

SATISFICING AND SEQUENTIAL TARGETS IN ECONOMIC POLICY: A POLITICO-ECONOMIC APPROACH

STAVROS A. DRAKOPOULOS*

Department of Philosophy and History of Science, University of Athens, Greece

The standard optimising framework has difficulties in explaining macroeconomic policy phenomena in some countries, such as long-term spiralling public debts and sequential setting of policy targets. Moreover, it has not responded convincingly to some common criticisms, such as the question of symmetry, and the failure to account for the existence of policy-lobbying groups. This paper suggests that a satisficing approach to economic policy is a possible way of accommodating all the above. This approach combined with priority target setting has been used in other social sciences. It concentrates on the concepts of sequential attention to policy objectives and 'satisfactory' macroeconomic targets. It also provides a choice theoretical framework as a foundation of the satisficing approach to economic policy. A simple example of a satisficing sequential target model is presented. There is also an attempt to link other alternative approaches, such as politico-economic models, with this framework.

One of the first explicit attempts to formulate a theory of macroeconomic policy planning was undertaken by Tinbergen (1952, 1956). Subsequently, other works appeared including Theil (1956, 1968), Fisher (1968, 1970), Pissarides (1972), Peston (1974), Kydland and Prescott (1977), Barro and Gordon (1983), and Currie and Levine (1985). The latest development in the field has been the increased emphasis in explaining government behaviour towards macropolicy in terms of game theory (see for example Alesina, 1987; Alesina and Tabellini, 1988; Hsieh, 2000). In spite of the differences in other respects (e.g. full optimal policy rule versus linear time invariant feedback rules; Currie and Levine, 1985; Hughes Hallett, 1989; Clarida, Gali and Gertler, 1999), the main body of the theory operates in an optimising framework. The standard implicit assumption of this framework is that policy-makers adopt an objective function that is characterised by continuous substitution between the objectives of macro policy (e.g. continuous substitution between employment and inflation, see for

* Special thanks are due to M. Milgate, C. Pitelis and to an anonymous referee. I would also like to acknowledge useful comments from P. Sloane, A. Hughes Hallett, T. Moutos, A. Oswald, I. Theodossiou and J. Skatun. The usual disclaimer applies.

instance Kydland and Prescott, 1977; Rotenberg and Woodford, 1997). Over the past several years there have been attempts to provide a theoretical basis of the policy-makers objective function by taking as the welfare criterion the concept of representative agent (see for instance Ireland, 1996).

The standard approach has received a number of theoretical criticisms, especially in the last two decades. In particular, the quadratic objective function (which is the commonest application of the optimising approach) has been attacked in terms of inadequacy. Critics have argued that its symmetry, in the sense that positive and negative deviations from the desired values have the same weight, is unrealistic. Most of the critics suggest a dynamic decision model in its place (e.g. Kunstman, 1984). Similarly, the representative agent basis has been criticised in terms of its adequacy in terms of welfare analysis. Some socioeconomic groups suffer more in recessions than others and thus the representative agent utility might not provide a correct indication of cyclical fluctuations in welfare (see also Clarida, Gali and Gertler, 1999, p. 1668). Another line of criticism is that the quadratic objective function fails to account for the existence of socioeconomic pressure groups, which are lobbying the policy-makers and thus undermine the idea that the policy planners optimise (e.g. Fernandez and Rodrik, 1991). Theorists who follow a politico-economic approach also sympathise with this view (see Frey, 1978). In particular, the importance of lobby groups might imply that some objectives are more 'urgent' than others and this undermines the standard idea of complete substitution of objectives. This viewpoint is also related to the public policy literature concerning the existence of many types of actors in the decision process (e.g. expenditure advocates, expenditure guardians; see Blom-Hansen, 1999). The final line of criticism has to do with empirical indications that actual policy-makers do not engage in optimising but follow a different decision pattern (for instance, priority target setting). In the same framework one could see the view that standard rational choice models are inadequate in explaining complex and dynamic political interactions which have been observed in the history of policy making (e.g. Fogel, 1992).

One possible way of taking into account all of the above criticisms is to adopt a 'satisficing' approach to economic policy. There have been a few attempts to formulate such an approach to economic policy, the most explicit being Mosley's work (Mosley, 1976; Mosley and Cracknell, 1984). Important elements of a satisficing approach can also be found in other works on economic policy such as Lindblom (1968), Frey (1978) and Gylfason and Lindbeck (1986). The satisficing framework takes into account the problems concerning symmetries, and the role of socioeconomic pressure groups. In addition, this framework contains the idea of sequential attention to goals, which implies that there is no continuous substitution among policy-makers' objectives. It also seems to be closer to the actual policy making since, as will be seen, there are historical and empirical findings pointing to the relevance of the satisficing approach. This paper has, as its starting point, a satisficing approach to economic policy and extends this into a priority-based choice model of government behaviour. The analysis is conducted in a politico-economic framework. Whereas other authors' emphasis was on the testing of the satisficing approach, this paper focuses on

its choice theoretical underpinning in relation to macropolicy design. The aim is to provide the choice theoretical basis towards constructing a satisficing approach to macroeconomic policy.

I. HISTORICAL RECORD

There are some historical episodes of macroeconomic policy that are difficult to explain by the traditional approach. The case of public debt is a good example. There are countries that have experienced substantial increases in their public debt figures. Such increases of public debt have a highly destabilising effect. For instance, in Italy the rate of public debt to GDP has continuously increased from 57% of GDP in 1980 to about 114% of GDP in 1999. Similar increases are observed in Greece, where there was an increase from 47 to 103·9% again in the same period. Moreover, Belgium's GDP debt ratio has continuously been rising from 55% in 1978 to 115% in 1999. In Spain, the public debt rose from 16·8% of GDP in the 1970–1980 period to 63·4% of GDP in 1999 (source: *European Economy*, 1999). There are other countries with lower total figures but with a continuously increasing rate of public debt (see also Roubini and Sachs, 1989). (It has to be noted though that in the last few years, the debt ratio has shown a downward trend in a number of EU countries.) Furthermore, in the US the debt/GDP ratio increased to 68% in 1995 and this ratio is comparable to the debt/GDP ratio of the period following the end of World War II (Alesina, 2000, p. 6).

It is not very easy to explain the above in the context of the standard optimising framework. The frequent prediction of this framework is that at least in peacetime, countries should experience a falling ratio of public debt to GDP due to the application of optimal tax smoothing by the fiscal authorities (Barro, 1979; Alesina, 2000). As Alesina and Drazen point out:

... [T]he timing of stabilizations and, in particular, their postponement cannot be easily understood in terms of models in which the policy maker is viewed as a social planner maximising the welfare of the representative individual (Alesina and Drazen, 1991, p. 1171).

Similarly, Alesina points out that with respect to the US public debt '... the fiscal policy of the 1980s was unsound from the point of view of the tax smoothing' (Alesina, 2000, p. 6). In favour of the standard approach, one could argue that rising public debt could be explained in terms of short-period maximising governments that borrow in order to bribe the electorate and ignore any problems that arise after the next election. Although this explanation seems plausible, it is at odds with the standard assumption of the traditional approach that voters are rational, forward-looking and perfectly informed (e.g. Austen-Smith and Banks, 1988; Taylor, 2000). Furthermore, there is still some difficulty in accounting for the continuing rise of public debt over a long period of years (see also Alesina, 2000). Moreover, this explanation is based more on politico-economic models than on standard optimising models. In particular, politico-economic models were the first to provide a rationale for believing that governments are not only willing to stabilise the economy but that they have an interest in creating some types of cycles (Frey, 1978, p. 218; for a general survey see Gartner, 2000).

In addition, there are significant empirical indications of the existence of explicit target levels of macroeconomic objectives by many governments. In particular, there are clear indications that the US government has followed and still follows a target-setting policy and, more importantly, a policy of sequential targets. In the first post-war years with the Employment Act of 1946, there was a legal commitment to full employment. Clearly, the government thought of full employment as the most important policy objective. This was also the case when the Kennedy–Johnson administration officially adopted a full employment goal of 4% unemployment (Tobin, 1987, p. 95). During the 1970s there were implicit targets of 5 and 6% (Tobin, 1987, p. 95). Subsequently, it seems that inflation replaced unemployment as the most important objective of macroeconomic policy. As Taylor states: '[In the last two decades] the Fed has placed a greater emphasis on keeping inflation low' (Taylor, 2000, p. 21). Furthermore, the policy-makers argue that price stability should be the ultimate goal and in practice this implies an inflation rate between 1 and 3% (Bernanke and Mishkin, 1997).

Maintaining a high level of employment was also an explicit priority goal for the UK government in the first post-war years (Kennedy, 1982, p. 25). Another explicit example of target-setting or priority behaviour of the policy planners, is the 1972 'dash for growth' budget, which was designed to raise the annual rate of growth to 5%. Fiscal and monetary instruments concentrated on raising the growth rate to the specified level (Gowland and James, 1990, p. 318). In the mid-1970s inflation started to acquire importance and gradually became the primary policy objective. This was made more obvious in the 1980s and was characterised by Conservative governments. Policy tools were directed to the control of inflation rather than unemployment as in earlier decades (Gowland and James, 1990, p. 332 and for a historical review of British economic policy see Greener, 2001). As was the case in the US, the authorities explicitly stated that macroeconomic policy should be devoted to combating inflation (Artis and Lewis, 1991, p. 55; Gamble, 1994, p. 194). In addition, it was evident that the government saw inflation as the most important policy objective:

Macroeconomic Policy formulation in Britain since 1979 would seem to have followed a markedly different approach. Rather than attack economic problems together, it has been argued that they need to be tackled sequentially: inflation first, then unemployment (Artis and Lewis, 1991, p. 54).

This type of behaviour is also not uncommon in other countries like Germany, where low inflation has long been viewed as the primary policy objective and essentially more important than any other goal (see Hibbs, 1985, pp. 194–95).

In support of the traditional optimising approach, one could argue again that the 'inflation first' approach can be explained in terms of a short-term rule of thumb designed to maximise an implicit utility function, the elimination of inflation being sufficient and/or necessary to reach other goals. Although it is difficult not to take into account the above claim, the time length of the historical examples mentioned, undermines the short-term element that is necessary for a standard 'optimising' explanation.

The crucial point emerging from the above is that the standard optimisation analysis might have some problems in explaining a number of historical episodes in the design of macroeconomic policy. First, there is some difficulty in explaining continuously increasing public debts over a period of years.¹ Second, the practice of target-setting is not easily compatible with the traditional optimisation of a quadratic objective function. Finally, the explicit ordering of policy objectives is also hard to reconcile. Rather it seems that many cases point towards a sequential target-setting approach of the type that we examine below. It has to be noted that some of the historical episodes can also be explained by using other alternative approaches, such as game theory, but as will be seen, it is not impossible to establish connections with satisficing explanations.

II. ALTERNATIVE APPROACHES TO MACROECONOMIC POLICY DESIGN

As was mentioned previously, the quadratic objective function is the most common objective function used in the literature. It has been argued that there are advantages in using it especially when there is a choice between specifying the model versus specifying the objective function. The quadratic objective function is thought to be a second-order approximation, while the model is only a linear or loglinear one (Hughes Hallett and Rees, 1983). It is also argued that given the inherent difficulties of macroeconomic model building, e.g. Keynesian versus Monetarist modelling, the quadratic objective function entails fewer problems. However, it seems that the quadratic objective function, and in general the optimising framework, have difficulties in explaining historical episodes, examples of which were mentioned above. This, combined with some theoretical criticisms already mentioned, gave rise to alternative approaches.

The satisficing approach to economic policy draws from the work of Simon (1959), Cyert and March (1963) and especially from the works of Lindblom (1968), Frey (1978), Frey and Schneider (1978) and Mosley (1976, 1984). The traditional underlying idea of such an approach is that the policy-makers engage in satisficing because of informational and computational constraints. The starting point of a satisficing framework is the existence of aspiration levels for macroeconomic policy objectives. For instance, policy-makers set specific target levels for important objectives, such as employment and inflation. Next, the decision-making body (the government) is seen as an organism which, 'instead of continuously striving for the best that is possible, reacts discontinuously when and only when the variables which affect its welfare have reached levels unsatisfactory to it' (Mosley, 1976, p. 60; also Frey, 1978, p. 211).

The traditional justification of satisficing theory is the idea of complexity (for a review see Conlisk, 1996). In the context of economic policy, this implies that initially the government attempts to maximise its utility subject to a number of constraints and future re-election prospects. However, the government is not able to solve this complex dynamic optimisation problem, and resorts to satisficing (Frey and Schneider, 1978).

¹ In the last few years, some authors have offered plausible explanations for rising public debt. However, they divert from the logic of the established approach by allowing the concept of socioeconomic groups to play a central role (see Alesina and Drazen, 1991).

Apart from the traditional satisficing justification, another theoretical foundation for the existence of satisfactory target levels might be in that they represent a compromise, which is reached after a conflict. Some papers on macroeconomic policy employ the idea of conflict among different socioeconomic groups. The primary example is the 'war of attrition' models (Backus and Driffill, 1985; Tabellini, 1987; Alesina and Drazen, 1991). The established practise, at least in US politics, of electoral campaign contribution groups affecting voting decisions of legislators, can be viewed in the same framework (see for instance Snyder, 1993; Stratmann, 2002). The satisfactory target idea can be seen as a compromise outcome of these conflicts. It is also possible to envisage conflict among different departments of the government or a conflict of different lobby pressures. This idea is found again in the literature of dynamic games between a monetary and a fiscal authority with conflicting objectives (Sargent, 1986; Loewy, 1988). It can also be found in political theories that emphasise the dichotomy between the public bureaucracy and the politicians. Political theorists have long pointed out the inherent conflict of objectives of different policy departments (for the basic exposition see Davis, Dempster and Wildavsky, 1966; and for a recent example Holzinger, 2001). The satisfactory level of a variable can be a compromise among these different departments (e.g. Mosley, 1976). Furthermore, these satisfactory levels of targets are not seen as rigid but as capable of modification upwards or downwards depending on their previous levels.

The satisficing model can be combined with the idea of sequential attention to goals. Sequential models have been proposed in the past, especially in connection to explaining past political events. For instance, Fogel suggested a sequential model as an alternative to the standard rational choice model in order to explain the political realignment of the 1850s in the US (Fogel, 1992). Similarly, the concept of 'hierarchy of policy goals' has been used in the public policy literature (for a recent example, see Greener, 2001). The idea of design of macroeconomic policy is not new in the literature. In particular, Tinbergen's discussion of macroeconomic policy targets in terms of 'urgent' and 'less urgent', where the less urgent targets are dropped when not all can be achieved, can be seen in this perspective (Tinbergen, 1956, pp. 59–60). There is also some suggestion (although relatively undeveloped) that the government might not engage in complete substitution among objectives (this is closely related to a sequential approach). Although a few subsequent authors, such as Peston (1974) and Encarnacion (1983), followed Tinbergen and suggested that continuous substitution might not be the norm, the idea did not have much impact on the literature of macroeconomic policy design. The adoption of the idea of sequential targets gives rise to a hierarchical approach to goals or priority-based choice: there are more important goals or targets that need to be satisfied first before secondary ones are considered.

A possible justification of such an approach can be found in politico-economic models. For instance, implicitly assuming a Phillips type trade-off, Hibbs (1977) argues that political parties have different preferences over the trade-off between unemployment and inflation outcomes. The main reason for this is that these outcomes have important consequences in terms of income distribution. His model

includes the notion of socioeconomic groups or classes. A low unemployment/high inflation outcome is favourable to the lower middle class; a high unemployment/low inflation outcome is favoured by the upper middle class. Left-wing parties choose the first outcome and right-wing parties choose the second. Frey *et al.* express similar ideas which emphasise the government's popularity as an additional important factor (Frey and Schneider, 1978; Frey and Ramser, 1976). There are indications of the empirical relevance of such models (Frey and Schneider, 1978; Alesina, 1987; Alesina and Sachs, 1988). These types of models support the view that the party in power will set target levels of priority policy objectives in order to satisfy its electoral support and increase the chances of re-election.

The historical episodes that we described cannot prove the validity of the satisficing approach. However, they can be accommodated in a sequential target satisficing framework. For instance, the experience of spiralling public debt can be explained in terms of a government that has set its primary objective to increase employment to a certain level by expansionary policies. Similarly, tackling a rising government deficit and thus a rising public debt may be very low down the priority list of a given administration. The explicit setting of targets that was observed in the US and UK can be explained by the satisficing theory. Finally, the 'dash for growth' and 'inflation first' episodes can be captured with a sequential targets satisficing model. It should be clear that the explanatory power of the model is enhanced when it is conceived within a politico-economic analytical framework. Moreover, there are empirical indications of satisficing behaviour in the context of economic policy (Mosley, 1976; Frey, 1978; Mosley and Cracknell, 1984).

Although there has been some work on satisficing and macroeconomic policy, the emphasis was not on the theoretical formulation of this approach to macroeconomic policy. We believe that the two important elements of the satisficing approach that we described, namely the aspiration levels of targets and the sequential attention to goals, can be captured with a priority-based or hierarchical choice system. This is also relevant to previous works, such as that of Tinbergen who also hinted at the hierarchical nature of macroeconomic policy planning.

III. MACROECONOMIC POLICY AND A PRIORITY-BASED MODEL

The priority-based model of choice has been used in a number of economic applications including consumer theory, demand and Engel curves, theory of the firm and social choice (Georgescu-Roegen, 1966; Day and Robinson, 1973; Chipman, 1971; Fishburn, 1974; Ferguson, 1964; Encarnacion, 1964A, 1964B, 1983; Earl, 1983; Drakopoulos, 1992, 1994). It has also been used in other social sciences, e.g. psychology, politics and sociology (see Maslow, 1954; Tversky, 1969; Ardrey, 1970; Margolis, 1982; Levi, 1986). The basic underlying idea of this choice system is that some critical level of variables (aspiration or satisfactory levels) must be satisfied before there is substitution. In other words, there is a loose ordering of variables in the sense that some given levels of important variables must be satisfied first before other less important

ones are considered. The general formal statement of the priority-based model is the following: Let x and x' be two alternatives which might be bundles of goods, business objectives or, more relevant with respect to macroeconomic policy, macroeconomic policy objectives.

$$x = (x_1, x_2, \dots x_n)$$

$$x' = (x'_1, x'_2, \dots x'_n)$$

$x \mathbf{P} x'$ iff (\mathbf{P} means 'preferred to')

1. $x^*_1 > x_1 > x'_1$, or
2. $x_1 = x'_1 < x^*_1; x_2 > x'_2$, or
3. $x_1 < x^*_1 < x_1$, or
4. $x^*_1 < x_1, x'_1; x^*_2 > x_2 > x'_2$
-
- $x^*_{n-1} < x_{n-1}, x'_{n-1}; x_n > x'_n$

The starred variables represent acceptable or satisfactory level goals, which of course in line with other work on satisficing, need not be fixed. The key point here is that components are not viewed as equally important. Component x_1 is considered as more important than x_2 up to a point where $x_1 \geq x^*$. The same holds true for x_2 and x_n . In a regular ordering, all the components are equally important (preferences are Archimedian; Borch, 1968). Thus in the case of macroeconomic policy such a system would imply, for instance, that a satisfactory level of inflation x_1 must be attained before the next objective unemployment x_2 is considered. Furthermore, the preference system is likely to produce kinked indifference curves (see Day and Robinson, 1973; and also the following section of this paper). We can also express the above in terms of utility if we assume that u is a preference index function or, stated differently, utility is represented as a components-ordered vector (Encarnacion, 1964A; Canterbury, 1979, p. 87). Then $u(x) > u(x')$ according to the previous choice system.

The above choice system can be applied to social choice. This is useful since many papers on the design of macroeconomic policy are expressed in such terms. Following Encarnacion (1983) we can consider the social utility function as a vector, in which each alternative can be represented in the space of objective variables: $z = (z^1, z^2)$. Now we form a function defined over z which would express social preferences. Corresponding to each objective i there is a function: $u^i = u^i(z^i)$ such that $u^i(x) > u^i(y)$ implies that the alternative x is preferred to alternative y on the basis of objective i . It is also assumed that there exist arbitrary $u^{*i} = u^i(z^{*i})$, where z^{*i} is a particular constraint level of z^i . The social utility function can then be written in the following form:

$$u = (\min[u^1(z^1), u^{*1}], \min[u^2(z^2), u^{*2}], \dots) \tag{3.1}$$

Relation (3.1) implies that social alternatives are ordered by the first objective up to the target level. Once the target has been reached, the second objective operates and consequently orders the social alternatives.

The sequential character of the social utility function can prove useful where there are multiple objectives, especially in relation to macroeconomic policy where constraints are common. Let us attempt to see the operation of relation (3.1) by giving a simple example. Assuming that there are two macroeconomic goals employment (L) and price stability (P) and that employment is the primary objective until L^* , then we can express the above by taking a two-part function:

$$U(L, L^*, P) = \{U_1(L, P), U_2(L, L^*, P)\} \quad (3.2)$$

where $U(L, L^*, P) = U_1$ for $L \leq L^*$ and $U(L, L^*, P) = U_2$ for $L > L^*$

Obviously, there is the problem of setting the 'appropriate' level of L^* (or P^* in the case where price stability is the primary objective). The standard explanation in the context of the satisficing model is that it represents compromise among government units (or lobby groups) and they might have to do with previous levels or even perceptions of electoral success (Mosley, 1976).¹ Another way of setting them might involve the application of a simple majority voting system. Following Black on voting and preferences, the social L^* , for instance, could be the median of individual candidates for L^* . In case there is a secondary target (e.g. P^*), a repetition of the process can be employed (see Black, 1958; Encarnacion, 1983). It is also worth noting that the problem of Arrow's impossibility theorem remains here, as is usually the case for theories of macroeconomic policy that involve the concept of socially desired targets (Arrow, 1963).

With the above in mind we can give a simple example which incorporates a specific government utility function. One of the possible ways to construct a government utility function based on the above (relations 3.1 and 3.2), is to adopt a two-part function that changes when the target level of the variable is achieved. Suppose that we have a simple situation of two objectives, employment (L) and price stability (P), with employment being the primary objective. The specific form utility function is a standard one (see Mankiw, 1988)

$$U = \begin{cases} L + bP^2 & \text{for } L < L^* \\ L^* + bP^2 + \sigma(L - L^*) & \text{for } L \geq L^* \end{cases} \quad (3.3)$$

where $0 \leq \sigma \leq 1$ and $b > 0$.

The structure of the utility function implies that employment becomes a secondary objective when the target level is reached. The incorporation of L^* can also be justified by accepting behavioural public bureaucracy models which assume that the bureaucracy is interested in the expansion of outlays; see Davis, Dempster and Wildasky, 1966; Niskanen, 1971; Van den Doel, 1979; Drakopoulos and Karayiannis, 1999). This group has a target of employment L^* , which is considered vital for its interests. Given the above utility function, the shape of the policy-makers' indifference curve will be as shown in Figure 1 (the formal proof is given in the Appendix, part A).

¹ This might be connected with models in which bureaucrats influence the level of Government spending (see Tullock, 1965; Niskanen, 1971).

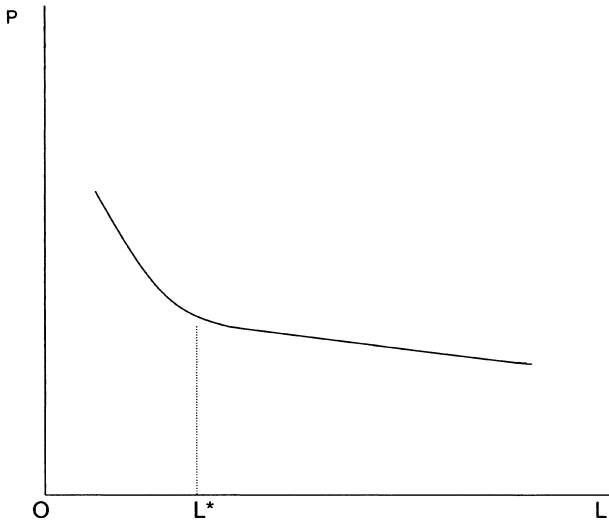


FIGURE 1. The policy-makers' indifference curve.

The kinked social indifference curve implies that policy-makers change objective when a critical level of the most important variable is reached. In this specific case when the satisfactory level of employment (L^*) is attained, the policy-makers care more about price stability (see also the Appendix, part B). It has to be noted that this example is for illustrative purposes only. We can construct a similar utility function where price stability is the prime objective. Furthermore, it is possible to add other objectives in this general framework (e.g. current deficit target).

IV. CONCLUDING COMMENTS

The satisficing framework implies that government policy-makers are operating in an extremely complex environment with limited time to make decisions. The government is seen as a complex organism, comprised of departments with conflicting objectives that are temporarily resolved by setting 'satisfactory' levels. One can mention here that even if the central Government legally formulates a goal, its implementation by the executive branch and local governments might be fragmented (see for instance, De Long, 1996). Moreover, because of this complexity the policy-makers exhibit sequential attention to goals. This can also be justified in terms of electoral strategy (i.e. giving more weight to a goal because it is perceived to lead to electoral victory).

This paper has claimed that the above satisficing framework can accommodate a number of the theoretical criticisms of the standard optimising approach and also that it can account for episodes of macroeconomic policy design, which are not easily explained by the standard optimising approach. The paper has also discussed the

theoretical implications of the satisficing framework in terms of choice theory. In particular, it provides a choice theoretical framework, utilising a priority-based choice system, for approaches to macropolicy which adopt a satisficing-type view of government behaviour.

It has to be noted that the above ideas are more plausible if the orthodox view of 'Rational Optimizing Government' is abandoned. As is the case in other instances in economics, the orthodox view of Government behaviour might facilitate the application of formalist methodology, but it is problematic given current and past phenomena. Thus, it seems that the above alternative ideas fit better in the context of a politico-economic framework in which conflicting government departments, lobby groups, political realignments, public bureaucracy, re-election considerations and the influence of socio-economic groups, play a central role. Furthermore, as the paper indicated, such a politico-economic framework seems to be more appropriate in explaining macro-economic policy phenomena in many countries.

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APPENDIX

Part A

The slope of the policy-makers' indifference curve will be:

$$\frac{dP}{dL} = \frac{-1}{2bP} < 0 \quad \text{for } L < L^*$$

$$du = 0 \tag{A.1}$$

$$\frac{-\sigma}{2bP} < 0 \quad \text{for } L > L^*$$

It is not hard to see that:

$$\frac{dP}{dL} \lim_{L \rightarrow L^*} > \frac{dP}{dL} \lim_{L \rightarrow L^{**}} \tag{A.2}$$

The above implies that the government's indifference curve has a kink at L^* , and that the curve is strongly convex around that point. It should be noted that the two slopes are equal and thus no kink exists only when $\sigma = 1$, and this means that we are back to

the standard smooth indifference curves. Also if $\sigma = 0$ then the indifference curve becomes horizontal after L^* .

Part B

In order to see the difference of this formulation from the standard approaches, we can incorporate it in a standard framework where the social utility function is maximised subject to a non-linear constraint showing the trade-off between employment and price stability in the form of:

$$P = g(L) \text{ with } g'(L) < 0 \text{ and } g''(L) > 0$$

For $L < L^*$ the problem of the government is :

$$\begin{aligned} \text{Max } U &= L + bP^2 \\ \text{L, P} \\ \text{s.t.} \\ P &= g(L) \end{aligned}$$

The solution of the above will give us the first order condition given as:

$$-1 = 2bPg'(L) \tag{A.3}$$

From the first order condition, we can find the slope of the equilibrium path. Thus by differentiating the above we find:

$$\frac{dP}{dL} \text{ } L < L^* = \frac{-g''(L)P}{g'(L)} > 0 \tag{A.4}$$

This implies that the equilibrium path has a positive slope. The problem for $L > L^*$ becomes:

$$\begin{aligned} \text{Max } U &= L^* + bP^2 + \sigma(L - L^*) \\ \text{L, P} \\ \text{s.t.} \\ P &= g(L) \end{aligned}$$

The solution of the above will give us the first order condition given as:

$$-\sigma = 2bPg'(L) \tag{A.5}$$

The slope of the equilibrium path will be exactly the same as before. However, there will be a kink at L^* which is equal to σ or in other words equal to the weight the government places on L after the target has been reached, as Figure A1 shows.

Initially, the equilibrium path implies increases in both employment and price stability. When L^* is reached, the equilibrium path becomes vertical implying price stability increases only. Eventually, the path becomes the same as before. If $\sigma = 1$ then there would be no kink in the equilibrium path. In the special case where the govern-

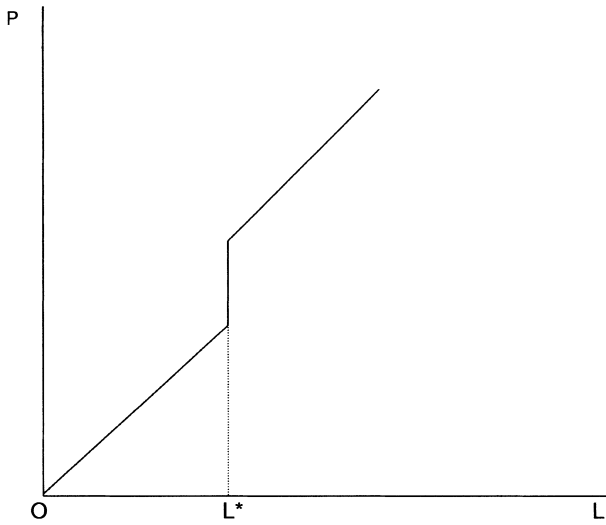


FIGURE A1. The equilibrium path.

ment does not place any weight on employment after L^* (thus $\sigma = 0$), then the equilibrium path will become vertical at L^* . It has to be noted that even in the context of a maximising framework, the priority based formulation produces interesting results in the sense of explaining the different emphasis of the policy-makers.

doi:10.1093/cpe/bzh001