GAMES FOR CENTRAL BANKERS:
MARKETS V/S POLITICS IN PUBLIC POLICY DECISIONS

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ABSTRACT

This paper questions the link between the establishment of a common currency among several countries and the necessity of political coordination. It begins by discussing why conducting a single monetary policy is thought to be easier within a single political unit. It then proceeds to enquire whether market mechanisms could be used to choose optimally the common policy of heterogenous actors, and thus provide an alternative to political decision-making. The advantage of market mechanisms is that they are transparent, predictable, and usually more efficient. In particular, the paper studies a simple game through which national representatives could choose the monetary policy of a single, multinational central bank. There are no fundamental logical objections or impossible practical obstacles to such market games, and even if they are rejected in principle they are useful in suggesting desirable amendments to traditional voting schemes.

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> *"Historically, political and currency jurisdictions have tended to coincide. [...]. One is indeed hard pressed to find any precedent in history, where sovereign nation states voluntarily ceded sovereignty in the monetary field to a genuinely supranational body. It is therefore clear that European Economic and Monetary Union has been, and will continue to be, not just an economic, but also a political project."* (Issing, 1999a).

1. Introduction

Since its conception, the idea of a European Economic and Monetary Union has come accompanied by talk of progressive political integration. Although the official declarations by European Union bodies have discussed only the economic gains from monetary unification, many observers have interpreted the monetary step as a political move, intended to fulfill political goals and preliminary to further political coordination.[1] There are several reasons why the adoption of a common currency has been interpreted in this light. First of all, money has a strong symbolic content: having a separate currency is a traditional attribute of sovereignty and establishing one is among the very first acts typically undertaken by a newly independent state. Second, as mentioned by Issing in the quote that heads this paper, there is no historical experience of monetary union among independent countries of comparable economic and political might. Indeed, trying to predict the effects of a common European central bank from past episodes, scholars have turned to the establishment of the Federal Reserve in the United

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[1]On the original official position of the EU bodies, see for example Commission of the European Communities (1990). For a recent reading of EMU as a primarily political event, see the pessimistic discussion in Feldstein (1998).

States or the monetary unification of Germany, both federal states. Finally, the economic gains from a common currency are difficult to quantify: independent monetary policy is sacrificed in exchange for credibly fixed exchange rates and a possibly more cooperative decision-making process than a fixed rate regime alone would provide. The loss of control over monetary policy is very visible, the gains more subtle and indirect.

The goal of this paper is to reflect on the link between the establishment of a common currency among several countries and the necessity of political coordination. The paper begins by discussing why conducting a single monetary policy is thought to be easier within a single political unit. It then proceeds to enquire whether market mechanisms could be used to choose optimally the common policy of heterogenous actors, and thus provide an alternative to political decision-making. The advantage of market mechanisms is that they are transparent, predictable, and usually more efficient. In particular, the paper studies a simple game through which national representatives could choose the monetary policy of a single, multinational central bank. As we shall see, there are no fundamental logical objections or impossible practical obstacles to such market games. But the idea of choosing public policy through bidding schemes inevitably leaves us uneasy. The paper concludes with some thoughts on the causes of the unease, and on the lessons that such schemes can provide for amending traditional voting mechanisms.

2. Monetary Union with Political Union?

To an economist, the fundamental reason why a common economic policy is associated with

political union must be that policy is a public good: as in the traditional example of national defense, an economic policy decision is identical for all regions and all individuals subject to it - hence the common interest rate and money supply set by the single central bank in a currency union; the common general government deficit in a fiscal union. At the same time, the effects of the policy are spread unequally, affecting some more than others and benefitting some more than others. Thus the point of departure must be that policy decisions are public goods that affect the distribution of wealth.

In the case of monetary policy, monetary interventions and interest rates setting will have different impacts on different geographical areas, sectors and individuals. Faust (1996) provides a very clear discussion of how this potential for redistribution was perceived at the founding of the Federal Reserve. The possibility to reduce the value of nominal debts through inflation was pitting the majority of the public, who were debtors, against the bankers. According to Faust, the presence of the regional Federal Reserves presidents on the Board was purposefully designed in response to this tension. Had all members of the Board been nominated by the executive, they would have reflected the common preference of voters, and at least at the time would have imparted an inflationary bias to monetary policy. Similarly, von Hagen (1999) discusses the delicate political position of the Bundesbank, required to arbitrate among different interests and beliefs, and developing a careful practice of incomplete transparency to maintain agreement among its Board members and independence from outside pressures. In the public debate surrounding the European Central Bank (ECB), the possibility that countries disagree on the ideal monetary policy is widely recognized. Whether this might occur because of different attitudes towards inflation, different shocks, or different transmission mechanisms for monetary policy, the result remains that with a common money some countries will be closer to their

ideal policy than others.[2]

The recognition that policy decisions involve redistribution is accompanied by the belief that a more equal distribution of gains and losses can be achieved within a single political unit[3]. As far as I can see, four lines of argument could support this position. First, it could be argued that within a country, regions and sectors of economic activity are more homogenous, and thus the difficulty of spreading costs and benefits equally much reduced. In the European Monetary Union, at least, this argument does not hold. Whether in terms of per capita income, unemployment rates or sectoral composition of the economy, for several countries the dispersion within national borders matches the dispersion among country averages within the Union.[4]

Second, absent liquidity constraints, sufficient portfolio diversification would protect individuals from redistributive shocks, including policy shocks. If the diversification could not be done through assets, physical movement across geographical borders or industries would work in the same direction. In practice, both strategies are easier to pursue within national borders, where the language is common,

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[2]There is a large literature investigating both the asymmetry of shocks and, more recently, the asymmetry of transmission mechanisms inside EMU. On the former question, see for example Bayoumi and Eichengreen (1993); on the latter, Gerlach and Smets (1995), Kashyap and Stein (1997), Dornbusch, Favero and Giavazzi (1998) and Favero, Giavazzi and Flabbi (1999).

[3]The study of asymmetrical effects of monetary policy within national borders has been stimulated by the research on EMU, but was previously rather neglected. See Ganley and Salmon (1997) for the UK, Carlino and DeFina (1998) for the U.S., and Hayo and Uhlenbrock (1999) for Germany.

[4]For example, in 1996 the standard deviation of per capita GDP (weighted by population) within Austria, Belgium, France and Italy was higher than between the EU countries (Commission of the European Communities (1999)). The result holds for Germany too, in this case reflecting unification.

the regulations and conventions familiar, and information richer.[5] Thus it should be simpler to equalize

expected returns within a country than internationally, or equivalently to protect oneself from being on

the wrong side of a policy action. In reality, even within individual countries portfolio diversification or

physical mobility are still very far from fulfilling such a role to a significant degree. More to the point,

both this argument and the preceding one rely on the economic structure of markets, not on the political

tools of a common jurisdiction. They state that longstanding trading habits and geographical proximity

lead to less segmented markets, a claim that could well be made for the future of the common European

market without entering the much more delicate area of further political coordination.

A third reason why policy's redistributive effects may matter less within a single political unit is

more compelling, and closer to what makes political jurisdictions distinctive: a jurisdiction routinely

decides and finances multiple public goods and thus has many channels for compensatory transfers. A

region or a sector hurt by a policy that benefits most of the country will be compensated through direct

payments, lower tax collection, larger receipts from the central government, or more favorable terms on

other common decisions. Some of these mechanisms will be automatic, as in the case of adjustments to

taxes and revenues implicitly insuring against idiosyncratic regional shocks within a country; others will

be negotiated.[6]

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[5]Within the European Union, recent research confirms that although the integration of financial markets is proceeding, a home country bias persists especially in equity markets and foreign direct investment, presumably reflecting different regulations and obstacles to information flows (see for example, de Menil (1999) and Portes and Rey (1999)).

[6]Even in federal states, automatic adjustment to regional shocks appear substantial. For the US, estimates of the federal fiscal system cushioning of regional declines in personal incomes range from a high of 30 percent (Sachs and Sala-i-Martin (1992), Bayoumi and Masson (1991)) to a low of 10 percent (von Hagen (1991)). As a comparison, Structural Funds in the European Union amount to not

Finally, members of a single political unit could be more tolerant about occasional defeats in policy debates and be willing to give larger weight to the common good. If this argument is in fact true, it must stem either from some form of altruism operating within precise geographical borders, or more probably from the long-term nature of the relationship, and the confidence that the present defeat will be compensated or reversed. Thus again the essential aspects appear to be a long habit of interaction and the expectation of some compensatory redistribution, either through other existing channels or in the future.

If the arguments associating monetary union in Europe to a process of increasing political integration implicitly amount to these four points, then they eventually reduce to the need to create a tradition of interaction and, what is more difficult, a channel for compensatory transfers. An interesting feature of these transfers in a political unit is that they are remarkably non-transparent: there is little public discussion of the different effects of public policy across a national economy, and even less of the measures that provide compensation, whether automatically, as mentioned above, or as result of political give and take. What function, if any, this lack of transparency fulfills is a question that deserves more attention than it has received so far. Although it poses obvious concerns about possible abuses, a small degree of opacity may conceivably have a role in allowing political representatives to aggregate the preferences of their heterogenous constituency. In fact, this is exactly the argument used by Issing (1999b) in defending the need for some partial veiling of the ECB operations: "considering the

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more than 2 per cent of GDP even in countries that are the program's most favored recipients. Note that Structural Funds are designed to target long-term development problems, as opposed to providing short-term insurance against negative shocks.

particular communication challenges in a multi-country monetary union" (p.9). [7]

For now we will ignore this question, and embrace the mainstream opinion that full disclosure of information to the public is always desirable because it makes institutions both more accountable and more predictable. But then a different issue arises naturally: if the difficulty of a monetary union without political union is in guaranteeing agreement in difficult times, and if the necessary transfers and the rules that regulate them should ideally be public knowledge, why not design an appropriate market mechanism to solve the problem? The advantage of market mechanisms is exactly that they are transparent and rule-bound, and although standard market exchange would not work in this case - recall that policy is a public good - it should be possible to design the appropriate market game for the problem on hand. From a formal point of view, the question is how to engineer the correct private provision of a public good, with each agent's contribution positively related to his true valuation of the good - a classical question in economics.

By "private" in this context I do not mean that individual citizens in the monetary union would be responsible for monetary policy, but that the countries' representatives in the Governing Council of the ECB would choose monetary policy according to the fixed rules of a game that does not require them

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[7]In their strong defense of the need for full transparency at the ECB, both Buiter (1999) and Svensson (1999) argue that providing less than full information to the public is self-defeating: it erodes the ECB's legitimacy and may lead to more interference by governments, eventually resulting in an inflationary bias. In their view, a lack of full openness can reflect only strategic efforts either to maintain some room for surprising the public (as discussed more explicitly in Svensson and Faust (1999)), or to cover possible mistakes (on a similar vein, see also Geraats (1999)). None of these authors discusses the multi-national nature of the ECB, which is instead Issing (1999b)'s main focus. Dixit (2000) does not address transparency, but analyzes explicitly the tension that the countries' heterogeneity imposes on the ECB. The role of ambiguity in the development of the Bundesbank's monetary target, as discussed by von Hagen (1999), is very relevant here.

to coordinate their strategies and does not rely on a central planner, given the enforcement provided by

the members of the Executive Board. Thus the contrast between "political" and market mechanisms

here reduces to the extent of explicit coordination required by the collective decision-making

procedure: essential in the former case, unnecessary, in fact counterproductive, in the latter. While the

distinction is plausible, it is certainly debatable: it applies immediately if political decisions require

unanimity, for example; but a majority rule could be seen as a decentralized procedure, coupled with an

ex ante rule translating individual votes into a collective decision. In the current practice: "The ECB's

decision-making process appears driven by a desire to form a broad consensus [..], rather than just

counting the majorities" (Financial Times, 10/22/99). In the two years of life of the ECB, in all meetings

for which detailed information is available, decisions were taken without formal voting, as admitted at

least twice by Duisenberg himself (ECB Press Conference, 10/7/99 and 2/3/00). In the terminology of

this paper, the extensive deliberations, the importance of personal interactions, the effort to reach

agreement without voting, all classify the decision-making procedure as "political". In contrast, as we

shall see, a market mechanism would be impersonal, decentralized and open about conflicts in

countries' objectives.[8]

Designing the correct market game for the provision of a public good means designing incentive

mechanisms such that the agents will act individually to further the collective interest. This has always

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[8]Even among the restricted set of scholars studying monetary union, the term "political" has been given very different meanings. For example, Dixit (1998) studies a common agency game where the different countries specify optimal contracts with the ECB, and calls "political solution" the Nash equilibrium of the game, as opposed to the coordinated outcome - the opposite reading of the word from what is suggested here.

been one of economists' chief ambitions, but the long tradition of proposing optimal mechanisms is matched by a poor record in seeing them implemented. I believe that this is the result of two main weaknesses. First, when the number of agents is large but not infinite, even the simplest mechanisms become very cumbersome. Second, in the presence of information problems, no ideal solution exists, and the waste of resources necessary to induce individuals to reveal their private information can be large enough to shed doubts on the desirability of the mechanism itself.[9] From these points of view, a monetary union among a restricted number of countries should provide an ideal setting: the number of countries is small, and the practical problems of implementation should be manageable. But what is more important, information should not be a major obstacle. In addition to the existing European statistics that the Commission has been making public through Eurostat, an important part of the preparations for monetary union has been specifying and organizing the collection of the data that the ECB needs for its operations. Annexes 10 and 11 in the EMI's report on the operational framework of the ECB (EMI, 1997) were devoted to this purpose, and harmonized data for the Euro area have been available since the Summer of 1998. While it is possible that a national central bank may at times be less open than desirable, on the whole asymmetry of information should be a much smaller problem than typical in most applications of incentive mechanisms.

Thus in what follows I will describe how the simplest scheme for private provision of a public good can be adapted to the efficient choice of monetary policy in a multinational central bank. The economic literature proposes a multitude of mechanisms that could be tailored to the problem on hand,

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[9]See for example the very clear discussion in Groves and Ledyard (1977).

and the challenge is not to find a scheme that would theoretically work, but one that is simple enough to be (conceivably) implementable. My goal here is to discuss a possible example and, more ambitiously, to suggest that thinking about such market mechanisms for coordinating policy decisions can be useful. At a minimum, it can help us foresee sources of tension in the current procedures and holds lessons on how to improve them.

3. A Market Mechanism for Common Monetary Policy

Consider the following scenario, a modified version of the game in Bagnoli and Lipman (1989). The Council of the ECB convenes to decide whether to change the interest rate, or to leave it at the current level. To keep the problem as simple as possible, we suppose that both the direction and the amount of the change, if a change has to occur, are predetermined. Although it is possible to design a more complicated version of the game where these variables are endogenous, for our illustrative purposes the assumption seems plausible: prior to a Council meeting, it is generally known whether the action to be considered is an increase or a cut in interest rates. Although the size of the interest rate adjustment is less well defined, in normal times changes occur mostly in steps of standard magnitude, either half or a quarter of a percentage point. All countries in the Union share the same interest rate level; hence our simplified set-up is equivalent to the discrete problem faced by a group of agents deciding, for example, whether to remain with the status quo or provide a public good, for example build a streetlight. Building the streetlight is logically analogous to the ECB intervention - i.e. the change in interest rate. In line with the notation in Bagnoli and Lipman, I call the decision that agents must take

d, where $d \in D = \{0, 1\}$; $d = 0$ corresponds to the status quo, $d = 1$ to changing the interest rate.

Countries' preferences over the policy decision differ, both because countries may have different opinions over the ideal stance of monetary policy and because they take into account the different transmission mechanisms linking the interest rate to their domestic economy. Thus what I call for simplicity "countries' preferences" is actually a reduced form that embodies their (possibly) different economic structures. Preferences are defined over the level of the interest rate and a private good w, freely exchangeable and always desirable, a proxy for wealth. As we shall see, the market mechanism envisioned here is based on the possibility of transfers of the private good w. Since countries are represented in the ECB Council by their national central bankers, and independence from national governments is one of the building blocks of the Maastricht Treaty, it is reasonable to identify w with funds directly controlled by the national central banks. Claims on reserve assets, whether held at the ECB or remaining with each national central bank seem the natural candidate. The extent to which these assets can be used independently by a national central bank is limited by the need for ECB's approval; in our context the provision poses no difficulty since the ECB should be the central "manager" of the scheme. Any exchange of these reserves would take place between countries' representatives and is understood as an exchange between national central banks. Notice that all transfers would take place within the Euro area, and thus would not per se affect the international value of the Euro.

The welfare function for country i can thus be written as $u_i(d, w_i)$, normalized to zero in the status quo for all countries: $u_i(0, w_i)=0 \ \forall i$. The normalization is harmless, but makes clear that the status quo will be the reference point. Welfare is always strictly increasing in the private good w, but

can be increasing or decreasing in d: all countries prefer larger amounts of the reserve assets, but as for

the interest rate, some may prefer a change while others may prefer the status quo. Call v_i the valuation

attached to the change in interest rate by country i, defined by: $u_i(1, w_i - v_i) = u_i(0, w_i) = 0$. If a

country prefers the status quo, v_i is negative: the country can be made indifferent to the interest rate

change only if it is compensated with a transfer of assets; on the other hand, a country that prefers the

rate change would be willing to pay for it. For now, I ignore the possibility of liquidity problems and

assume $v_i < w_i \ \forall i$. Each national central banker on the ECB Council represents the interests of his

own country, and thus I will talk of his utility as identical to the country's welfare; he knows both his

own and everybody's else preferences (more precisely, all preferences are common knowledge).

We want to describe a mechanism, as simple as possible, such that the countries'

representatives will take the efficient decision, acting in a decentralized manner and without a

benevolent central planner. The Board of the ECB, composed of the members of the Council who are

not national central bankers, administers the mechanism, collecting any surplus if there is any and

verifying and enforcing the concerted decision. The mechanism should be completely transparent, so

that possible conflicts in national preferences - the central cause of unease, and hence mystery at the

heart of the ECB - take place in full light.

Defining which decision is efficient should not be particularly contentious: we want to select that

decision such that all opponents could at least in theory be compensated. Thus, if we denote with a star

the efficient decision d^*, our criterion selects $d^*=0$ if $\sum v_i < 0$ and $d^*=1$ if $\sum v_i \geq 0$ (making the

arbitrary choice $d^*=1$ if $\sum v_i = 0$). The actual extent of compensation, and hence the desirable

distribution of the private good w, is as usual less clear. It seems reasonable to assume that countries

cannot leave the Union at this stage without facing an extraordinarily large political cost, and thus we cannot appeal to any obvious participation constraint. A plausible requirement is that in the final outcome no country should find itself strictly worse-off than in the status quo: even if a country cannot leave, it can make its displeasure publicly and loudly known, a course of events that a new institution, with little experience and legitimacy, would do well to avoid. According to Widgrén (1999), guaranteeing pay-offs at least as high as in the status quo is an essential ingredient of a well-designed system for multinational decision-making. This is the criterion I apply below - others could be proposed, and may be implemented by appropriate modifications of the mechanism studied here. Summarizing, the desirable outcomes are the following: if $\sum v_i < 0$, then $d^*=0$ and $w_i = w_i^o$ $\forall i$, where w_i^o is the initial endowment of the private assets; if $\sum v_i \geq 0$, then $d^*=1$ and $w_i \geq w_i^o - v_i$ $\forall i$. In words, if the sum of the valuations is negative, no change to the status quo should occur; if the sum of the valuations is positive or zero, then the change in interest rate should be adopted, accompanied by transfers that make every country at least as well-off as in the status quo. I call such outcomes efficient allocations.

Consider the following mechanism: each national representative quotes a value σ_i, possibly negative; if $\sum \sigma_i < 0$, then $d = 0$ and $w_i = w_i^o$, i.e. the status quo is maintained, and no transfer takes place; if $\sum \sigma_i \geq 0$, then $d = 1$ and $w_i = w_i^o - \sigma_i$, i.e. the interest rate is changed and each representative pays the contribution he has announced (or receives it if negative). Thus each player's strategy, the announcement of σ_i, corresponds to the announcement of the player's valuation, and his payoff π_i (equal to his realized utility) depends on the whole set of σ_i's: $\pi_i(\sum \sigma_{-i}, \sigma_i)$, where $\sum \sigma_{-i}$ is the sum of all announcements by players different from i. All announcements are made simultaneously, and if $\sum \sigma_i >$

0 the resulting surplus is collected by the Board of the ECB.

Let's impose a weak truth-telling constraint requiring that whenever indifferent between alternative announcements a player tells the truth: in equilibrium $\sigma_i \neq v_i$ if and only if $\pi_i(\sum \sigma_{-i}, \sigma_i) > \pi_i(\sum \sigma_{-i}, v_i)$. We reach the surprising conclusion that *all* Nash equilibria satisfying such a constraint implement an efficient allocation (although not all need be truthful).

It is not difficult to see why. Intuitively, a player cannot gain by announcing a valuation higher than the true one, because such a strategy either has no effect (if $\sum \sigma_i < 0$), or costs him more than he is willing to pay (if $\sum \sigma_i \geq 0$) and results in negative utility. On the other hand, announcing a lower valuation than the true one is advantageous only if it does not lead to preserving the status quo, when truthful revelation would have led to a change in the interest rate. Hence it can only occur, it if occurs at all, when the final outcome is unaffected, i.e. when the outcome is identical to that reached under truthful strategies, and thus efficient.

The formal proof is only slightly more involved. Suppose first that $\sum v_i < 0$. Could the equilibrium be characterized by $\sum \sigma_i \geq 0$? Only if one or more players were declaring a higher valuation than the true one - a stronger preference for changing monetary policy or a weaker opposition than actually experienced - or $\sigma_i > v_i$ for some i. But if $\sum \sigma_i \geq 0$, then $d = 1$ and $w_i = w_i^o - \sigma_i$, and announcing the true valuation $\sigma_i = v_i$ always strictly dominates $\sigma_i > v_i$ since $u_i(1, w_i^o - \sigma_i) < 0$ if $\sigma_i > v_i$. It follows that $\sigma_i > v_i$ cannot be an equilibrium: if $\sum v_i < 0$, equilibrium strategies must be such that $\sum \sigma_i < 0$, and thus $d = 0$ and $w_i = w_i^o$ - the status quo is maintained and the efficient allocation implemented. In fact notice that given $\sum \sigma_i < 0$, all individual strategies yield the same payoff $u_i(0, w_i^o) = 0$; hence the requirement that whenever indifferent agents tell the truth selects $\sigma_i = v_i$ $\forall i$ as the unique

equilibrium strategy.

Now suppose $\sum v_i = 0$. The argument used in the previous paragraph rules out the possibility that in equilibrium $\sum \sigma_i > 0$. Suppose then $\sum \sigma_i < 0$. Again there must be at least one player who is not announcing his truthful valuation, but if $\sum \sigma_i < 0$, then $d = 0$, $w_i = w_i^o$, and $u_i(0, w_i^o) = 0$, and thus his payoff would be unchanged by telling the truth, whether or not this strategy would affect the final outcome. Thus equilibrium requires $\sum \sigma_i = 0$. If $\sum \sigma_i = 0$, then $d = 1$ and $w_i = w_i^o - \sigma_i$, and announcing a higher valuation than the truth is an inferior strategy. But if $\sigma_i \leq v_i$ $\forall i$, then the two conditions: $\sum v_i = 0$ and $\sum \sigma_i = 0$ imply that $\sigma_i = v_i$ $\forall i$: again truth-telling is the unique equilibrium and the efficient allocation is implemented.

Consider now the final scenario: $\sum v_i > 0$. Suppose $\sum \sigma_i > 0$. Then, without changing the decision to alter the status quo, any player i declaring $\sigma_i > 0$ and being taxed correspondingly would gain by lowering his announcement until $\sum \sigma_i = 0$. Thus $\sum \sigma_i > 0$ cannot be an equilibrium. In this scenario, and contrary to the previous two cases, truth-telling by all players is ruled out. Suppose $\sum \sigma_i < 0$. Then there is at least one player i announcing $\sigma_i < v_i$, and as argued before his payoff would be unchanged by telling the truth. Thus again $\sum \sigma_i < 0$ cannot be an equilibrium.[10] Can $\sum \sigma_i = 0$ be an equilibrium? What individual strategies would support it? Consider player i declaring σ_i. Suppose first $\sigma_i > v_i$. Then i's utility is strictly negative; announcing $\sigma_i = v_i$ would change the outcome to the status quo and be welfare increasing. Thus $\sigma_i > v_i$ cannot be an equilibrium. Suppose now $\sigma_i < v_i$. Then i's utility is strictly positive; with a lower σ_i the final outcome would revert to the status quo, a strict utility

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[10]Notice that if there exists a $\widetilde{\sigma_i} \in (\sigma_i, v_i)$ such that $\sum \sigma_{-i} + \widetilde{\sigma_i} \geq 0$, then player i can strictly gain by announcing $\widetilde{\sigma_i}$. The conclusion in the text is unchanged.

loss; a higher σ_i would leave the outcome unchanged but increase the compensation i has to pay (or reduce the compensation i receives), and again reduce i's utility. Thus i announcing $\sigma_i < v_i$ has no incentive to deviate. Finally suppose $\sigma_i = v_i$. Then i's utility is zero; a lower σ_i would change the outcome but not the payoff, and our weak truth-telling requirement rules out the deviation; a higher σ_i would not change the outcome but strictly reduce utility. Thus i announcing $\sigma_i = v_i$ will not deviate. It follows that strategies such that $\sum \sigma_i = 0$ can indeed be an equilibrium as long as $\sigma_i \leq v_i$ $\forall i$. In fact, considering the previous elements of our discussion, we conclude that these are the only possible equilibrium strategies when $\sum v_i > 0$.

I can now summarize the results. If $\sum v_i < 0$, then there is a unique equilibrium characterized by $\sigma_i = v_i$ $\forall i$ - hence $\sum \sigma_i < 0$ - and inducing the efficient outcome $d=0$, $w_i = w_i^o$ $\forall i$. If $\sum v_i \geq 0$, then all equilibria must be such that $\sum \sigma_i = 0$ and $\sigma_i \leq v_i$ $\forall i$, again inducing the efficient outcome $d = 1$ and $w_i = w_i^o - \sigma_i \geq w_i^o - v_i$ $\forall i$. As stated earlier, the mechanism fully implements the efficient allocation: all equilibria of the game lead to the efficient outcome.

Not all equilibrium strategies are truth-telling. In particular, although truth-telling is the unique equilibrium when $\sum v_i \leq 0$ (it is in fact a weakly dominant strategy), when $\sum v_i > 0$ at least some players must be understating their preference for the monetary policy change, or overstating their opposition. These are the players who enjoy a positive utility gain. The game does not determine their number - it could be one player, it could be all - or the distribution of the surplus among them. Although the existence of multiple equilibria does not affect efficiency, a practical mechanism for deciding monetary policy in a multinational central bank would need to be more precise on this issue. I will return to this point later.

For now, it is important to emphasize how strong and simple the conclusion is. It is a strong result because, as mentioned above, although there are multiple equilibria all of them lead to the efficient allocation. Hence the desired outcome will be achieved independently of whether or not a coordination rule selecting among the possible equilibria develops from the repeated interaction of the same players. It is also very simple, because the game we are studying is so natural. As remarked by Bagnoli and Lipman, most mechanisms implementing efficient public good provision are artificial and complex, even in the case of complete information.[11] But the game discussed here is as straightforward as any mechanism can be. The players are asked to express their valuations of the public good, knowing that it will be provided and compensatory transfers will take place if there is sufficient collective demand. Changing the level of the interest rate has zero direct cost; but in the more general game where a positive expenditure is required for supplying the public good, the mechanism can be reinterpreted as a collection of voluntary contributions. If total contributions are sufficient to cover the cost, the public good is provided; otherwise the contributions are refunded. If anything feels unnatural about the game, it is not the game itself, but rather its unusual application to a monetary policy decision.

Not surprisingly, such an obvious scheme has been studied in detail, especially by the literature devoted to the question of free riding (see for example Palfrey and Rosenthal, 1984). Focusing on all

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[11]In Casella (1997), I discuss the application to a monetary policy game of an elegant scheme proposed by Varian (1994) for decentralizing optimal allocations in the presence of externalities. The scheme requires each player to quote prices at which to demand compensation from all other players and prices at which to offer compensation. In a monetary union with 11 countries deciding independently the levels of their money supplies, 220 prices would have to be quoted. Including the money supply decisions, the solution would require solving a simultaneous system of 231 equations. The mechanism, so polished in theory, quickly becomes unrealistic.

Nash equilibria, that literature identified "good" equilibria, where the efficient allocation is achieved, but also a set of "bad" equilibria resulting in inefficient outcomes. However, as remarked by Bagnoli and Lipman, the efficient equilibria are much more robust than the inefficient ones and thus are the only ones selected by plausible refinements of the equilibrium concept. In their work, Bagnoli and Lipman require that equilibrium strategies be robust to small probabilities of mistakes by the other players, after dominated strategies are excluded (intuitively, a player is not really sure of the contributions the others are going to offer, but can safely exclude that any contribution will be more than the player's valuation). Here the same purpose is fulfilled by the simpler requirement that when indifferent a player tells the truth.

To see why a weak truth-telling constraint is sufficient to rule out inferior outcomes, consider what might happen without it. When the sum of the declared valuations is negative, or $\sum \sigma_i < 0$, the status quo is confirmed and no transfers take place. Thus if $\sum \sigma_{-i} + v_i \leq 0$, player i is indifferent among all announcements $\sigma_i \leq v_i$ and may well declare a large negative σ_i. But this argument holds for all players and therefore implies that $\sum \sigma_i < 0$ can be an equilibrium, even when the sum of the true valuations is non-negative ($\sum v_i \geq 0$), leading to the inefficient result that the status quo is confirmed when it should not be. If we require that whenever indifferent a player tells the truth, the inferior outcome is ruled out: whenever $\sum \sigma_{-i} + v_i \leq 0$, player i announces v_i, with the result that the sum of the declared valuations cannot be negative if $\sum v_i \geq 0$.

Although more subtle equilibrium requirements are possible, a weak truth-telling constraint has two main advantages: first of all, it is very intuitive and not implausibly restrictive. Second, recall that this is a game of complete information; thus players know what others' true valuations are. Especially in

the particular context of a multinational policy agency, there are advantages from developing a reputation for "straight talking", particularly in contrast to lying capriciously, when lies do not bring any strategic benefit.

I can conclude that the scheme would work efficiently. But how does it compare to alternative decision-making mechanisms?

4. Discussion

Given the ECB's formal but possibly not substantive reliance on voting, it is not clear what alternative mechanism is most relevant. Let's consider first the possibility of centralized decision-making by the Council. In the absence of information problems, a well-intentioned central planner can always choose directly the optimal allocation. Two questions arise then: can the central planner's benevolent intentions indeed be relied upon? Which objective function will the planner choose? From these points of view a market scheme has advantages. First of all, by leaving all authority to countries' representatives, the mechanism minimizes the loss of sovereignty required by joining the monetary union, or, more precisely, makes the extent of such a loss clear, predictable and governed by fixed rules. There is no advocation of a "culture of collective responsibility", a possibly desirable, but at the end rather slippery concept; no uncertainty about the future identity of the ECB Board; no reliance on forever well-intentioned international central bankers. Second, even if such a collective culture does indeed come into being, we just do not know how to aggregate the preferences of the individual countries into a Euro-area objective. If we think of the Council as simply maximizing a weighted sum of

national welfares, the choice of weights is problematic: by looking at Euro-area averages, the ECB is effectively using each country's share as weight, a plausible approach, but not a self-evident one, as would become clear if one country were to deviate significantly from the rest.[12] In the absence of transfers some countries could in fact fare worse than in the status quo.

None of these problems, and particularly the identification of the correct aggregate objective and the exchange of appropriate transfers, can be solved by resorting to voting procedures. If national representatives reflect the preferences of their country, the number of votes given to each of them (or, in the case of the ECB, the nationality of the members of the Executive Board) are an open and difficult issue. Alternatively, if some or most of the representatives reflect Europe-wide concerns, we are back at the thorny question of correct aggregation. As for transfers, typically and certainly at the ECB, their open discussion is neither planned nor encouraged. But if they do not take place, countries on the losing side of a policy decision are hurt; if in fact they do take place, in whatever fashion, they are hidden from the public and protected from scrutiny.[13] In addition, of course, majority voting can be faulted on the usual criterion that efficiency need not be achieved because the intensity of preferences is not accounted for: a mild preference by a majority dominates a very strong opposition by a minority. Finally, given the ECB's reliance on consensus, it is possible that decisions are in fact taken according

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[12]For example, the Harmonized Index of Consumer Prices, the final objective of the ECB, is constructed using as country weights the shares of private domestic consumption expenditure.

[13]When we think of policy decisions made on the basis of monetary transfers, we inevitably think of corruption. But the essence of a market mechanism is to make the transfers transparent and use the forces of open competition to come to the efficient decision. Transfers that are not declared openly and observed by the majority of the public are more easily channeled away from the public interest, whether or not they are monetary in nature.

to a unanimity requirement. Although unanimity guarantees that no country fares worse than in the status quo, in the absence of transfers the requirement imposes a strong and inefficient status quo bias.

From all of these perspectives, a market mechanism is preferable. In essence, because it reduces hard to define aggregate objectives to individual preferences and because it lets agents negotiate and arbitrage away possibility of gains, once an efficiency criterion is agreed upon a market mechanism overcomes the problem of defining a joint welfare function and engineers correct transfers. And it does so in a transparent and rule-bound manner.

This said, the mechanism has its own weaknesses. Starting with the more technical objections, as remarked earlier, whenever the change in policy is strictly desirable the multiplicity of equilibria leaves the distribution of the gains indeterminate. Even though efficiency is always preserved, this indeterminacy could create problems in practice. There are however two reasons to believe that the problem could be overcome. First, if the scheme were implemented literally, as a completely decentralized mechanism functioning without prior consultation among ECB Council members, in the presence of complete information one of the equilibria could emerge as focal. The problem only occurs when $\sum v_i > 0$; in this case, consider the equilibrium where each player announces $\hat{\sigma}_i < v_i$ such that

$$\sum \hat{\sigma}_i = 0 \text{ and } u_i(1, w_i - \hat{\sigma}_i) = k > 0 \ \forall i,$$ i.e. where the gains are divided equally among all players.

Such an equilibrium is the risk-dominant equilibrium of the game, in the sense of Harsanyi and Selten (1988), that is the equilibrium that players would select when unsure of the other players' strategies but able to form subjective expectations of these strategies, based on the common knowledge of the

payoffs.[14] Alternatively, and possibly more realistically, the national representatives could agree on a

"fair" distribution of the surplus during discussions that would precede their individual announcements.

In general, pre-play communication should be credible both because the selected outcome would be an

equilibrium - and hence no-one would have reason to deviate if he believed the others' stated intentions

- and because in this game there is no reason not to believe such stated intentions - no-one has reason

to manipulate others' beliefs. A natural form of pre-play communication that solves the multiplicity

problem is to agree to announce valuations sequentially in a specified order, presumably rotating over

time, as opposed to simultaneously. When the sum of the valuations is non-positive, truthful

announcements remain the unique equilibrium; when the sum of the valuations is positive, the first mover

captures the whole surplus, while all other players make truthful announcements (i.e. if $\sum v_i > 0$, then σ_1

$= v_1 - \sum v_i$, $\sigma_i = v_i \ \forall i \neq 1$, and $\sum \sigma_i = 0$. The equilibrium is always unique.[15]

Allowing for communication before the announcements, indeed relying on it for selecting the

equilibrium, appears to violate a strict requirement that the mechanism be decentralized. But in reality it

would be unrealistic, and probably undesirable, to rule out consultations between the countries, or

deprive country representatives of the expertise of the ECB Board. The goal of the market mechanism

I am describing is to set bounds on the agreements that the countries can enter during these pre-play

negotiations. Notice for example that the mechanism ensures that no country can ever be made worse-

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[14]Notice that our game is analogous to the standard bargaining game where players divide a given amount of money by announcing (simultaneously) their shares, under the constraint that the money will be allocated only if the sum of the announcements does not exceed the amount in question. These are unanimity games, where an equilibrium can be reached if and only if all players select it. Theorem 5.6.1 in Harsanyi and Selten (1988) can be applied directly.

[15]I thank Gabrielle Demange for suggesting this simple solution to the multiplicity problem.

off than in the status quo, a particularly important bound since the repeated nature of the game could in theory allow for a larger set of equilibria than those characterizing the static play.[16]

A second question of great practical relevance is raised by the large differences in economic size and population among EMU countries. At equal per capita wealth, bigger countries could command much larger resources, and since the policy is a public good, affecting all of their citizens, their valuation of the policy would be correspondingly much larger. But in the absence of liquidity constraints and given the requirement that no player can be made worse off than in the status quo, this is just as it should be. If more individuals, represented by the large countries, desire a policy change and are willing to compensate those who oppose it, then the change should be enacted; if on the other hand, it is a minority who wants to change policy but is not willing to compensate the majority set against it, then the status quo will prevail.[17]

The real difficulty is that in fact liquidity constraints cannot be excluded and would result in smaller, less rich countries having little say. This suggests a different line of reasoning. The market mechanism functions because countries express their preferences by renouncing a valuable private good. But does the private good really need to be monetary wealth? If we can think of an alternative, we might be able to overcome both the possibility of unfairly limiting the influence of the smaller

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[16]In this game any outcome that is not an equilibrium of the static game is Pareto-dominated by one of the (static) equilibria. Given that no player can be forced to accept a negative payoff, it is difficult to see how anyone could gain from enforcing an equilibrium in the repeated game that is not in the set of equilibria of the static game.

[17]Of course this leaves open the question of the aggregation of preferences at the national level. In the text, I am implicitly making the standard assumption that the national representative is able to set unambiguous national objectives, but the logically consistent position would be to advocate a market mechanism decentralizing decisions within national borders.

economies and the unmistakable (if possibly naïf) distaste at the idea of securing the direction of

common policies through financial might. In this setting, the natural alternative to having countries bid

for their preferred outcomes with *financial* capital would be to have them bid with *political* capital: if

countries had a given amount of political capital, they could decide how much to use at any individual

meeting, in an effort to equalize their expected gain from each. In other words, each country could be

given a determined amount of total votes a year, for example, and be allowed to use any number of

them (not superior to the remaining stock) on any deliberation. Intuitively, the possibility to carry votes

over time makes it possible to generate a comparison between different decisions, or equivalently an

endogenous valuation of each outcome in terms of votes (how many votes is a country willing to spend

to sway a decision in its favor?). This creates an analogue to the auction-like market mechanism

discussed in this paper. Even when applied to monetary policy, with regularly scheduled meetings and

unidimensional decisions, and even in the absence of information problems, the solution to this game

requires some thought. But ex ante it seems that efficiency could be enhanced: in its intertemporal

planning, a country will try to smooth the marginal return from spending votes; across countries, if in

equilibrium those on the losing side of an issue choose to spend less votes on it, they will be somewhat

compensated through the smaller depletion of the votes stock.[18] Without allowing explicit transfers of

votes among countries, some compensation is thus implicitly generated by the mechanism itself. From a

pragmatic point of view, the mechanism seems simple enough and possibly politically acceptable (once

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[18]The complication is that no player will vote unless he has some probability of being pivotal. I
expect an equilibrium with mixed strategies where both the number of votes each player casts and the
probability of voting depend on his valuation of the issue at hand, relative both to future issues and to
the other players' valuations.

the difficult but independent problem of determining each country's total votes has been overcome);

more acceptable than the full-fledged market mechanism and exchange of transfers that full efficiency

seems to demand.

5. Conclusions

The problem of coordinating a single monetary policy among sovereign heterogenous countries

of comparable economic and political size is now faced daily by the European System of Central

Banks. Although there is much talk of "establishing a European outlook" , there has been little explicit

discussion of the criteria and trade-offs that should lead policy-makers in aggregating and weighing the

needs of the different countries. Whether or not we think that market mechanisms can be appropriate

to the task, the thesis of this paper is that discussing feasible decentralized market schemes can help us

clarify what we consider essential, desirable, or unacceptable in supranational decision-making.

Comparisons with national central banks are useful but fall short of providing an applicable blueprint

exactly because they ignore the multinational nature of the ECB.

This paper argues that a common policy is a public good with unequal effects on the distribution

of wealth. When it is decided within a single political unit, the distributional effects can be countered,

more or less explicitly, through transfers to the losers, but such transfers are more difficult to explain to

each country's electorate, execute and enforce in an international setting. A decentralized market

mechanism has two advantages over most political solutions: it generates the correct, and transparent,

transfers, and avoids the difficult problem of aggregating different national preferences. A plausible

mechanism is presented and solved in the paper. However, a market scheme has a fundamental weakness: in the presence of liquidity constraints, smaller and poorer countries are effectively under represented. Both the advantages and the failings of the mechanism suggests amendments to traditional voting schemes. For example, an intriguing possibility would be to give countries stocks of votes that could be allocated among different deliberations over time. The possibility of substituting votes intertemporally should provide some needed flexibility and bring the scheme closer to an auction-like market mechanism. It is the task of ongoing research to verify whether the promises of such a scheme stand up to rigorous analysis.

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