

THE EMERGING NEW THEORY OF ECONOMIC POLICY

1. INTRODUCTION

A new theory of economic policy is emerging from the ashes of the classical one, elaborated since the 1940s by Ragnar Frisch, Ian Tinbergen, Bent Hansen, Henri Theil and others and prematurely died under Lucas's fierce criticism.

The classical theory of economic policy asserted the conditions for the controllability of a fixed set of targets by policymakers endowed with given instruments. It thus stated some general conditions for policy effectiveness and the need for policymakers to have recourse to second best solutions – by maximizing their preference function subject to the model representing the economy – in the case of a non-perfectly controllable system.

The founding fathers of economic policy were not concerned with analyzing the effectiveness of specific policy instruments. However, in the framework of the classical theory of economic policymaking it is not difficult to find the counterpart of the concepts of policy ineffectiveness and neutrality raised in the economic literature with reference to specific instruments, monetary policy, fiscal policy or others¹.

After its success, the classical theory of economic policy has been the object of fierce criticism from a number of points of view. The introduction of rational expectations led to an assertion of ineffectiveness of monetary policy more forceful than that stated by Friedman (1968) (see Sargent and Wallace, 1975). In a similar way, with rational expectations fiscal policy was considered to be ineffective on income. A proposition of policy neutrality or 'invariance' was then stated. Apart from the critiques advanced with reference to the effectiveness of specific instruments, Lucas (1976) raised the more general and forceful argument according to which a Tinbergen-type decision model is inconsistent with the assumption of rational expectations.

In more recent years, following Barro and Gordon (1983), a new approach to the analysis of economic policy has been developed, that

¹ See Holly and Hughes Hallett (1989).

of policy games, exempt from Lucas critique. Within this approach the issues of effectiveness of specific policy instruments have been raised again, mainly with reference to monetary policy, starting from the pioneering article of Gylfason and Lindbeck (1994)². Explicit or implicit formal conditions leading to monetary policy ineffectiveness – or neutrality – have thus been investigated in specific setups within the class of linear quadratic (LQ) games. Such conditions were apparently very different from those stated in the classical analysis of policy effectiveness and controllability: the latter are expressed in terms of matrix ranks, whereas the former have to do with the nature of the private sector's preference function³.

The need has thus arisen to investigate *general* conditions for policy controllability in the new strategic multi-player context. Research with this purpose has led not only to assert such conditions, but also to find conditions for the existence of an equilibrium in this new context⁴.

The aim of this paper is to present such conditions as well as to discuss the wide range of their applications in economic analysis and policy, in particular from the perspective of model building.

The paper is organized as follows. The next section describes the evolution of the classical theory of economic policy, the reasons of its decline and its recent rediscovery in a strategic context. Section 3 outlines the main contents of the new theory of economic policy. The new theory is in fact focused not only on problems of policy effectiveness, but also on the existence of the equilibrium of the economic system, which was considered to be outside the theory of economic policy in non-strategic contexts. Section 3 also presents intuitions for some extensions. Section 4 concludes and hints at further generalizations and applications.

2. THE TINBERGEN-THEIL APPROACH AND THE LUCAS CRITIQUE

2.1 *The Classical Approach to the Theory of Economic Policy*

The theory of economic policy has its roots in Tinbergen's

² See, among others, Acocella and Ciccarone (1997), Grüner and Hefeker (1999), Guzzo and Velasco (1999), Lawler (2000; 2001), Soskice and Iversen (2000), Coricelli *et al.* (2004; 2006), Cukierman and Lippi (2001), Jerger (2002), Lippi (2003), Acocella and Di Bartolomeo (2004).

³ See Acocella and Di Bartolomeo (2004).

⁴ See Acocella and Di Bartolomeo (2005; 2006), Acocella *et al.* (2006; 2007a; 2007b).

econometric models of the Dutch and the US economy (Tinbergen, 1936; 1939) and was developed when Tinbergen was serving as the first director of the Dutch Central Planning Bureau, 1945 on (Hughes Hallett, 1989).

Tinbergen addressed in formal terms the issue of the *controllability* of a fixed set of independent targets by a policymaker facing a parametric context (i.e. facing an economy represented by a system of linear equations) and endowed with given instruments and stated the well-known conditions for *policy* existence (see Tinbergen, 1952, 1956), in terms of number of instruments and targets. A similar approach was developed by Bent Hansen in the same years (see Hansen, 1958)⁵.

Tinbergen's theory raised some problems, some of which were then solved by Theil (1956). In particular, by prescribing that the policymaker should maximize a preference function subject to constraints describing the functioning of the economy, he avoided both the sub-optimality of an *a priori* choice of target values and the difficulties facing the policymaker when endowed with a lower number of instruments than the number of targets.

In doing so Theil arrived at a solution of the policy problem formally very similar to that predicated by Ragnar Frisch (1949; 1950; 1957; 1961), who had first conceived policy problems in terms of maximizing a social preference function, derived by interviewing policymakers.

Theil also overcame the rigid distinction between targets and instruments, allowing the latter to be relevant *per se* and directly introducing them into the objective function⁶, and developed the theory of economic policy in a dynamic setting⁷. Further improvements and advancements of the classical theory as to the *existence*, *uniqueness* and *design* of economic policies are due to a number of authors and accounted for in Leontief (1964; 1976), Heal (1973), Johansen (1977; 1978), Preston and Pagan (1982), Hughes Hallett and Rees (1983) and Petit (1990).

Development of the modern methods of control theory⁸ complemented this strand of literature to give an apparently very powerful set of instruments for designing and implementing policy issues.

⁵ As Petit (1990: 5) reminds us, the Swedish edition of Hansen's book is dated 1955.

⁶ This, however, may be necessary partly because of a misspecification of the objective function (Petit, 1990: 148).

⁷ Hansen (1958) also developed a dynamic approach to the policy problem.

⁸ See Bellman (1957; 1961); Kalman (1960); Pontryagin *et al.* (1962); Athans and Falb (1966); Pyndick (1973); Aoki (1976).

With the exception of Hansen (1958), the founding fathers of economic policy were only partly concerned with analyzing the *effectiveness of specific policy instruments*, which has been raised by the subsequent economic literature with reference to specific instruments, to monetary policy, fiscal policy, etc.

Indeed, by starting from the structural form and comparing it with the reduced one, in the framework of the classical theory of economic policymaking it is not difficult – in some cases at least – to find the counterpart of the concepts of policy ineffectiveness.

2.2 The Critique to the Classical Theory of Economic Policy

The classical theory of economic policy has been the object of criticism from a number of points of view. The introduction of rational expectations led to an assertion of the ineffectiveness of monetary policy more forceful than that famously stated by Milton Friedman in his 1968 *American Economic Association Presidential Address* (Sargent and Wallace, 1975). In a similar way, with rational expectations fiscal policy had been considered to be ineffective on income (Barro, 1974). A proposition of policy neutrality or ‘invariance’ was then stated.

Apart from the critiques advanced with reference to the effectiveness of specific instruments, the more general argument was raised by Lucas (1976) according to which a Tinbergen-type decision model is inconsistent with the assumption of rational expectations. The importance of this contribution lies in the fact that it denies the validity of the solution given by Tinbergen, Theil and others to the existence of an (optimal) policy vector (or a sequence of vectors) that can achieve policy targets (or get close to it), assuming the private sector behavior to be invariant to the vector itself.

2.3 Policy Games and the Neutrality Proposition

In the 1980s, pioneered by Barro and Gordon (1983), a new approach to the analysis of economic policy was developed, that of policy games, allowing us to overcome the Lucas critique. The main argument of policy invariance of the private sector’s behavior, raised by Lucas, can in fact be tackled when the issue facing the policymaker is built in a context (that of games) where the private sector’s behavior is explicitly modeled from its preferences, thus taking account of the different (expected) economic policies.

With Barro and Gordon (1983) the emphasis of the policy debate was still far from the search for conditions of existence of an instrument vector that could guarantee satisfaction of some fixed targets (Tinbergen's fixed-target approach) or an optimal policy that maximizes a given preference function (Theil's flexible-target approach). The discussion concentrated instead on issues of the *effectiveness* (or neutrality) of specific instruments, continuing in the new setting the debate started in the previous two decades.

Barro and Gordon (1983) analyzed the effectiveness of monetary policy in terms of a game between the central bank and the private sector, where the latter is the leader and trades off real wage and employment when setting the nominal wage rate. They delivered again the well-known assertion of monetary neutrality as a result of the private sector expectations of the monetary policy. The private sector forms rational expectations and fully crowds-out monetary effects on real output. In addition, Kydland and Prescott's (1977) time inconsistency implies a socially inefficient inflation bias in their model⁹.

The debate on monetary policy neutrality has been developed later in different ways. In an influential article, Rogoff (1985) shows that asymmetric information between public and private agents can break the neutrality mechanism, but only in terms of second moments by creating a trade off between the variances of inflation and output (or employment). Another line of discussion has been about the preferences of the private sector, which is strictly related to the issue of micro-foundations. Gylfason and Lindbeck (1994) suggest that monetary policy non-neutrality arises whenever the private sector (labor unions) is inflation averse¹⁰. Jerger (2002) demonstrates that the traditional paradigm of classical dichotomy does not hold if wage setters are inflation averse also in a different setting.

However, this rule seems to lose ground when non-competitive markets are introduced into the picture: Soskice and Iversen (2000), Coricelli *et al.* (2006), Cukierman and Lippi (2001), and other studies¹¹ show in fact that non-neutrality of monetary policy can derive from the interaction between imperfectly competitive goods and labor markets even when unions do not explicitly share a common objective with the monetary authorities. Acocella and Di

⁹ See, also Stokey (1990) and Sargent (2002: Chapter 3).

¹⁰ Acocella and Ciccarone (1997) generalize the result to the case of preference for the debt stabilization in the union's loss.

¹¹ See Cukierman (2004) for a survey.

Bartolomeo (2004) suggest that all these cases can be generalized and non-neutrality only emerges under specific conditions in terms of number of instruments and targets, when unions share some targets with the monetary authorities either directly or indirectly.

Policy games also recently seem to have taken on a new lease of life in dynamic context. The traditional Barro-Gordon mechanism has been implemented in general equilibrium framework by Ireland (1999) by considering a cash-in-advance model.

The Barro-Gordon model has also been extended to the case of multiple equilibria in order to explain different empirical stylized fact about long periods of high and low persistent inflation (Albanesi *et al.*, 2003a; 2003b). The current mainstream of monetary economics¹², which is based on a micro-founded version of Rogoff (1985) with price stickiness, is also oriented to the policy game literature, in particular, along the pioneering lines of Gylfason and Lindbeck (1986), to the introduction of the labor union behavior and fiscal and monetary policy interactions (see Blachard and Gali, 2005). Further evolutions are in the direction of the interaction among many monetary and fiscal authorities in both the new open-macro-economy (e.g. Pappa, 2004) and monetary union contexts (e.g., for a survey, van Aarle *et al.*, 2006). Finally, a promising new field of application in macroeconomics is that of robust control, which can be modeled as a policy game between a policymaker and a fictitious evil agent (see, among others, Söderström, 2002 and Leitemo and Söderström, 2004).

3. TOWARDS A 'NEW' THEORY OF ECONOMIC POLICY

3.1 *The Emerging New Theory*

The current debate on economic policy seems to focus on conditions for policy effectiveness, in a context – that of policy games – where each player has a preference function. The conditions found for the effectiveness of specific policies have simply to do with the arguments of the policymaker's preference function as compared to those of the other player(s). Thus they are stated in terms apparently different from those of the classical analysis of policy effectiveness and controllability, as the latter are expressed in terms of matrix ranks, whereas the former have to do with the nature of the private

¹² See e.g. Clarida *et al.* (1999).

sector's preference function and its relation with the policymaker's (sharing or not sharing some objective).

An advancement in the theory of economic policy has been reached when it has been realized that:

- a) the conditions for policy effectiveness stated since Gylfason and Lindbeck (1994) hold only under specific circumstances, which have to do with the requirements of controllability of an economic system asserted by the classical theory of economic policy¹³;
- b) general conditions for policy (in)effectiveness in a strategic multi-player context can be expressed that *are related* to the requirements of controllability laid down in the classical theory of economic policy;
- c) in the new setting of policy games, conditions under b) are relevant also for the existence of an equilibrium of the economic system (Acocella and Di Bartolomeo, 2005; 2006; Acocella *et al.*, 2006; 2007a; 2007b; 2007c).

In order to state the conditions for policy (in)effectiveness in a strategic context and apply the traditional theory of economic policy to study the properties of a policy game equilibrium, we first recall the traditional Tinbergen's *golden rule*, ensuring the existence – and uniqueness – of a policy that can control the economic system, according to which a policymaker can reach its (fixed) targets if the number of its independent instruments equals the number of its independent targets.

Second, we redefine *policy ineffectiveness*, since its classical definition¹⁴ cannot be maintained in the realm of policy games as policy instruments are here endogenous variables, whose values really depend on the preferences of the decision-makers. In this realm

¹³ In the small scale models normally used for analytical purposes, where there are only one or two policy targets and instruments, it is easy to pass from conditions for the effectiveness of specific instruments to those for controllability of the economic system. In particular, introducing an additional target – but not an additional instrument – for the private sector, sharing this target with the public sector can make a policy instrument effective, as now the private sector can no longer unilaterally influence its original target, without ensuring the system controllability by the policymaker. And when these models are expressed in a structural form, it is also easy to confound the issues of controllability with those of effectiveness of specific instruments.

¹⁴ The classical definition of policy ineffectiveness implies that autonomous changes in policymaker's instruments have no influence on the targets.

we can say that a policy is ineffective if the equilibrium values of the targets are never affected by changes in the parameters of its criterion¹⁵.

The new theory of economic policy has asserted the following propositions:

Proposition 1 (Ineffectiveness): *in a policy game where at least two players share some targets and an equilibrium exists, if one (and only one) player satisfies the golden rule, all the other players' policies are ineffective.*

Proposition 2 (Existence of equilibrium or consistency): *existence of the game equilibrium requires that two or more players do not satisfy the golden rule, if they share some targets (unless they share the same target values).*

These propositions appear to be particularly relevant from a methodological point of view. In fact, if we want to ensure a particularly important feature of the policy game we are going to build, in the form of some action taken by a player (in particular that player to which – in a narrow definition of economic policy – we want to attribute the quality of a policymaker) to be effective, we need that player to satisfy the golden rule of economy policy, as stated in Proposition 1.

In addition, in order to build a viable model, a check of *mutual consistency* between the optimal decisions of the agents must be performed. In other terms, we need to check the interaction between the players to guarantee a solution, i.e. equilibrium existence. In any game with all kinds of players (all public, all private or both public and private) having overlapping targets, the existence of an *equilibrium of the whole system* must exclude controllability of the same targets by more than one player. Proposition 2 must then be satisfied.

As an example, consider the case in which we want to model monetary policy. If we want to comply with empirical evidence, which – not without some disagreement – predicts that monetary policy is neutral in the long-run, while being non-neutral in the short run, we must ensure that the private sector is able to control output (the set of real variables) in the long, but not in the short, run (proposition 1). In addition, in order to overtake the Lucas critique, we must take account of the interaction with the private sector, whose action must

¹⁵ See Gylfason and Lindbeck (1994).

be modeled. To ensure consistency of the public and private sector choices, if they have overlapping targets, we need to check that they are not able to control the system at the same time (proposition 2).

3.2 Extensions

These propositions are so far mainly limited to the common LQ-games in a perfect information static context. Static controllability and equilibrium existence have also been examined in a dynamic setting. They refer to Nash policy games, but also hold in the case of a hierarchical equilibrium.

By contrast, if we extend our analysis to the case of linear-quadratic preferences, results are slightly different. By linear quadratic preferences we mean that some (target) variables are second order entry in the players' preference and others enter only linearly, i.e. are first order entry. In the case of linear-quadratic preferences, the golden rule has to be redefined in terms of quadratic target variables, i.e. a policymaker satisfies the golden rule if the number of its independent instruments equals the number of its independent quadratic targets. In this case both propositions still hold for simultaneous (Nash) games. Proposition 1 also applies to the hierarchical case under linear quadratic preferences, but proposition 2 does not hold.

Conditions for a Nash Feedback Equilibrium in LQ-difference games have also been found (Acocella *et al.*, 2007a).

Propositions 1 and 2 just presented have been further extended to the case of sparseness, which is very important in economics since it is displayed by most economic models. Sparseness means that economies are characterized by structural forms where each endogenous variable is related to just one or two other endogenous variables; and then to one or two lagged endogenous variables or control (predetermined) variables. In the case of sparse economies, the two propositions can be rewritten as follows.

Proposition 1: In the case of sparse matrices, if the targets of one (and only one) player which are directly subject to dynamic adjustments also satisfy the Golden Rule among themselves, then the policies of all other players will be ineffective with respect to their dynamic targets.

Proposition 2: Conversely, no Nash feedback equilibrium exists in the case of sparse matrices, if two or more players satisfy the

Golden Rule for their dynamic targets – unless they happen to share target values for those variables. But the Nash equilibrium may still exist if the Golden Rule is satisfied and the target values for the non-dynamic targets differ across players; and the policies of the other players will still be effective for those targets even if one (or some) player satisfies the Golden Rule (Acocella *et al.*, 2007a).

Rational expectations of non-strategic agents have also been considered (Acocella *et al.*, 2007b)¹⁶ in the new theory of economic policy. This step is important for at least two reasons: first, because the rational expectations were fatal to the classical theory; and second because the rational expectations assumption is the usual technique for introducing the forward looking behavior of the private sector, a vital ingredient in the recent development of modern macroeconomic theory.

The new theory of economic policy therefore has been extended to the case where not only do the strategic interactions between the players respect the rational expectation assumption, but also the constraints that they face can be derived from this assumption.

On-going developments include full extension to dynamic controllability as well as applications to issues of public goods and time inconsistency (Acocella *et al.*, 2007c; 2007d).

4. CONCLUSIONS

The emerging new theory of economic policy settles an old issue (policy controllability) in the only setting (policy games) in which it can be consistently placed to overcome the Lucas critique. This theory goes back somehow to the propositions of the classical theory, which is of interest from the point of view of the history of economic thought.

Its two fundamental propositions appear to be essential for model building, as they state the conditions for the consistency of the optimal strategies of all the players (and thus the existence of the equilibrium of the game) as well as the effectiveness of policy instruments.

The new theory can ‘naturally’ accommodate issues of micro-foundations of macroeconomic relations, since the strategies of

¹⁶ Indeed, the rational expectations of strategic agents are strictly related to the policy games since the rational expectation constraint emerges as a particular case of Stackelberg game. The agents that form rational expectations can be, in fact, considered as the game leader with respect to the action of the other agents or policymakers.

the different players are the outcomes of a maximizing process. In this sense it is particularly suitable for the recent development of macroeconomic literature, where the linear-quadratic approach is predominant, even if not exclusive, because of the log-linearization procedure. This is the case of the cited standard New Keynesian literature and cash-in-advance versions of Barro and Gordon (1983) as well as of the recent developments that, in the spirit of Gylfason and Lindbeck (1986), consider the interaction between monetary and fiscal authorities and labor unions, as in, e.g., Blanchard and Gali (2005; 2006). Further grounds of applicability lie in the evolution of the literature about dynamic interactions among many monetary and fiscal authorities both in the new open macro-economy and in monetary union contexts¹⁷; and the promising field of application of robust control to macroeconomics, which can be modeled as a policy game between a policymaker and a fictitious evil agent¹⁸.

The propositions outlined in this paper, or similar ones to be developed, can be applied to all these models, in principle¹⁹. In some cases, these could raise further difficulties. For instance, the non-linearity existing in many of the aforementioned models would apparently make it difficult to apply our propositions, which have been introduced only for the linear-quadratic case, and can thus be generalized one-for-one only to log-linear-quadratic versions of non linear models. Robust control policy games strongly call for the introduction of uncertainty in a more complex manner than additive disturbs, which can be easily managed in a linear-quadratic context. Together with such difficulties, however, further fields of applications of the new theory of economic policy could emerge and enhance its domain.

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¹⁷ See Pappa (2004) or van Aarle *et al.* (2006) for a survey.

¹⁸ See, among others, Söderström (2002) and Leitemo and Söderström (2004).

¹⁹ For applications to New Keynesian models see Acocella *et al.* (2007b).

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ABSTRACT

This paper outlines the evolution of the theory of economic policy from the classical contributions of Ragnar Frisch, Ian Tinbergen, Bent Hansen, Henri Theil to recent work in the field of strategic interaction. The new, emerging theory of economic policy, albeit rooted in the classical paradigm, is consistent with rational expectations, and is particularly important for model building, as it states general conditions for the effectiveness of economic policy and the existence of equilibrium.

Keywords: Policy Games, Policy Effectiveness, Controllability, Equilibrium Existence

JEL Classification: C72, E52, E61

RIASSUNTO

La nuova teoria emergente della politica economica

Il saggio delinea l'evoluzione della teoria della politica economica a partire dai contributi classici di Ragnar Frisch, Ian Tinbergen, Bent Hansen ed Henry Theil fino alla recente considerazione di situazioni di interazione strategica.

La nuova teoria emergente della politica economica ha le sue radici in quella classica, ma è coerente con le aspettative razionali, ed assume particolare rilievo per la costruzione dei modelli, dato che stabilisce le condizioni generali per l'efficacia della politica economica e per l'esistenza dell'equilibrio.