important findings, reflected in reality, is that the decision rule applied may critically influence the decisions of a committee. The most commonly analysed decision rules are simple majority and unanimity, even if (and because) they represent the two extremes[9] of the entire spectrum of qualified majorities (often used in important decisions such as constitutional amendments etc.). However, these two decision rules are the most interesting from the theoretical point of view precisely because they are both relatively simple to model and represent border cases – any other plurality voting rule is by definition located between them. The practical importance of these rules is implied by their frequent application in the setup of MPCs: *de jure* supremacy of a simple majority rule, and possible *de facto* use of unanimity in the ECB[10].

[8] These probabilities are supposedly equal for all jurors. Later, the author introduces heterogeneity into the committee, but it concerns members' disutilities of two types of errors and the cost of information acquisition. Persico (2004) finds that restricting to one type of juror can only improve the outcome.

[9] It has to be mentioned that the possibility of adopting (less important) decisions even without the consent of any kind of majority has also been analyzed. See Erlenmeter and Gersbach (2001). It seems, however, that in monetary policy such flexible majority rules, possibly allowing for minor interest rate changes with support from only a minority of voters, are not feasible in practice. To realize the possible negative consequences, consider a case where there are two minorities who want a minor change, but in opposite directions. Moreover, such minorities desiring opposite changes, which would probably cancel each other out during one meeting, might emerge in two consecutive meetings, which would lead to an undesirable interest rate volatility.

[10] Wim Duisenberg and Jean-Claude Trichet in their press conferences always claim that the decision taken by the Governing Council was consensual.

Gerling *et al.* (2005), in their game theoretic survey, alleviate the (unrealistic) Condorcet's hypothesis and analyze committee decision making from the perspective of information acquisition. They show that unanimity is an optimal decision rule only if some important requirements are met, i.e. if the committee has perfect information at its disposal and shares a common objective. In fact, these two condition make the exact decision rule unimportant. However, when these premises are not fulfilled, the unanimity rule has some undesired features. In general, when strategic voting is a plausible possibility, the unanimity rule, which gives a veto power to every voter, may lead to biased committee decisions even if the number of its members tends to infinity. This socially suboptimal outcome results from the fact that every member's vote is pivotal, which involves some kind of herding behavior: if all jury members convict – the last one will convict also, even if her own signal suggests the contrary[11].

In spite of this argument, unanimous (or consensual) decisions are believed to work in environments where the first type error is costly (e.g. convicting an innocent person). Thus, the unanimity rule is applied to some important decisions, especially in the international context – it applies within some multilateral negotiations such as WTO and some important issues within the European Union, but also in American penal juries[12].

Situated at the other end of the majorities required to adopt decisions is the simple majority rule. Though having been applied to public decisions since at least Athenian democracy and subjected to scientific analysis since at least Condorcet (1785), its simplicity was re-interpreted in terms of the median voter theorem only in the mid 20th century by Black (1948). Its weak form states that the alternative which wins in elections guided by majority rule is always supported by the median voter, while its strong form says that the median voter always obtains his or her most preferred policy. This means that any committee decision taken by simple majority can be (accurately) proxied by the preferences of the median voter, which are usually easier to obtain.

The applicability of the median voter theorem, however, crucially depends on the existence of the median voter, which is, in turn, is contingent on the type of individual preferences. Some problems arise when available options are not quantifiable. A simple example is often given with three voters (A, B, C) and three alternatives (x, y, z): If A prefers x to y to z, B prefers y to z to x and C – z

[11] See e.g. Feddersen and Pesendorfer (1999).

[12] Feddersen's and Pesendorfer's (1999) results have been contested, at least with respect to juries, by Coughlan (2000).

to x to y, there is no median voter nor optimal (stable) outcome[13]. However, if voter preferences are single peaked (in the case of one-dimensional spaces) the median voter exists[14]. This is arguably the case in monetary policy, where the policy maker probably has his or her preferred interest rate and is more displeased the more the rate set deviates from this optimal value. In the case of two dimensions, the existence of the median voter requires strongly symmetrical preferences. Nevertheless, it has been shown that a dominant part of political questions can be transposed to one-dimensional spaces (Poole and Daniels, 1985). Moreover, the median voter theorem has been also generalised to multi-dimensional spaces[15].

To overcome the problems linked to unanimous voting while still assuring a greater probability of correct decisions than in case of simple majority (or, in more political terms, to obtain a higher degree of legitimacy) qualified majorities are required for some decision making bodies to adopt particular acts. Examples may go from constitutional amendments in virtually all countries[16] to the majority of competencies of the Council (of Ministers) of the European Union. The latter example turns our attention to the fact that the applicability of a qualified majority is sometimes accompanied by the casting of weighted votes.

In the case of weighted voting, several measures of effective power are applicable. The first and simplest possibility of assessing a voter's influence is the elementary share of her vote (number of cast votes relative to the overall number of votes) compared to the shares of other voters. However, this measure does not allow for an objective appraisal of power during votes, when some coalitions may be formed.

To overcome this flaw, power indices have been developed[17]. The basic idea underlying these indices is that the real voting power is implied by the possibility of being pivotal i.e. the situation when a voter's membership in a coalition determines the result of voting (Banzhaf, 1965). Another way of assessing this impact is by measuring the marginal coalition pay off implied by the last voter entry into the coalition. These contributions are summed up for each player and result in the Shapley-Shubik power index. This index measures

[13] This is known as Condorcet's voting paradox, and was also presented in his 1785 seminal work.

[14] This was shown originally by Black (1948).

[15] See Barberà *et al.* (1993).

[16] The author is not aware of any democratic state where constitutional amendments would require only a simple majority of votes.

[17] For a more precise appraisal of the two most popular measures (viz. Banzhaf index and Shapley-Shubik index) see Banzhaf (1965) and Shapley (1997). For a recent comprehensive scrutiny of the subject, see Felsenthal and Machover (1998) or Holler and Owen (2001).

the real voting power more precisely when coalitions are formed consciously, with communication among members[18].

The optimal weights ascribed to decision-makers depend on their abilities, as shown by Ben-Yashar and Nitzan (1997). Moreover, they show that the optimal decision rule also depends on these skills, as well as on prior factors with respect to the state of the world. These meaningful theoretical advances seem, however, of limited relevance to real-life decision making, as, firstly, objective assessment of decision-making skills is difficult, and secondly, weighing votes according to such a measure appears highly politically incorrect in the public domain.

A decision rule which possibly has much more practical applications was proposed by Caplin and Nalebuff (1988). They show that under some plausible assumptions a qualified majority (supermajority) requiring 64% of votes leads to stable outcomes even in multi-dimensional decisions.

Experimental studies and the role of psychology

A remarkable research program - aimed at (indirect) verification of Condorcet's theorem and creating important liaisons between decision-making and psychology - is emerging and takes the form of experimental studies. Questions like how groups make policy-type decisions compared to individuals, or which kind of motivations may induced by different voting rules, are being raised and tested. An example of this type of research in the field has been presented by Marchese and Montefiori (2011).

These authors compare how small committees deal with public choice problems (provision of a public good) under the mean and the median[19] rule. Moreover, they try to distinguish between sincere and strategic behavior with and without information about other members' preferences[20]. The results of the experiment support the relative advantage of the mean over median rule (in terms of social welfare losses).

Nevertheless, the setup of this experiment gives no explicit *ex ante* social optimum, and even if the players can infer it (it is supposed to be a simple mean of the three players), it has no weight assigned in their personal welfare functions. Moreover, there is no communication among voters. Thus the whole experiment incites to strategic and selfish behaviour on the part of participants (even if, probably due to some difficulties in finding the optimal strategy, some players chose to reveal their true preferences).

[18] See e.g. Widgrén (1994).

[19] This obviously stylizes simple majority voting. See the remarks above on the median voter theorem.

[20] Welfare functions are quadratic and thus one dimensional and single peaked.

The problem of the decision rule often emerges in the (general) context of international organizations. Maggi and Morelli (2006) focus on theoretical aspects of governance in such an environment, and more specifically concentrate on the implications of the lack of an external enforceability mechanism. This means that even after the collective adoption of a decision, it remains a country's sovereign decision whether to execute it or not.

The authors analyze collective actions, which are undertaken by an international organization if a majority of its members (or all of them) agree. The decision rule is chosen *ex ante*, under the "veil of ignorance" on the future costs of actions (benefits are normalized to 1). These costs can be lower or higher (i.e. exceeding benefits) with a fixed and commonly known *ex ante* symmetric probability distribution. The authors also allow for the correlation of cost probabilities among countries. After observing their respective cost realizations (which are private information) countries simultaneously signal if they wish to participate in the common action (in opposition to the *status quo*). Then countries simultaneously choose their actions. "Pure" common actions are taken if all members participate[21].

The game is repeated once and decisions are taken on the basis of common expected utility. Thus some member countries may vote for a common action *ex ante* (and apply it) even if it may wind up not being beneficial for them *ex post*. In such a case the country must have incentives to comply with the previously taken decision. Such motivation is assured by the expected utility from future decisions.

The two considered decision rules are unanimity and an "efficient" (qualified) majority, which is the optimal rule for a "one shot game" with enforcement (lowest majority assuring positive common *ex ante* utility)[22]. Depending on the discount factor (common to all governments), the optimal self-enforcing decision rule may be only one of these two. Thus, a majority is more probable in organizations taking frequent decisions (or with more stable governments), where the discount factor is higher.

Some other important findings of Maggi and Morelli (2006) include the finding that a higher correlation among members' preferences (higher organization's homogeneity) implies that a majority rather than unanimity

[21] The authors analyze also "impure" common actions, which are implemented only by a subset of countries. Nevertheless, for the purpose of the present dissertation, only "pure" common actions are taken into account, since the monetary decisions of the ECB always concern all countries participating in the euro area.

[22] This "first best majority rule" depends on costs, benefits, and number of members. This makes the analysis especially interesting, because further parameters (discount factor, correlation etc.) do not influence it.

decision rule can improve welfare. This mechanism is based on the fact that in more homogeneous organizations future common actions are more probable and thus the expected value from cooperation is higher. Consequently, countries are more prone to accept instantaneous losses than rely on yield from future activities. This conforms to the real world observation, an example being the European Union, a relatively homogeneous organization, where more and more decisions are taken by majority rather than unanimity.

Voting procedures, especially within international organizations, has also been considered in some less conventional ways. These alternative decision making scenarios include, for example, market mechanisms (Casella 2001) or possibilities of inter-temporal transmission of votes (Casella 2005). Although the first possibility was initially thought of as a market tool for such "goods" as budgetary deficit limits (such as the 3 percent threshold allowed by the Stability and Growth Pact) and based on American experience of pollution permits, the possibility of votes being traded might also be considered, and such an alternative is mentioned by the author, but rather as a possible by-product of storable votes.

However, this setup relies on the somewhat controversial assumption that the public authorities are profit-maximizing. Another option is to allow for saving unused votes (when a decision-maker is relatively indifferent about the two alternatives being voted) and take advantage of them in an opportune moment (when a voter has a clear preference between the possible choices). The proposition of storable votes seem to be politically acceptable[23] and, under some rather plausible assumptions such a solution may better the *ex ante* welfare[24]. This hypothesis has been successfully tested in an experiment presented in a companion paper by Casella *et al.* (2006).

International organizations' voting schemes, without enforcing mechanisms, may be completed by Widgrén's (1999) vision of flexible integration being the equivalent of a decision rule. He analyses European Treaties as an incomplete contract, which sets rules for bargaining between two levels of governments – supranational and national ones. Moreover, national governments signing the treaty may differ from those which later take decisions under the treaty provisions. The author defines *ex ante* efficiency as the expectation to attain the preferred point of all local governments[25], and *ex post* efficiency as an outcome which is Pareto-efficient. Other crucial definitions

[23] Although the author's plan to apply it to the ECB Governing Council might be difficult due to the status quo prevailing in its decisions as well as a tendency to consensus.

[24] However, the author admits that some counterexamples may be found.

[25] These are supposedly identical.

include common policy, which is the outcome adopted by all governments, and a flexible integration treaty, which requires a pre-defined majority to adopt a policy, but gives a possibility to minority members to apply an alternative outcome. In his analysis, Widgrén finds that there is a trade-off between *ex ante* and *ex post* efficiency if a common policy is to be applied in all states, and only flexible integration proves to be an adequate decision tool for overcoming this difficulty[26].

4. Internal features

Modeling the internal characteristics of committees in general, without any information about their purposes, external framework, the information they process etc., seems difficult and even futile from some points of view. Thus, as mentioned in the previous section, some internal characteristics of committees are assumed, without being explicitly modeled (this is the case of a common objective or heterogeneity of decision-making skills). Nevertheless, some remarkable efforts in analyzing internal features, such as communication or seniority (order of speech) within a committee have been made and are presented below.

Communication

The possibility of communication and exchange of views is precisely one of the comparative advantages of the committee setup over individual decision making. The resulting information pool is believed to reduce incentives for strategic voting. Gerling *et al.* (2005) presents some important theoretical implications of the revelation of private information by committee members prior to voting. First, exchange of information before choosing alternatives may help attenuate the adverse effects of conflicting interests[27]. Second, also in a setup with communication, the optimal size of the committee is smaller when information becomes costly, which confirms the results above. Finally, by eliminating strategic behavior and sharing all available information, communication allows for the optimal decision to be taken by all the members and, thus, makes the decision rule irrelevant. The authors remark, however, that such a vision is probably exceedingly optimistic, as it also requires that decision-makers share common objectives. Schulte (2010) completes this argument and

[26] This finding seems to offer a theoretical underpinning for a "multispeed Europe", which is, in fact, politically controversial, at least in some EU member states.

[27] An in-depth analysis of conflicting and common interests in committees can be also found in Li et al. (2001).

proves that if the dissimilar preferences of committee members are known, the pre-voting communication allows for a perfect information aggregation and thus leads to more informed (and better) decisions.

Another argument is given by Berk and Bierut (2009) is that, even if communication does provide an alternative to expanding the number of members of a monetary policy committee, it is the most efficient if the skills of the members (the probability that their individual decision would be correct) are relatively lower.

Order of speech

Important in-committee factors include the order of speech, which can be also connected to the role of agenda setter[28], and which is not neutral with regards to the real (in contrast to nominal) power of a vote. In many committees the chairperson, besides having a tie-breaking power, is also the first to speak. This advantage of being *primus inter pares* may have some important implications, which have been modeled e.g. by Ottaviani and Sorensen (2001). In their model, votes (or private information revealing) are driven by reputation concerns. Thus less informed decision makers, if speaking after members who are believed to be better informed, tend to adhere to their opinion (i.e. vote for the same option), while ignoring their own signal.

This setup, while suggesting the possibility of herding behavior, allows for some important insights. First, the authors show that an anti-seniority rule (less informed members speaking before those endowed with supposedly more exact information), which in principle eliminates herding, is not always optimal. This is true when a number of junior experts agree with an action, and when more expert ones do not dare reveal their true signal if they have doubts as to its accuracy. Second, when faced with a significant number of equally skilled members, the design of an optimal order of speaking becomes impossible. These two remarks suggest that, in a restrained and heterogeneous committee, devising the optimal voting (and communication) order may be easier, thus allowing for better aggregation of information.

5. Conclusions

This article presented a general view on the decision-making literature. Interestingly, an overwhelming majority of the issues discussed can be easily

[28] See e.g. Primo (2002) for a discussion of such a power implied by the possibility of offering the first proposal.

and directly translated into our external-internal factors analysis. Moreover, this literature provides some insights on important interactions among these issues, such as the relationship between committee size and the optimal decision rule, or the implications of communication and preferences on the decision rule.

These general remarks are summarized in Table 1 below. It should be emphasized that they may be applied, and the scope of the analysis can be extended, to more specific aspects of committee decisions. Unsurprisingly, the problems presented will find their counterparts in the framework of monetary policy made by a committee, where much more analysis can be presented with respect to internal factors.

Table 1. Main issues raised by the literature on collective decision making

Question	References	Findings
Committee or individual?	Condorcet (1785)	Committee, because the probability of a correct decision is higher
	Méon (2006)	Committee, because the volatility of majority decisions is lower than committee members' preferred outcomes
Optimal size	Condorcet (1785)	Unbounded
	Persico (2004)	Bounded, if adding decision-makers is costly
	Koriyama and Szentes (2009)	Bounded, but the inefficiency of an oversized committee is very limited compared to the inefficiency of too small a committee.
	Hahn (2012)	Bounded, if decision-makers have career concerns and compete for an opportunity to speak.
Decision-making scheme – rotation	Bosman *et al.* (2005)	Rotation may increase the efficiency of decisions, at the cost of redistribution effects and strategic behavior. Unanimity outcome often overlaps with median voter's preferences
Decision-making rule	Persico (2004)	Optimal one depends on the quality of information. Unanimity is optimal only if the information is perfect.
	Black (1948)	Simple majority favors median voter
	Ben-Yashar & Nitzan (1997)	Optimal voters' weights depend on their abilities
	Caplin & Nalebuff (1988)	64%-majority rule is optimal in multi-dimensional decision making
	Gerling *et al.* (2005)	Unimportant, if information is perfect and the objective is common. Otherwise, unanimity is undesirable.
	Marchese & Montefiori (2005)	Averaging of preferences is better than simple majority voting in provision of public goods
	Casella (2001 and 2005)	Storable or tradable votes may improve ex ante welfare
	Maggi & Morelli (2006)	Lack of enforceability of decisions in international organizations justifies the frequent use of unanimity. Nevertheless, if preferences of voters are correlated (and/or the issue is of smaller

		importance), unanimity is worse than other majority schemes.
	Widgrén (1999)	Flexible integration is equivalent to an optimal decision rule.
Communication and order of speech	Ottaviani & Sorensen (2001)	Optimal speech order depends on skills.
	Gerling *et al.* (2005)	Communications makes conflicting interests irrelevant and lowers optimal committee size if information is costly.
	Schulte (2010)	Communication allows for perfect information aggregation even if the preferences of committee members are heterogeneous (when these differences are of common knowledge).

Source: own elaboration.

Even if an analysis of the equally broad literature related to collective monetary policy-making represents the main proposed direction of further research, some preliminary conclusions can be reached. First, there are some strong arguments for delegating monetary policy to a committee (confirmed by the practice of most industrialized countries). Second, monetary policy committees should rather be restrained and decisions should be made by simple majority voting. Third, the heterogeneity of such a committee may be desirable, and should not pose any problems with efficient information aggregation. There are, however, some issues for which a more detailed investigation into the specific context of monetary policy is necessary. This includes the mechanisms for stabilizing the preferences and outcomes, such as optimal nomination design, overlapping terms of office, and the consequences of the composition of a monetary policy council for macroeconomic stability.

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Streszczenie

ASPEKTY TEORETYCZNE KOLEKTYWNEGO PODEJMOWANIA DECYZJI – PRZEGLĄD LITERATURY

Artykuł ma na celu dokonanie przeglądu literatury ekonomicznej z zakresu kolektywnego podejmowania decyzji. W tym celu zaproponowano ramy pozwalające na ustrukturyzowaną analizę czynników wpływających na pracę organu kolektywnego (rady). Dokonano podziału tych czynników na zewnętrzne (tzn. kształtowane poza samą radą, np. przez wymogi prawne) oraz wewnętrzne (związane ze składem rady oraz interakcjami między jej członkami). Dokonany w ramach zaproponowanej struktury przegląd literatury ogólnoekonomicznej dotyczącej kolektywnego podejmowania decyzji pozwala na zaproponowanie interesujących kierunków dalszych badań, w tym konsekwencji dla kształtu rad polityki pieniężnej.

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