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BUSINESS CYCLE ANALYSIS AND PUBLIC POLICY

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1 INTRODUCTION

Practically every country that is exposed to business cycles has adopted policies designed to reduce their volume or to eliminate them. Political insistence on such action can hardly be attributed to business cycle research, but that research has had a decided influence on the types of policy that have been considered or adopted. While it is now generally agreed that business fluctuations are inherent in the capitalistic process, it is also agreed that the excesses of inflation or deflation that actually occur have no constructive purpose whatever. Fluctuations in private investment may be required to give effect to the irregular process of technological change and adaptation to it; but they also give rise to 'multiplier' and 'acceleration' effects which may account for the bulk of the business cycle.

This distinction between primary and secondary effects leads some to hope it may be possible to devise policies that will remove the secondary consequences and leave the capitalistic process not only unimpaired but improved. On the other hand, the same analysis leads others to the view that the sole way to cure the ills arising from the business cycle is to abolish it. They therefore recommend that the economy be kept in a state of continued inflationary pressure, held in by direct allocation and price controls. With such a policy a decline in activity in one sector of the economy can be compensated by relaxation of the restraints on another. This is essentially the type of full employment policy followed in several European countries at present. While such a policy can be relied on to eliminate the business cycle, it remains to be seen whether it will kill the capitalist goose.

The policy of the United States has so far been directed toward abatement of the rigors of the business cycle, and in this paper I shall discuss the possibility of action in that direction.

Policies designed to reduce the extent of business fluctuations can hardly fail to affect the equilibrium or trend values about which the economy fluctuates. In what follows we shall therefore be concerned with the contribution that economic research has made or can make to both these aspects of public policy.

Stabilization policy can lead to three categories of government action:

- 1) Measures to bring about institutional or structural changes in the private economy itself. Put formally this means changes in parameters of the structural equations determining the behavior of the private economy. Once the change is accomplished it is hoped that the private economy will function more effectively without further government intervention.
- 2) Measures to provide government control over endogenous variables in the private economy where such control is needed for stabilization purposes. This category cannot be clearly distinguished from (1). Suppose the government were to assume temporary control over the price of steel. That action may be described either in terms of controlling the variable or as substituting a new structural relation for the old one. I use the term 'controlling the variable' to denote cases where government action on an *ad hoc* basis within the period of the business cycle is contemplated.
- 3) Measures to compensate changes in the private economy through the government's conduct of its own program, particularly in the budgetary and monetary fields. This type of action involves public control of variables exogenous to the private economy.

To illustrate the distinction between these categories, consider the question of reducing fluctuations in inventories. A tax measure that penalized speculative inventory transactions would represent a structural change. Direct action to limit inventory holdings, as was taken during the war, would involve control over variables in the private economy. Finally, government purchase or sale of inventories for stabilization purposes would be a type of compensatory action.

While measures within each category are probably required to achieve stability there is considerable freedom of choice as to the type of control that is attempted — as the inventory example illustrates. The possibility of choice raises difficult questions from the viewpoint of economic analysis. To what extent should the adoption of a control device be governed by the definiteness with which its economic consequences can be predicted? Is it good public policy to vest in the government discretionary economic powers where economic analysis cannot provide satisfactory guides for their use? Do the admitted defects in the operation of the private economy themselves warrant government intervention where the effects of that intervention can be, at best, imperfectly foreseen?

2 INSTITUTIONAL OR STRUCTURAL CHANGE

Measures to increase the propensity to consume furnish a good example of proposals to alleviate depressions through structural changes in the private economy. During the '30's especially it was held that if the government shifted the burden of taxation from low to high incomes and increased taxes on corporate incomes, the propensity to consume out of personal

incomes would be increased, so that the need to resort to government deficits to cure depressions would be reduced.

This view, so widely held a decade ago, is now open to serious question even by many of its former adherents. Some of the reasons for doubt are:

1) There is now considerable doubt whether the marginal propensity to consume among income groups varies nearly as much as the average propensity, and the argument for redistributive taxation depends on large differences among marginal propensities.

2) It is now realized that consumption by lower income groups may depend on the consumption of higher income groups. If so, greater equality of incomes may actually reduce consumption out of a given national income rather than increase it.

3) Recent experience has again demonstrated that corporate profits and savings are highly sensitive to changes in national income and prices. Corporations in the aggregate run surpluses in good times and deficits in bad, and thus cushion the impact of cyclical change. It may be preferable to leave this flexibility in the private economy rather than transfer it to the government revenue system by increasing taxes on corporate profits.

4) Under the influence of the *General Theory*, many economists overlooked the possibility that the supply of particular kinds of savings, notably corporate savings, might have a pronounced effect on the rate of investment. And, more generally, in the spirit of the '30's, many economists believed that it was possible to manipulate the propensity to consume without effecting inducements and incentives to invest. This belief commands far less support today.

We would run into even more serious difficulty in attempting to predict the effect of structural changes bearing directly on incentives to invest. We have no definitive economic analysis of the effects on business cycles of measures to reduce monopoly or to remove rigidities in the price system. Other difficult examples come readily to mind. Estimates of the quantitative effects of proposed structural changes are still hardly more than a gleam in the econometrician's eye.

Nevertheless, economic analysis can furnish useful qualitative judgments. There can hardly be any doubt that the adoption of deposit insurance and mortgage relief were useful and constructive steps. Placing the personal income tax on a current basis can be applauded as a step toward stability. Our present knowledge does, I believe, enable us to tell whether important structural changes will add to the stability of the economic system. Unfortunately, many measures that promote stability may also lower the average level at which the economy operates or slow down the rate of economic progress, and, inversely, a higher average level of operation may be won at the cost of greater instability. But, as a practical rule, more

uncertainties on one side should not weigh heavily against the prospect of real improvements on the other.

Of course, institutional and structural changes in the economy will occur for political and social reasons. Is the economist to stand on the sidelines because business cycle research has so far led to inconclusive results? I do not mean to imply that at all. Surely we can expect that the economist can improve on the result that would be reached by the layman without his advice. But I believe the number of proposals for change that can be justified from the business cycle point of view alone is very limited.

3 DIRECT CONTROL OVER ENDOGENOUS VARIABLES

The Spence Bill (H.R. 2756), proposed in the present session of Congress, reflects a type of thinking that was very prominent in NRA days and still has strong support in official circles. The Bill would give the President wide power to fix prices, allocate materials, and increase productive capacity either through encouragement and assistance to private enterprise or, where necessary, through direct government action. Such controls are held to be needed from time to time to correct specific maladjustments of prices or quantities that impede continued prosperity. Although there seems to be no likelihood that the Spence Bill will be passed in the present economic circumstances, it represents the approach that is frequently used by the President's Council of Economic Advisers and is likely to have strong appeal in the face of political demands that the government 'take determined action'.

Even without a legislative mandate, the government cannot or does not avoid control of major variables. The relation of wages to prices, of agricultural to industrial prices, and the behavior over time of particular prices are all held to have their effects on economic stability; and the government exhorts business, labor, and agriculture to achieve 'proper' price relationships and to avoid 'maladjustments'. To what extent can economic analysis provide a basis for judgment on these matters?

Increases in money wages are frequently urged as a means of increasing mass consumer purchasing power, thereby avoiding depressions or promoting prosperity. To assess the merits of this argument we need to know the effects of money wage increases on prices, profit margins, and investment decisions. I know of no economic analysis that can provide conclusive answers on these essential points.

The effects of changes on the relation of agricultural to industrial prices is still a matter for dispute. It can be argued that higher agricultural prices increase the ability of farmers to purchase industrial products and that lower agricultural prices increase the ability of the industrial population to purchase their own products. Which of these influences is stronger should

be within the power of statistical research to determine, but we do not yet know the answer.

The official attitude toward particular price increases produced the recent episode of 'industrial statesmanship' and its concomitant, the gray market. There is at least as much to be said against that policy as for it.

Nevertheless, business cycle research raises a strong presumption that things may go wrong because of price and wage maladjustments. Is there any reason to prefer the errors that result from the operation of the market to those that come from government intervention? I believe there is on the ground that business is better able to protect itself against the vagaries of the price system than those of government action.

There may, however, be clear-cut cases where economic analysis can justify control of economic variables. Subsequent events have thoroughly justified the view held by many economists at the end of the war that restrictions on nonresidential building should have been continued until the demand for residential building had eased. Such action would have diminished inflationary pressure after the war and might well have provided support for the economy at present.

Direct control of inventory accumulation, industry by industry, may prove to be the only effective way of removing one of the most serious economic instabilities. But I do not believe that these controls should depend on current diagnosis of the business cycle. They should aim rather at maintaining certain fixed relations, for instance, a fixed ratio of inventories to output. Such a policy would be designed to restrict inventory accumulations to production needs and thereby to eliminate speculation.

As another example, it may prove feasible for the government to get well established industries, such as the railroads, to adopt long-term investment programs that would be carried out regardless of current business conditions.

These illustrations of possible uses of controls depend on my belief that we do have enough knowledge of the business cycle to warrant attempts to eliminate sources of instability, but far greater diagnostic skill is required to correct 'maladjustments' during the course of the cycle.

4 CONTROL OF EXOGENOUS VARIABLES — COMPENSATORY ACTION

A Fiscal and Monetary Measures

Under this heading I include government expenditure and revenue programs designed to offset fluctuations in the private economy and central control of money and credit to the same end.

Business cycle analysis fully warrants compensatory fiscal action to remove the secondary deflation. There is no useful purpose to be served by permitting an autonomous decline in expenditures on, say, industrial

equipment, housing, or business durables to spread to the rest of the economy. Under ideal conditions, tax payments or transfer payments would be varied to maintain consumers' purchasing power.

The difficult questions arise when we consider more refined types of compensatory action. Should the primary changes themselves be compensated? Should a decline in private housing be offset by an increase in public housing? Should a decrease in business expenditures on capital equipment be offset by construction of, say, public power projects? Or should a decline in investment be offset by an increase in consumption?

There are obvious difficulties with any scheme of full compensation owing to the immobility of productive factors from place to place or from industry to industry. There are less obvious cases where the correct action depends on the economic diagnosis of the causes of the decline in private activity. If a decline in private housing results from high construction costs, the public housing program may keep up costs and prevent needed adjustments. A program of temporary compensation may then give way to one of permanent government support for the housing industry. Similar problems arise when we consider the question of stabilizing total investment expenditures. Unless government investment is complementary to private investment, rather than competitive with it, attempts to prolong prosperity by public works may also prolong the underlying causes of depression.

The difficulties of compensatory action increase when we turn to the question of recovering from a depression rather than maintaining prosperity. Fiscal policy from 1933 to 1937 certainly did not raise the American economy to a state of stable prosperity, and there is no evidence that we now have the ability to do better in the future.

In the present state of economic knowledge, I think fiscal policy should aim chiefly at limiting undesirable increases or decreases in total purchasing power rather than at stabilizing particular sectors of the economy. This, of course, means accepting a more limited objective than complete stabilization for the time being, but improvements in our qualitative and quantitative analysis should permit refinements in the future.

The effects of changes in monetary policy are more difficult to appraise than those of fiscal policy which has a direct impact on the income stream. The econometric studies of Tinbergen and Klein conclude that monetary influences have not been important in the periods studied. Nevertheless, I doubt the validity of these results. Obviously, a sufficiently restrictive monetary policy could precipitate a depression and a sufficiently expansive one could increase the rates of consumption and investment. With the national debt at its present size, even moderate changes in interest rates may have marked effects. In the absence of a definitive economic analysis,

the official attitude seems to be to prefer relative stability of interest rates to plunging into the unknown.

B *The Question of Forecasting*

Any economic policy decision involves some kind of prognosis. Even provision of relief for people already unemployed involves an assumption that the unemployment will continue, or better, that it would be dangerous to assume that it will not. Action to correct demonstrated maladjustments of the kind discussed above would have to be justified on the grounds that they will not cure themselves. Structural changes should be based on the view that the structural defects in the system that they are designed to remove will continue to be important. But the question of our ability to forecast cyclical change arises in explicit form when compensatory policies are considered.

If highly accurate forecasts of the course of the private economy could be made, they would provide the basis for compensatory action. But forecasts of the required degree of accuracy are not available.

The Cowles Commission results represent the extent to which business cycle analysis has provided a forecasting device.¹ Klein gives confidence intervals for forecasts based on his model (see p. 118), and they are obviously too wide to provide for government action. In many cases it would be impossible to tell from the forecasts whether the outlook should be considered to be deflationary or inflationary. Even the calculated confidence intervals depend on the assumptions that the price level and private investment are known; that other disturbances are randomly distributed; and that there are no errors of observation in the basic time series. The real confidence intervals are much wider than those given.

The most promising approach to forecasting seems to be through the direct investigation of investment and consumption intentions. But this approach too is in an embryonic state from the viewpoint of its practical usefulness.

At present, I believe that some simple autoregressive device would be as satisfactory as any method. Apart from the possibility of abrupt changes in government policy, such as large changes in the defense program, it is probable we would do as well simply to assume that the present state of affairs will continue as to attempt to predict change. Or we might use Orcutt's formula:²

$$(1) \quad Y_{t+1} = Y_t + .3(Y_t - Y_{t-1}) + \Sigma_{t+1}$$

¹ L. R. Klein, *The Use of Econometric Models as a Guide to Economic Policy*, *Econometrica*, April 1947, p. 111.

² G. H. Orcutt and S. F. James, *Testing the Significance of Correlation Between Time Series*, *Biometrika*, XXXV, Part III and IV, December 1948.

where Y is the national income or any other economic variable and Σ is a random term. Orcutt has found that this autoregressive pattern characterized many observed time series in the interwar period. It seems sensible, in the light of our general economic knowledge, to assume, as the formula does, that change in the most recently observed direction will continue at a reduced rate. If the situation has been changing, it is reasonable to assume that change will continue; and, since business cycles do have turning points, it seems reasonable to assume that the rate of change will decrease. If no change has taken place in the recent past, there seems no good grounds for assuming that change will commence without specific information to that effect.³

Since the regular budget process requires planning for a year or more in advance, there is need for shorter-run compensatory devices. One possibility is to introduce 'formula flexibility' by providing for changes in expenditure items or tax rates depending on some autoregressive formula applied to monthly indexes of production or employment.

Some important government expenditure programs, such as unemployment compensation or farm price support, vary automatically with income and employment. The progressiveness of the income tax makes tax yields vary more than proportionately to income. Such programs act as automatic stabilizers, and from the viewpoint of controlling the business cycle, there are strong arguments for adopting them more widely.

Apart from its value as a forecast, a simple autoregressive formula provides the government with a useful strategic assumption on which to base its policy. A strategic assumption differs from a forecast in that it is based in part on what happens if things do not turn out as planned. It is thus analogous to the saddle point in the theory of games.

Assuming Orcutt's formula is accepted as the best available forecasting device, how should it be modified to serve as a satisfactory strategic assumption? It seems unlikely that it would serve any useful purpose to go outside the limits of assuming that next year's value of Y will equal this year's on the one side and that recent changes in Y will continue undamped on the other. That is,

$$(2) \quad Y_{t+1} = Y_t + \Sigma_{t+1}$$

and

$$(3) \quad Y_{t+1} = Y_t + (Y_t - Y_{t-1}) + \Sigma_{t+1}$$

In a mild inflationary situation, there may be more danger in going too

³ At first sight, this formula may seem open to serious objection because it will never forecast a turning point. But it may work well everywhere except at turning points; and more complicated forecasting methods have been notoriously unsuccessful in predicting turning points of the business cycle.

far with anti-inflationary measures than not going far enough, since going too far may precipitate a depression. In that event it would be desirable to modify the best forecast, (1), in the direction of the limit, (2), and to use a coefficient for the rate of change term of less than .3. On the other hand, in a depression the risks of doing too little in the way of anti-deflation may be considered greater than the risks of doing too much. In that event one would modify the best forecast in the direction of (3) and use a coefficient greater than .3 as the basis for action.

It follows from these examples that the appropriate strategic assumption might diverge from the best forecast in different ways depending on the phase of the business cycle, other economic and political circumstances.

An autoregressive method conforms well to practical requirements. Governments are naturally reluctant to base their actions on forecasts unsupported by clear evidence that the layman can understand. He can understand a projection of an existing rate of change, or the projection of the present level of a variable where there is no clear evidence of change. On the other hand, governments are now chary of predicting that prosperity is 'around the corner', and it may be inexpedient, on purely economic grounds, to predict a depression that might not occur, since governments must pay attention to the expectations they create.

In this paper I have dwelt largely on the limitations of business cycle analysis from the viewpoint of public policy; and consequently have paid no tribute to the skill, patience, and imagination that have gone into business cycle research. Despite these efforts, knowledge of the business cycle is still a scarce resource. From the viewpoint of both public policy and research that resource should not be dissipated. But I believe that policies that make full use of the knowledge we do have, and at the same time recognize its limitations, can produce a high degree of economic stability.

COMMENT

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Harking back to Mr. Haberler's paper, I wonder if I am correctly interpreting its purport in the proposition that a 'planned economy' can be expected to do better at stabilizing cycles than the kind of economy we have — whatever one may call it — not because of its planning (in which

it is inferior) but because of other features of its system. That is, after its forecasts and plans have gone wrong, it will take prompter and more adequate compensatory action than our kind of modified private-enterprise system will do. I suspect this is probably right; and that, accordingly, the emphasis on 'planning' in discussions of the subject is misleading.

Coming to Mr. Smithies' paper, I am in such general agreement with the trend of his thinking that I am afraid my comments will not be particularly exciting. I shall not quarrel with his classification, though the distinctions puzzle me a bit; and I hope there may be, on the whole, less doubt about the effect of key measures than about the pigeon-hole in which they should be classified. In that connection, I note that when, in these discussions, 'qualitative' knowledge of the effects of policies has been contrasted with quantitative, 'qualitative' seems to refer to knowledge of the *direction* of change brought about by the policy in question in the quantitative variables on which the discussion seems to center. A full scale qualitative discussion would go much farther afield.

With regard to the question of shifting the distribution of disposable income in the direction of greater equality, for the purpose of increasing consumer spending, the main effect of such measures would seem to be noncyclical, and any incidental cyclical effect they might have does not seem to have been clearly brought out. In that connection, you are probably familiar with Mr. Lubell's study, and my comments on it.¹ My own shorthand estimate was in the form that it would take a shifting of five dollars, or nearly five dollars, of income from richer to poorer groups, to increase consumer spending by one dollar, assuming total income remained unchanged. The effect on total spending would include a plus or minus effect on investment spending. In my further rough estimate of how far the equalization process could go before the minus would outweigh the plus, I guessed the practicable increase in total spending, from a given total income, to be about 1 per cent. That answer would naturally depend on how far a country had already gone toward equalization. Cyclical transfer payments of an expansionary sort are, of course, a different matter.

I am interested in Mr. Smithies' further proposition that consumption by lower income groups may depend on that of higher income groups. The only instances I can think of offhand seem to be noncyclical, and I would be glad to give Mr. Smithies part of my time to elaborate.

Next, as to the kinds of controls included in the Spence Bill; one understands what they might do to resist inflation; their effect in stabilizing cycles or mitigating persistent depression is dimly glimpsed through the

¹ H. Lubell, *Effects of Income Redistribution on Consumer's Expenditures*, *American Economic Review*, March 1947, pp. 157-70; A Correction, *ibid.*, December 1947, p. 930, and my note on p. 931.

foggy atmosphere that surrounds the concept of 'maladjustments'. In the interest of clarity, I propose a tax on the use of this term unaccompanied by explicit definition of what is meant. It would not raise much revenue, but would be a disincentive tax. The same would apply to the opposite-number concept, that of the delicate balance of correct adjustment which has figured so prominently in statements of the President's Council of Economic Advisers.

As to the kindred question of the effects of wage increases on total economic activity, I heartily agree that "I know of no economic analysis that can provide conclusive answers. . . ." This includes such theorising as I have myself attempted on the subject.

In passing, I note the suggestion of maintaining a fixed ratio of inventories to output. If that is the best that can be aimed at, it should be noted that it introduces a built-in acceleration factor.

Turning to compensatory action, I hope it would not be necessary to decide whether to compensate secondary movements only, or primary also, since I do not see how one is to distinguish one from the other as they are merged in the actual, *ex post*, fluctuations of housing construction or other investment. This may furnish a text, or pretext, for stressing the point that results in this field cannot be neatly divided into percentages, assignable to different causes and the sum of the percentages equaling 100. Causation is a joint resultant of an indefinite number of active and conditioning variables. In maintaining purchasing power, it is never safe to forget that the desired effect may be facilitated or obstructed by the other accompanying conditions; it may sustain employment or be dissipated in price inflation.

A neglected phase of this subject seems to be the implications of the idea of compensatory action that would completely *remove* a secondary deflation. The 'built-in' dampeners are necessarily partial in their action; and the deliberate, timed compensators (like changes in tax rates) necessarily allow a recession to get started before they come into action. Under these circumstances, what are the implications of 100 per cent maintenance of consumer buying power? There are some unemployed; and I assume we cannot afford to pay them as much for not working as they got for working. Instead of eliminating unemployment, that would presumably convert a lot of involuntary unemployment into voluntary. This could be handled by a state that does not mind conscripting labor, but a liberal state is debarred from that answer. Nevertheless, it might be driven close to that answer, by a side door, through being forced to become hard-boiled in applying the principle that a worker forfeits his claim to benefits if he refuses a reasonable offer of a job.

So we may assume the incomes of the unemployed would shrink. Then

if total income is to be maintained, it is inescapable that some other disposable incomes should be increased; not those that need it most and not because of anything the recipients have done to create or to deserve it, but simply because there is a recession to be compensated. It is a quaint idea, and I do not know that this implication of the concept of complete compensation has been explicitly examined. It seems to deserve pretty searching examination if we are to undertake policies that promise complete compensation of secondary fluctuation in income.

A similar conclusion appears when one examines the implications of complete stabilization of construction, *via* counter-cyclical timing of public works.² This would introduce an artificial reverse cycle in some branches of construction and some types of materials. And I would attach considerable importance to the danger Smithies mentions — of supporting unduly high construction costs and prices, which should be brought down rather than supported by an unconditionally guaranteed demand.³ Removal of such structural defects may not in itself be enough to stabilise the economy, but failure to remove them may be a serious handicap to other stabilization policies.

To sum up, Smithies seems to combine judicious skepticism with a temperate degree of optimism that limited objectives may be attainable.

² See Julius Margolis, *Public Works and Economic Stability*, *Journal of Political Economy*, August 1949, pp. 293-303.

³ Cf. Wesley C. Ballaine, *How Government Purchasing Procedures Strengthen Monopoly Elements*, *ibid.*, December 1943, pp. 538-46.

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1) Smithies' objective is to examine the contribution of economic analysis to the alleviation of business fluctuations. He classifies the different possible policies, appraises their merits, points out the limitations, and ends on a note of qualified optimism with regard to the potentialities inherent in the intelligent use of existing knowledge.

2) The purpose of this note is to consider some of the postulates on which an appraisal such as that by Smithies must be based. It is not that Smithies' conclusions are unpalatable, indeed most of them are eminently reasonable. It appears essential, however, that some of the hidden underlying assumptions (including certain value judgments) be brought into the open if policy discussion is to be anything more than a statement of faith.

3) Perhaps the most fundamental assumption inherent in the present stabilization discussion is that community action is (or, at least, might conceivably be) desirable for the purpose of remedying economic ills; and that, in particular, policy problems must be considered already at the

present, admittedly inadequate, stage of our knowledge concerning the 'mechanism' (causal structure) of economic fluctuations. The alternative viewpoints, not inexistent I think, would be (a) our knowledge is too scant for us even to consider public policy in this field, and (b) no matter what our state of knowledge, things should be permitted to follow their 'natural' course.

4) Granting that community action should be considered as conceivably advisable, the choice will depend on the precise objectives of such action. How can one determine these objectives? The viewpoint often adopted in welfare economics (Pareto type) is that the economist *qua* economist should concern himself only with objectives capable of securing an unanimous vote by the whole population (the compensation principle). As I understand his paper, Smithies avoids this issue and, essentially, formulates a preference schedule of his own concerning alternative states of the economy. His utility function decreases with the amplitude of business fluctuations and increases with the 'trend values' — with relatively heavy weight attached to the latter!^{1a} It presumably depends also on such things as the extent to which the adopted policies would be discretionary.^{1b}

5) Even when the economist's utility function is given, there remains the fundamental difficulty of seeing into the future. The merits of a policy must be evaluated in terms of what is likely to happen if the policy *is* adopted versus what might happen if the policy is *not* adopted. This is, essentially, the task of forecasting the future on two (or more) alternative assumptions. Smithies raises this problem of predictability in his introduction and also devotes to it Section 4B (The Question of Forecasting).² Clearly, the economist's dilemma is that of having to choose under circumstances of uncertainty or even complete ignorance with regard to the likelihood of events whose occurrence is to determine the consequences of the policies involved. The statement that the existing margin of uncertainty is unsatisfactorily large³ points to the desirability of further research, but does not relieve us of the need for choice.⁴

^{1a} "... more uncertainties on one side should not weigh heavily against the prospect of real improvements on the other."

^{1b} "Is it good public policy to vest in the government discretionary economic powers where economic analysis cannot provide satisfactory guides for their use?"

² "To what extent should the adoption of a control device be governed by the definiteness with which its economic consequences can be predicted?" "Do the admitted defects in the operation of the private economy themselves warrant government intervention where the effects of intervention can be, at best imperfectly foreseen?"

³ "Klein gives confidence intervals for forecasts based on his model . . . and they are obviously too wide to provide for government action."

⁴ It may be, of course, that if the margin of uncertainty is very wide, governmental non-interference is the best possible choice, but this need not necessarily be so.

Assuming that no additional knowledge can be acquired before the choice is to be made, the problem becomes one of a 'rational' criterion to be used in choosing under incomplete information. One such criterion has been proposed by the authors of the *Theory of Games*: that of choosing the action under which the 'worst'⁵ that can happen is better than under any alternative choice of action. This 'minimax principle' is an example, by no means unique, of a criterion for choice under incomplete information.

To answer some of the questions raised by Smithies we must first commit ourselves to a choice of criterion, whether it be the minimax principle or something else, and find out what action the selected criterion recommends. It is clear that two individuals possessing the same information and characterized by the same utility function (say with regard to 'stability' versus 'trend value') might choose different policies if they follow different criteria (e.g., minimax versus maximax) for choice under incomplete information.

6) Whether the economist's policy goals are merely his general ones or are meant to express the 'desires of the community', it must be taken into account that, while the government is attempting to carry out the policy, a good deal of freedom will be left to the individual units (consumers, entrepreneurs, labor unions, banks, etc.).

Such a unit is primarily motivated by its own objectives (individual utility maximization) and its decisions are based to a considerable extent on the expectations of future actions of the government.⁶ More precisely, the *public*, i.e., the aggregate of the individual units, follows a rule of behavior dependent on the (subjective) information available to it. For instance, it might be that the public's behavior is expressible in terms of the minimax principle.

The situation is clearly reminiscent of that encountered in the theory of strategic games and suggests the possibility of analogous solutions. In particular, an argument can be put forward in favor of 'mixed' (randomized) strategies.⁷ The latter, in principle, eliminate the discretionary element in the government's action without giving the public advance information that might be used for defeating the government's policies.⁸ Also, in principle at least, the public's confidence in the success of the policies ceases to be a necessary condition for the success itself. (The latter assertion corresponds to the fact that the 'player' following an optimal

⁵ As measured by the mathematical expectation of utility.

⁶ 'Government' as used here includes the Federal Reserve System, etc.

⁷ It is my view that such a solution has the political advantages of 'rules' in the 'rules vs. authority' argument without sharing the destabilizing features of a system in which all actions of the government would be completely predictable.

⁸ That is, I conjecture that a realistic 'pay-off' matrix will lack a saddlepoint.

strategy can count on realizing at least the 'value of the game' regardless of the other 'player's' strategy.)⁹

7) Smithies classifies the policies into three groups — structural, direct control, and compensatory. (His terminology resembles, but is not equivalent to, that used in some of the econometric literature.) Smithies' main objection to the policies in the first two categories seems to be that, at the present state of our knowledge, their consequences are more difficult to predict than those in the third.¹⁰ My view is that the type of knowledge needed to anticipate the effects of the 'compensatory' policies is essentially the same as in the case of the 'direct controls' and that the more fundamental distinction lies in the way policies affect the freedom of action of the individual consumer or entrepreneur. The 'structural' and 'direct control' policies tend to deprive some individuals of the rights previously exercised, e.g., the right to free price setting or allocation of the budget dollar, while the typical compensatory policies (especially government expenditures or commodity purchases, banking activities, and sales) do not.¹¹ In terms of social values this is, of course, a very important factor affecting the choice of policy type.

As for predictability, the only safe generalization would seem to be that primary effects of a given policy are easier to foresee than the secondary ones. In particular, there is nothing obvious about the effectiveness of the 'automatic stabilizers' as a class, once the possible changes in expectations are taken into account.

Other principles of policy classification may be of interest. In particular, policies differ with respect to the extent to which they regulate the separate sectors of the economy. Thus we have monetary policy at one extreme, price and output control (as in wartime) at the other. The latter, as Smithies points out, are likely to interfere with the natural equilibrating (and optimizing) process; but is not the same true of the inventory controls, considered by Smithies in a rather favorable light?

8) I share Smithies' view that prognosis is always present in policy making, as well as his conviction that the forecasting tools at present available are very unsatisfactory. The concept of the 'strategic assumption' is also use-

⁹ It is important to recall that the 'value' is the mathematical expectation of the player's utility. Those who object to the measurable utility postulates, on which such an approach is based, may prefer to think in terms of minimaxing utility rather than its mathematical expectation. It should be borne in mind, however, that the 'guaranteed value' will appear lower.

¹⁰ Smithies does cite counter examples in both directions.

¹¹ Variations in the level of compulsory transfers (taxes, subsidies) seem to form an intermediate category in this respect. They touch the individual directly but do not necessarily restrict his rights.

ful,¹² as is the 'slanting' of forecasts in the direction that will lead to a less risky policy.

Where I part company with Smithies is in his choice of the Orcutt formula as a basis for prediction. The reasons are partly of a technical nature and those will not be given here. What must, however, be pointed out is that the Orcutt formula is of no help in the following fundamental type of problem: what is the probable *difference* in the level of national income on alternative assumptions with regard to the policies to be adopted by the government? (Klein's equations, with their wide confidence intervals and dependence on the assumptions to be made concerning certain variables, do provide an answer.)¹³

¹² In the language of the theory of games the 'strategic assumption' on the part of player X concerning Y's strategy is the assumption that Y will adopt an optimal strategy.

¹³ So does the traditional variety of theorizing in terms of assuming the signs of various elasticities, etc.

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Smithies has said correctly that if a change occurs in one of the structural parameters in an econometric model, we shall often know only the *direction* of the change, not its *magnitude*. He concludes that it is uneconomical to put much effort into determining accurately the values of the structural parameters. The intuitive argument is illustrated by an example: it is foolish to measure one distance to within a thousandth of an inch if it is going to be added to another that contains an error of a foot or two. Similarly, Smithies argues that in evaluating the effect of a change in a structural parameter, when we know only the direction of the change and not its magnitude, we cannot get a quantitative answer, so it is not necessary to have accurate knowledge of any of the parameters.

I wish to point out that in some cases of change in an important variable induced by a change in some structural parameter, the direction of the effect *cannot* be told from a knowledge solely of the direction of the initial change in the parameter in question — in these cases it is frequently necessary to know also the values (or at least upper and lower bounding values) of certain other parameters in the system. This is because the derivative of any variable with respect to any parameter (i.e., the ratio of the resulting change in the variable to the initial change in the parameter, for small changes) is given by a ratio of two determinants that depend upon structural parameters, and the sign of a determinant cannot be found in general without knowledge of the values of its elements.

For example, we may know that an enlarged social security program will increase the marginal propensity to consume. Consider the effect upon income of this increase in the marginal propensity to consume, α , in the following simple model, where Y = real income, C = real consumption, I = real investment, and Greek letters are parameters:

$$C - \alpha Y = \beta$$

$$I - \gamma Y = \delta$$

$$C + I - Y = 0$$

Differentiating each equation with respect to α , we have

$$\frac{\partial C}{\partial \alpha} - \alpha \frac{\partial Y}{\partial \alpha} = 0$$

$$\frac{\partial I}{\partial \alpha} - \gamma \frac{\partial Y}{\partial \alpha} = 0$$

$$\frac{\partial C}{\partial \alpha} + \frac{\partial I}{\partial \alpha} - \frac{\partial Y}{\partial \alpha} = 0$$

Solving this system for $\frac{\partial Y}{\partial \alpha}$, we get

$$\frac{\partial Y}{\partial \alpha} = \frac{\begin{vmatrix} 1 & 0 & Y \\ 0 & 1 & 0 \\ 1 & 1 & 0 \end{vmatrix}}{\begin{vmatrix} 1 & 0 & -\alpha \\ 0 & 1 & -\gamma \\ 1 & 1 & -1 \end{vmatrix}} = \frac{-Y}{-1 + \gamma + \alpha}$$

Thus we see that in order to tell in this model whether an increase in the marginal propensity to consume will increase income, we have to know whether the sum $\alpha + \gamma$ is less than 1.

Even without estimating α and γ , we may know or believe for other reasons (such as the fact of the stability of the system) that $\alpha + \gamma < 1$ in this case, but in more complicated cases such *a priori* knowledge is insufficient, and it becomes necessary to *estimate* some or all of the other parameters in order to find the direction of change of income in response to an increase in the given parameter. An illustrative example follows, in which a parameter of the tax system is changed. Variables are consumption C , investment I , wage income W , profit income P , national income Y , interest rate r , taxes on wage income T^W , and taxes on profit income T^P , all in

deflated dollars except r . Greek letters denote parameters, τ being a function of the money supply.

$$\begin{array}{rcl}
 C & -\alpha W - \beta P + \alpha T^W + \beta T^P - \gamma r & = \mu \\
 I & -\delta P & + \delta T^P - \epsilon r = \nu \\
 & W & - \xi Y = \pi \\
 & -\eta W & + T^W = \rho \\
 & & T^W + T^P - \theta Y = \sigma \\
 & & r - \lambda Y = \tau \\
 C + I & & - Y = 0 \\
 & W + P & - Y = 0
 \end{array}$$

The fourth equation determines total taxes ($T^W + T^P$) as a function of national income Y , and the third determines the share to be borne by wage earners as a function of wage income W ; thus a rise in the parameter η represents a shift of the tax burden from entrepreneurs to wage earners. By the same process as was used in the previous example, we obtain

$$\frac{\partial Y}{\partial \eta} = \frac{W(\alpha - \beta - \delta)}{\xi(1 - \eta)(\alpha - \beta - \delta) + (1 - \theta)(\beta + \delta) + \lambda(\gamma + \epsilon) - 1}$$

It is not possible to deduce the sign of this expression from the usual *a priori* assumptions such as $\alpha > 0$, $\beta > 0$, $\delta > 0$, $0 < \beta + \delta < 1$, so that in order to determine the sign of $\partial Y / \partial \eta$ it is necessary to estimate certain parameters.