ECONOMIC PLANNING AND INTERSECTORAL FISCAL POLICIES

Dennis J. SNOWER *)

Forschungsbericht /
Research Memorandum No. 149

March 1980

*) Assistent der Abteilung Ökonomie am Institut für Höhere Studien, Wien

Die in diesem Forschungsbericht getroffenen Aussagen liegen im Verantwortungsbereich des Autors und sollen daher nicht als Aussagen des Instituts für Höhere Studien wiedergegeben werden.

CONTENTS page

Summary

This paper attacks the conventional wisdom that fiscal policies move an economy along a unique, downward-sloping, short-run Phillips curve. In the context of a non-market-clearing model, it is shown that wnenever demand-pull inflation and involuntary unemployment occur conjointly,
(a) each sectoral government expenditure and each sectoral tax receipt is (in general) associated with a different Phillips curve,
(b) whereas some of these Phillips curves may be downward-sloping, others may be upward-sloping, and
(c) sectoral fiscal policies which increase the budget deficit do not necessarily induce upward movements along their respective Phillips curves and sectoral fiscal policies which reduce the budget deficit do not necessarily give rise to downward movements.
The policy implication of this analysis is that the inflation-unemployment impact of aggregate government expenditures and aggregate tax receipts may be manipulated through their intersectoral breakdown.

Zusammenfassung

Die herkömmliche makroökonomische Doktrin, daß Fiskalpolitik einen Ökonomie entlang einer eindeutigen, kurzfristigen Phillips Kurve zu bewegen vermag, wird in diesem Artikel in Frage gestellt. Wenn eine durch Überschußnachfrage bedingte Inflation mit einer unfreiwilligen Arbeitslosigkeit simultan auftritt, dann
(a) ist jede sektoral Staatsausgabe und jede sektoral Steuereinnahme im Allgemeinen mit einer anderen Phillips Kurve verbunden,
(b) besteht die Möglichkeit, daß diese sektoral zugeordneten Phillips Kurven einen negativen sowhl als auch positiven Steigungsgrad haben und
(c) bewegt eine sektoral Fiskalpolitik die das Staatsdefizit erhöht nicht unbedingt eine Ökonomie aufwärts entlang der entsprechenden Phillips Kurve und löst eine sektorale Fiskalpolitik die das Staatsdefizit verringert nich unbedingt die entgegengesetzte Bewegung aus.

ECONOMIC PLANNING AND INTERSECTORAL FISCAL POLICIES

1. Introduction

The purpose of this paper is to explore the use of intersectoral fiscal policies as instruments of economic planning in mature, capitalist systems. Although intersectoral fiscal policies are applicable with regard to a wide variety of capitalist planning objectives (such as growth, income distribution, balance of payments, pollution, and resource depletion objectives), this paper only analyzes their function in dealing with the joint problems of inflation and unemployment. In other words, intersectoral fiscal policies here concern government expenditures and taxes whose sectoral composition is analyzed with reference to its inflation-unemployment impact. What makes these policy instruments particularly attractive in this context is that they permit the government to influence inflation and unemployment without interfering with the operation of the price system and without hampering the entrepreneurial pursuit of technological efficiency (in contrast to, say, incomes policies). Moreover, it will be shown that intersectoral fiscal policies generally give the government a far greater degree of control over inflation and unemployment than do the macroeconomic instruments (such as those centering around the aggregate government expenditures, aggregate tax receipts, and aggregate money supply) which have been commonly used ever since the acceptance of Keynesian macroeconomic theory. Naturally, such considerations do not imply that intersectoral fiscal policies should replace the more traditional instruments of capitalist economic planning, but simply that these policies may play a role in the treatment of inflation and unemployment which the traditional instruments cannot duplicate. Thus, these policies may constitute a significant

contribution to the arsenal of policy weapons which a government has at its disposal to fight inflation and unemployment.

The need for economic planning in capitalist systems becomes particularly apparent whenever economic activites are characterized by externalities. If economic agents do not have to pay for the entire harm they incur or are not fully compensated for the benefits they provide, it may be necessary to devise an economic plan which outlines how private enterprise may be induced to serve the public interest. Both inflation and unemployment may be understood as externality problems. For example, a firm which raises the price of its product contributes to inflation, but usually does not have to pay for other individuals' transactions costs associated with the resulting reorganization of finanacial portfolios. Similarly, a firm which hires a worker under conditions of Keynesian unemployment is usually not fully compensated for the social benefits associated with the multiplier effects resulting from this employment activity. Intersectoral fiscal policies may serve as responses to such externality problems.

Two major approaches to the analysis of inflation and unemployment have emerged from the recent literature on macroeconomic disequilibrium theory. One is the "expectational error approach" of Alchian (1970), Friedman (1968), Lucas (1973, 1975), McCall (1970), Mortenson (1970a, b), Parsons (1973), Phelps (1970), Salop (1973), Sargent (1973), Siven (1974), Weiss (1972), and others. This approach concerns market-clearing conditions and centers on the possibility that economic agents' expectations concerning various macroeconomic variables (e.g. the rate of inflation) may be disappointed. The consequent reformulation of these expectations leads to changes in economic activity. In this context, it is shown how various instruments of capitalist planning -- such as monetary and fiscal policies -- may influence inflation and unemployment via the expectational errors which these policies induce. The other approach is the "non-market-

clearing approach" which centers on the possibility that markets may fail to clear on account of a variety of price rigidities. These rigidities may be explained in terms of the risk-shifting contracts of Azariadis (1975, 1978), Bailey (1974), Grossman (1977, 1978), Gordon (1974), etc.; the price-change costs of Barro (1972), Carlton (1978), Sheshinski and Weiss (1977), etc.; the non-Walrasian "conjectural equilibria" of Hahn (1978) and Negishi (1960); or various oligopoly models. This approach usually does not involve a consideration of expectational errors (although the analytical structure of the standard non-market-clearing models does not logically require the absence of such errors). In this context, a policy shock in one market (e.g. the labor market) gives rise to "real spillover effects" on other markets (e.g. the commodity markets), as described by Barro and Grossman (1971, 1976) and Malinvaud (1977).

In this paper the latter approach is followed. Inflation an unemployment are assumed to be generated by certain markets' failure to clear. Not all types of inflation and unemployment can be understood in these terms. In fact, it is expedient to restict our analysis to demand-pull inflation and involuntary unemployment. We presume that involuntary unemployment exists whenever a rise in the demand for labor, at the prevailing market prices, would lead to a rise in the amount of labor services offered for sale. Furthermore, we assume that prices of products rise in response to excess demands in the corresponding markets, but that this response is lagged. An excess product demand is presumed to exist whenever a rise in the supply of that product, at the prevailing market prices, would lead to a rise in the amount of that product purchased.

The analysis below is concerned with the joint occurence of demand-pull inflation and involuntary unemployment. For this purpose, it is necessary to specify a non-market-clearing marcoeconomic scenario in which excess demand in a product market occurs at the same time as excess supply in the labor

market. In the Keynesian scenario of involuntary unemployment -- by way of contrast -- excess supply in the labor market is coupled with excess supply in every product market. In that scenario, an increase in government expenditures on each product gives rise to real spillover effects characterized by a sequence of reductions in excess product and labor supplies. However, in our inflation-unemployment scenario, the real spillover effects are not so straightforward. Not every government product demand increase stimulates inflation and not every such increase dampens unemployment. It is under these circumstances -- in which demand-pull inflation and involuntary unemployment occur simultaneously -- that intersectoral fiscal policies have a particularly important role to play.

In the theoretical literature on economic planning, the distinction between short-run plans (which are devised with respect to a detailed set of consumption and production activities in the near future) and long-run plans (which are concerned with the dynamic paths of a limited number of consumption and production aggregates over a long span of time) is usually made. For example, the short-run planning literature subsumes decentralized, multi-level planning techniques (such as those of Arrow and Hurwicz (1960), Kornai and Liptak (1963), Heal (1969), Lange (1936), Malinvaud (1967), Taylor (1929), and Weitzman (1970)), whereas the long-run planning literature is largely devoted to optimal growth paths (e.g. Arrow and Kurz (1970), Cass (1965), Dixit (1968), Gale (1967), Phelps (1966), Ramsey (1928), and Samuelson (1965)). Although the temporal dividing line between short-run and long-run plans is rather vague and arbitrary, this distinction is also made in planning practice. Capitalist economies (such as France and Holland) which make use of economic planning procedures commonly employ detailed one-year plans and highly aggregative five- to fifteen-year plans in conjunction with one another. Yet, in general, the short-run plans command relatively greater attention in mature, capi-

talist economies than in socialist or developing economies.

This paper is concerned with short-run planning. In fact, the "short run" will be adopted as a theoretical construct for the purpose of defining a non-market-clearing scenario. As noted above, the non-market-clearing approach presupposes price rigidities and in the short run economic agents take prices to be exogenously given and make their decisions about quantity demands and quantity supplies on the basis of these prices. The excess demands and supplies which emerge from these decisions characterize a non-market-clearing scenario. In the longer run we assume that the excess demands and supplies exert a lagged influence on prices. Naturally, the changed prices cause economic agents to reformulate their decisions about quantity demands and supplies and thereby the non-market-clearing scenario is transformed. These longer-run developments lie beyond the scope of this paper; they are treated in Snower (1978). Our analysis here is concerned with a static picture of a particular non-market-clearing scenario in which a given excess product demand and a given involuntary unemployment arise from a given constellation of prices. Thus, strictly speaking, the "demand-pull inflation" described in the analysis below merely comprises "demand-pull inflationary pressures".

The most popular conceptions of capitalist planning with regard to inflation and unemployment are based on Phillips-curve analysis. Given the state of inflationary expectations -- so the conventional wisdom goes -- there exists a unique relation between aggregate inflation and aggregate unemployment for each capitalist economy. This Phillips curve is usually held to be downward-sloping. Expansionary fiscal and monetary policies (characterized in terms of an expansion of aggregate government expenditures, a contraction of aggregate tax receipts, or an expansion of the aggregate money supply) allegedly cause the economy to move upward along this Phillips curve; contractionary fiscal and monetary policies allegedly elicit a movement in the opposite direction. Thus, for given

inflationary expectations, the Phillips curve is represented as a menu of inflation-unemployment possibilities which may be realized through the appropriate adjustment of the above macroeconomic policy instruments.

These macroeconomic instruments lose their bite whenever the position of the Phillips curve is such that all its inflation-unemployment possiblities are socially or politically unacceptable. Under such circumstances, attempts have traditionally been made to supplement these macroeconomic instruments by other instruments, such as incomes policies, "moral suasion" of private enterprise, or nationalization of certain industries. Yet these supplementary instruments suffer from a number of severe deficiencies. Firstly, they usually interfere with the functioning of the price system, which is responsible for transmitting information about demands and supplies to economic agents and thereby makes these agents responsive to changes in consumer tastes, production capacities, and so on. In a non-market-clearing scenario, the price system performs this role only imperfectly (since it does not ensure that all markets clear). Nevertheless, the supplementary instruments usually represent an extra impediment to the price system and the task of collecting and transmitting information about demands and supplies by other means may be very costly. Secondly, incomes policies and various types of "moral suasion" are characteristically riddled with loopholes which economic agents, pursuing the goals of private enterprise, gradually learn to exploit. Finally, "moral suasion" and nationalization often destroy those entrepreneurial incentives which promote technological efficiency.

Intersectoral fiscal policies are not associated with such drawbacks. Nor can their role be represented as that of achieving a particular point on a unique, downward-sloping Phillips curve. The analysis below leads to a rather surprising result which implies that intersectoral fiscal policies may be able to play an exceptional role in combatting demand-pull inflation and involuntary unemployment. The

result is that (a) whenever demand-pull inflation and involuntary unemployment occur conjointly, each sectoral government expenditure and each sectoral tax receipt is (in general) associated with a different tradeoff between aggregate inflation and aggregate unemployment and (b) whereas some of these tradeoffs may be downward-sloping, others may be upward-sloping. It will be shown that the slopes of these tradeoffs depend on the factor intensities and factor profitabilities in the various production sectors.

The result above represents an attack on the conventional wisdom concerning the uniqueness and the downward slope of the short-run Phillips curve. Since different sectoral government expenditures and different sectoral tax receipts are associated with different Phillips curves, the intersectoral allocation of government expenditures and tax receipts may be organized with regard to the government's inflation and unemployment objectives. Naturally, this consideration does not imply that intersectoral fiscal policies should be aimed solely at the minimization of demand-pull inflation and involuntary unemployment. There are many other worthy goals for a government to pursue. Yet insofar as the joint occurence of demand-pull inflation and involuntary unemployment commands government attention, the impact of intersectoral fiscal policies on these two economic evils should not be ignored.

For the sake of expositional simplicity, our analysis of intersectoral fiscal policies will be restricted to government expenditures. It will be apparent that a similar analysis (with analogous conclusions) can be undertaken with respect to tax receipts. The object of this paper is not to solve an actual planning problem for a capitalist economy, but simply to describe the use of intersectoral fiscal policies as planning instruments with regard to demand-pull inflation and involuntary unemployment.

In the next section, a macroeconomic model of non-market-clearing conditions is constructed in terms of the op-

timizing behavior of individual economic agents. Section 3 describes a particular non-market-clearing scenario in which demand-pull inflation and involuntary unemployment occur conjointly, derives the inflation-unemployment tradeoffs corresponding to different seetoral government expenditures, and presents a brief overview of the analytical conclusions and policy implications.

2. The Structure of the Non-Market-Clearing Model

Consider an economy which produces an investment good and a consumption good, both of which may also be used as intermediate goods. Call these goods Q_1 and Q_2. They are produced by means of capital and labor, denoted by F_1 and F_2, respectively. The prices of Q_1 and Q_2 are P_1 and P_2, respectively; the prices of F_1 and F_2 are PF_1 and PF_2, respectively.[1] Each good and each factor is homogeneous. In the short run, production coefficients and the prices of goods and factors are fixed.

There are four types of economic agents: firms, households, capital speculators, and the government. Their behavior is modeled in terms of "representative" economic agents. The "representative firm" purchases labor services, capital services and intermediate goods to produce investment goods and consumption goods. The "representative household" supplies labor services, demands consumption goods, and accumulates money balances. The "representative capital speculator" buys the investment goods from the firm and sells capital services to the firm. The government receives taxes from the households, prints fiat money, and buys investment and consumption goods.

The firm is assumed to be a profit-maximizing agent. It produces each good by means of a single technical process, characterized by input-output coefficients: a_{ij} is the amount of intermediate good i required to produce one unit of good j; b_{hj} is the amount of factor h required to produce one

unit of good j. Since the product and factor markets need not clear, the firm may be faced with factor supply constraints and product demand constraints. $\bar{F}_1$ and $\bar{F}_2$ are the supplies of capital services (by the capital speculator) and labor services (by the household), respectively, available to the firm. $(\bar{D}_1 + \bar{G}_1)$ is the demand (of the capital speculator and the government, respectively) for the investment good; $(\bar{D}_2 + \bar{G}_2)$ is the demand (of the household and the government, respectively) for the consumption good. Let π_f be the total profits accruing to the firm and $\tilde{\alpha}_1$ and $\tilde{\alpha}_2$ (both positive) be profits per unit of the investment good and the consumption good, respectively. Then the optimization program of the firm may be written as follows:

$$
\begin{aligned}
(1)\quad \text{Maximize} \quad & \pi_f = \tilde{\alpha}_1 \cdot Q_1 + \tilde{\alpha}_2 \cdot Q_2 \\
\text{subject to} \quad & b_{11} \cdot Q_1 + b_{12} \cdot Q_2 \leqq \bar{F}_1 \\
& b_{21} \cdot Q_1 + b_{22} \cdot Q_2 \leqq \bar{F}_2 \\
& (1-a_{11}) \cdot Q_1 - a_{12} \cdot Q_2 \leqq \bar{D}_1 + \bar{G}_1 \\
& -a_{21} \cdot Q_1 + (1-a_{22}) \cdot Q_2 \leqq \bar{D}_2 + \bar{G}_2
\end{aligned}
$$

where

$$\tilde{\alpha}_1 = P_1 \cdot (1 - a_{11} - a_{21}) - PF_1 \cdot b_{11} - PF_2 \cdot b_{21}$$

$$\tilde{\alpha}_2 = P_2 \cdot (1 - a_{12} - a_{22}) - PF_1 \cdot b_{12} - PF_2 \cdot b_{22}$$

and $Q_1, Q_2 \geqq 0$.[2] Let the slack variables corresponding to the four constraints of this program be ϕ_1 (idle capital services), ϕ_2 (unemployment of labor), σ_1 (excess investment demand), and σ_2 (excess consumption demand), respectively.

The capital speculator is an analytical device which provides a particularly simple explanation of investment

behavior. In reality, the function of the capital speculator -- to buy the investment goods and sell the capital services -- is usually performed by the firm. Then investment demand may be derived (conjointly with labor demand and output supplies) by finding the outputs which maximize the stream of present and expected future profits subject to the present and expected future labor supply constraints and consumption demand constraints. However, to avoid the algebraic complications which this intertemporal program would engender, we create the capital speculator whose investment demand is exogenously given:

$$(2a) \quad D_1 = \bar{D}_1.$$

In this manner we avoid the task of formulating a theory of expectations formation with respect to future prices, production coefficients, labor supplies, and consumption demands. The capital services which the capital speculators make available to the firms are simply those associated with the capital stock carried forward from the previous time period:

$$(2b) \quad F_1 = \bar{F}_1.$$

The profits accruing to the capital speculators are

$$(3) \quad \pi_s = PF_1 \cdot (b_{11} \cdot Q_1 + b_{12} \cdot Q_2) - P_1 \cdot \bar{D}_1.$$

The household is assumed to be a utility maximizing agent. We represent its utility as a Cobb-Douglas function of leisure, consumption, real money balances,[3] and government consumption demand:

$$(4a) \quad U = A \cdot (F_2^{max} - F_2)^{\beta} \cdot (D_2 + G_2)^{\gamma} \cdot (M/P_2)^{\delta},$$

where A, β, γ, and δ are constants, (M/P_2) is the household's store of real money balances, and F_2^{max} is the upper bound on

the labor services it is capable of supplying. The government provides G_2 free of charge to the household (e.g. in the form of free school milk).

The household faces a budget constraint and -- since product and factor markets need not clear -- a consumption good supply constraint and a labor demand constraint. In the budget constraint, receipts (consisting of distributed profits and the wage bill) are set equal to outlays (consisting of consumption expenditures, taxes, and money-balance accumulation). All profits accuring to the firm and the capital speculator are distributed to the household:

$$(4b) \quad \pi = \pi_f + \pi_s$$

$$= P_1 \cdot Q_1 - P_1 \cdot a_{11} \cdot Q_1 - P_2 \cdot a_{21} \cdot Q_1 - PF_2 \cdot b_{21} \cdot Q_1$$

$$+ P_2 \cdot Q_2 - P_1 \cdot a_{12} \cdot Q_2 - P_2 \cdot a_{22} \cdot Q_2$$

$$- PF_2 \cdot b_{22} \cdot Q_2 - P_1 \cdot \bar{D}_1$$

$$= \alpha_1 \cdot Q_1 + \alpha_2 \cdot Q_2 - P_1 \cdot \bar{D}_1 \quad .$$

The household accepts these profits as exogenously given; it does not take the effect of its economic activities on the level of profits into account. Taxes are paid in a lump-sum amount, T. The supply of consumption goods available to the household is $[-a_{21} \cdot \bar{Q}_1 + (1-a_{22})\ \bar{Q}_2 - G_2]$,[4] where $\bar{Q}_1$ and $\bar{Q}_2$ are the amounts of the investment good and the consumption good (respectively) produced by the firm i.e. Q_1 and Q_2 are the solution of Program (1)). The demand for labor services is $[b_{21} \cdot \bar{Q}_1 + b_{22} \cdot \bar{Q}_2]$.
The constraints under which the household maximizes its utility are

$$(4c) \quad P_2 \cdot D_2 + \Delta M + P_2 \cdot T = \pi + PF_2 \cdot F_2$$

$$D_2 \leqq - a_{21} \cdot \bar{Q}_1 + (1-a_{22}) \cdot \bar{Q}_2 - \bar{G}_2$$

$$F_2 \leqq b_{21} \cdot \bar{Q}_1 + b_{22} \cdot \bar{Q}_2$$

where $\Delta M = M - M_{-1}$ and M_{-1} is the household's stock of money balances carried forward from the previous time period.

The government demands for investment goods and consumption goods are exogenously given:

$$(5) \quad G_1 = \bar{G}_1$$
$$G_2 = \bar{G}_2.$$

Taxes and the supply of fiat money are exogenously given as well:

$$(6) \quad T = \bar{T}$$
$$(7) \quad M^S = \bar{M^S}.$$

The government's budget constraint may be expressed as

$$(8) \quad G_1 + G_2 - T = \Delta M.$$

The investment goods (e.g. roads) which the government purchases in period t are made available to the firm free of charge in period t+1.

The components of our model economy are given by the Programs and Equations (1) - (8). The economy contains five markets: an investment good market, a consumption good market, a market for labor services, a market for capital services, and a money market. We define effective demand[6] in each market

as the amount economic agents wish to purchase, at the prevailing market prices, given the effective constraints in all other markets.[7] The effective supply in each market is the amount economic agents wish to sell, at the prevailing market prices, given the effective constraints in all other markets. Excess supply exists in a given market whenever a rise in demand, at the prevailing market prices, would lead to a rise in the amount of market transactions. Similarly, excess demand exists whenever a rise in supply, at the prevailing market prices, would elicit a rise in transactions.

The next section describes a particular non-market-clearing scenario of this model: a scenario in which excess labor supply coexists with excess consumption demand. In this context, the effect of changes in G_1 and G_2 on demand-pull inflation and involuntary unemployment are examined. It is assumed that these changes in G_1 and G_2 are financed by the appropriate adjustments in ΔM^S.

3. Inflation-Unemployment Tradeoffs and Intersectoral Fiscal Policies

Suppose that the prices of goods and factors are such as to generate a non-market-clearing scenario in which unemployment and excess consumption demand occur simultaneously. Under these circumstances, the household must be effectively constrained by the demand for labor and the supply of consumption goods (i.e. the second and third constraints of System (4a) must hold as equalities). Moreover, the firm cannot be effectively constrained by the supply of labor services or the demand for consumption goods; thus, we assume it to be effectively constrained by the supply of capital services and the demand for investment goods (i.e. the first and third constraints of Program (1) hold as equalities):

$$(9) \quad b_{11}\cdot Q_1 + b_{12}\cdot Q_2 = \bar{F}_1$$

$$(1-a_{11})\cdot Q_1 - a_{12}\cdot Q_2 = \bar{D}_1 + \bar{G}_1 \quad .^8$$

The solution of this equation system is

$$(10) \quad Q_1 = -\frac{1}{|\delta|} \cdot [a_{12}\cdot \bar{F}_1 + b_{12}\cdot(\bar{D}_1+\bar{G}_1)]$$

$$Q_2 = \frac{1}{|\delta|} \cdot [b_{11}\cdot(D_1+G_1) - (1-a_{11})\cdot F_1] \quad ,$$

where $|\delta| < 0$ is the determinant of the coefficient matrix of System (9). We suppose that both Q_1 and Q_2 are positive.

The unemployment which occurs in this non-market-clearing scenario may be identified as the second slack variable of Program (1):

$$(11) \quad \phi_2 = F_2 - b_{21}\cdot Q_1 - b_{22}\cdot Q_2 \quad .$$

The excess consumption demand may be identified as the fourth slack variable of that program

$$(12) \quad \sigma_2 = D_2 + G_2 + a_{21}\cdot Q_1 - (1-a_{22})\cdot Q_2 \quad .$$

We analyze demand-pull inflation only in terms of product prices (i.e. the prices of the investment goods and consumptions goods). The price of each good is assumed to respond with a lag to the excess demand or excess supply in that market for that good. In particular, each price rises in the face of excess demand and falls in the face of excess supply, but not sufficiently to change the configurations of binding constraints on the firm and household optimization programs. The magnitude of each price change is assumed to be a monotonically increasing function of its associated excess demand.

Thus, the excess consumption demand, σ_2 , may be used as an ordinal proxy for demand-pull inflation originating in the consumption good market. The investment good market is characterized by excess supply.[9] For expositional simplicity -- yet without affecting the thrust of our analytical conclusions -- we ignor the effect of this excess supply on the price of the investment goods. Hence, σ_2 will represent demand-pull inflation in the analysis below.

It may now be shown that changes in government consumption expenditures are, in general, associated with a different inflation-unemployment tradeoff than are changes in government investment expenditures. Consider first the effect of an increase in government consumption demand on involuntary unemployment. Since consumption demands do not effectively constrain the firm's production activity, an increase in G_2 leaves the production of Q_1 and Q_1 unchanged

$$(13) \quad \frac{dQ_1}{dG_2} = 0 \qquad \text{and} \qquad \frac{dQ_2}{dG_2} = 0 \quad ,$$

and therefore has no influence on the effective demand for labor, $(b_{21}\cdot Q_1 + b_{22}\cdot Q_2)$. The effective supply of labor is the amount of labor services which the household wishes to sell at the prevailing market prices, given its consumption good supply constraint. Maximizing the utility function (4a) subject to the budget constraint and the consumption good supply constraint of System (4c), we obtain the following labor supply function:

$$(14) \quad F_2 = \left(\frac{\delta}{\beta+\delta}\right)\cdot F_2^{max} + \left(\frac{\beta}{\beta+\delta}\right)\cdot\left(\frac{1}{PF_2/P_2}\right)\cdot[-a_{21}\cdot Q_1 + (1-a_{22})\cdot Q_2$$

$$- G_2 - \left(\frac{M_{-1}}{P_2}\right) - \left(\frac{\alpha_1}{P_2}\cdot Q_1 + \frac{\alpha_2}{P_2}\cdot Q_2\right) + T] \quad .$$

Assuming that government consumption demand is satisfied at the expense of household consumption, an increase in G_2 leads to a fall in the effective labor supply[10] and thereby to a fall in involuntary unemployment:

$$(15) \quad \frac{d\phi_2}{dG_2} = \frac{dF_2}{dG_2} = -\left(\frac{\beta}{\beta+\delta}\right) \cdot \left(\frac{1}{PF_2/P_2}\right) \quad .$$

The effect of an increase in government consumption demand on demand-pull inflation may be derived with reference to Equation (12). G_2 affects σ_2 directly (since G_2 is a component of consumption demand); any indirect effects would have to operate through the effective household consumption demand (D_2), the intermediate demands for Q_2 ($a_{21} \cdot Q_1 + a_{22} \cdot Q_2$), or the effective supply of consumption goods (Q_2). The effective household consumption demand is the amount of consumption goods which the household wishes to purchase at the prevailing market prices, given its labor demand constraint. Maximizing the utility function (4a) subject to the budget constraint and the labor demand constraint of System (4c), the following consumption demand function may be derived:

$$(16) \quad D_2 = \left(\frac{\gamma}{\gamma+\delta}\right) \cdot \left[\frac{\alpha_1}{P_2} \cdot Q_1 + \frac{\alpha_2}{P_2} \cdot Q_2 - T + \frac{PF_2}{P_2} \cdot (b_{21} \cdot Q_1 + b_{22} \cdot Q_2) + \frac{M_{-1}}{P_2}\right] \quad .$$

Yet since an increase in G_2 has no impact on the production of Q_1 and Q_2, it cannot affect this consumption demand either. For the same reason, the intermediate demands for Q_2 and the effective supply of consumption goods also remain unchanged. Thus, G_2 affects demand-pull inflation solely through its direct contribution to consumption demand:

$$(17) \quad \frac{d\sigma_2}{dG_2} = \frac{dG_2}{dG_2} = 1 \quad .$$

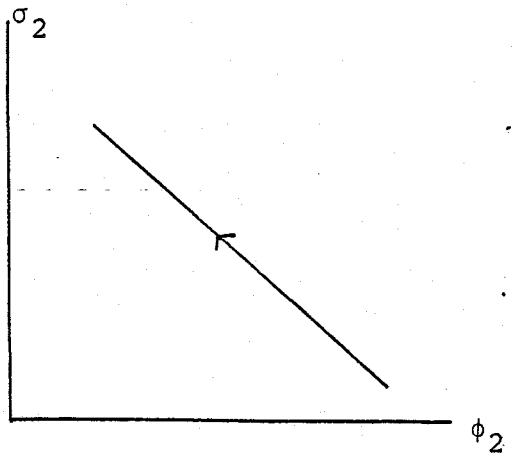


FIGURE 1

In sum, a rise in government consumption expenditures stimulates demand-pull inflation and reduces involuntary unemployment, as indicated by the arrow in Figure 1. Obviously, a reduction in government consumption expenditures has the opposite effect (provided that the reduction is not large enough to eliminate the excess consumption demand of our non-market-clearing scenario). Thus, this case is in harmony with the conventional wisdom that the Phillips curve is downward-sloping and that expansionary (contractionary) fiscal policy causes an upward (downward) movement along this Phillips curve.

Next, consider the inflation-unemployment impact of changes in government investment expenditures. The effect of an increase in G_1 on the production of Q_1 and Q_2 is implied by Equations (10):

$$(18) \quad \frac{dQ_1}{dG_1} = -\frac{b_{12}}{1\delta 1} \qquad \text{and} \qquad \frac{dQ_2}{dG_1} = \frac{b_{11}}{1\delta 1} \quad .$$

G_1 influences involuntary unemployment both via the effective labor supply and via the effective labor demand. The effective labor supply may be derived from the household's utility maximization subject to the budget constraint and the consumption good supply constraint; thus, the labor supply function is given by Equation (14). The effective demand for labor is $(b_{12} \cdot Q_1 + b_{22} \cdot Q_2)$.

Substituting Equation (14) into Equation (11), the effect of an increase in G_1 on ϕ_1 may be obtained with the help of Equations (18):

$$(19)\quad \frac{d\phi_2}{dG_1} = \left[\left(\frac{\beta}{\beta+\delta}\right)\cdot\left(\frac{1}{PF_2}\right)\cdot\left(\frac{1}{1\delta 1}\right)\right]\cdot|\pi_k| - \left[\frac{1}{1\delta 1}\right]\cdot|B|$$

$$+ \left(\frac{\beta}{\beta+\delta}\right)\cdot\left(\frac{1}{PF_2/P_2}\right)\cdot\frac{1}{1\delta 1}\cdot[b_{12}\cdot a_{21} + b_{11}\cdot(1-a_{22})]\quad ,$$

where $|\pi_k| = (\alpha_1\cdot b_{12}-\alpha_2\cdot b_{11})$ and $|B| = (b_{11}\cdot b_{22}-b_{21}\cdot b_{12})$. If $|\pi_k| \gtreqless 0$, then $(\alpha_1/b_{11}) \gtreqless (\alpha_2/b_{12})$, i.e. total profits per unit of capital accruing to the household from the production of Q_1 exceed, equal, or fall short of total profits per unit of capital accruing to the household from the produciton of Q_2. Hence, we call $|\pi_k|$ a measure of the relative capital profitability of the first production sector. If $|B| \gtreqless 0$, then $(b_{11}/b_{21}) \gtreqless (b_{12}/b_{22})$, i.e. the capital-labor ratio of the first production sector is greater than, equal to, or less than the capital-labor ratio of the second production sector. Hence, we call $|B|$ a measure of the relative capital-labor intensity of the first production sector.

As for the inflationary impact of government expenditures, G_1 does not affect σ_2 directly (since G_1 is not a component of consumption demand), but it does affect the household consumption demand, the intermediate demands for Q_2, and the supply of Q_2. The effective household consumption demand is described by Equation (16). Substituting this equation into Equation (12) and recalling Equations (18), the effect of an increase in G_1 on σ_2 may be derived:

$$(20)\quad \frac{d\sigma_2}{dG_1} = \left(\frac{\gamma}{\gamma+\delta}\right)\cdot\frac{1}{1\delta 1}\cdot\left[\frac{PF_2}{P_2}\cdot|B| - \frac{1}{P_2}\cdot|\pi_k|\right]$$
$$-\left(a_{21}\cdot\frac{b_{12}}{1\delta 1} + (1-a_{22})\cdot\frac{b_{11}}{1\delta 1}\right) \quad .$$

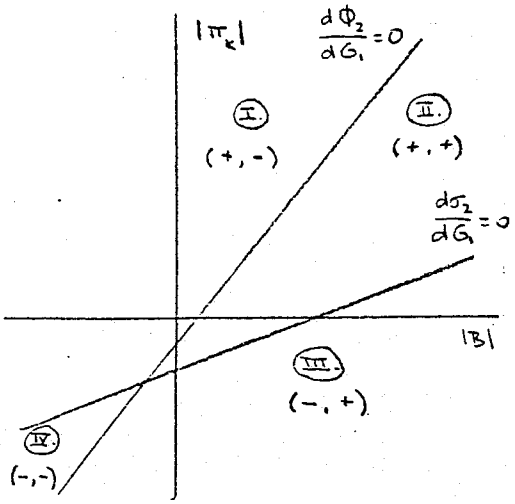
The joint effects of an increase in government investment expenditures on demand-pull inflation and involuntary unemployment are pictured in Figure 2.

$$(19a)\quad \frac{d\sigma_2}{dG_1} = 0 \quad <=>$$

$$|\pi_k| = PF_2 \cdot |B| - \left(\frac{\gamma+\delta}{\gamma}\right) \cdot P_2 \cdot [a_{21} \cdot b_{12} + (1-a_{22}) \cdot b_{11}]$$

$$(20a)\quad \frac{d\phi_2}{dG_1} = 0 \quad <=>$$

$$|\pi_k| = PF_2 \cdot \left(\frac{\beta+\delta}{\beta}\right) \cdot |B| - [b_{12} \cdot a_{21} + b_{11} \cdot (1-a_{22})] \ .$$



(The sign patterns refer to $\left(\frac{d\sigma_2}{dG_1}, \frac{d\phi_2}{dG_1}\right)$.)

FIGURE 2

It is apparent that the slope of the $(d\phi_2/dG_1)=0$ line exceeds the slope of the $(d\sigma_2/dG_1)=0$ line. These two lines divide $|\pi_k|$ - $|B|$ space into four areas, denoted by Roman numerals.

In area I, an increase in government investment expenditures stimulates demand-pull inflation and reduces involuntary unemployment. These qualitative impacts are the same as those following from an increase in government consumption expenditures (illustrated in Figure 1). Yet the position and downward shope of the inflation-unemployment tradeoff associated with government expenditures are,in general, different from those associated with government consumption expenditures. This difference contradicts the conventional wisdom that all fiscal policy instruments move the economy along a unique Phillips curve. In area III, government investment expenditures are also associated with a downward-sloping inflation-unemployment tradeoff, but here an increase in government expenditures

reduces demand-pull inflation and stimulates involuntary unemployment! This possibility flies in the face of the traditional belief that expansionary fiscal policy leads to a rise in inflation and a fall in unemployment. In area II, an increase in government investment expenditures stimulates both inflation and unemployment; whereas in area IV, both inflation and unemployment are reduced. In these two areas, the inflation-unemployment tradeoff is upward-sloping! Here the conventional presumption of a downward-sloping Phillips curve is contradicted.

In sum, government expenditures devoted to different sectors of the economy are generally associated with different inflation-unemployment tradeoffs and these tradeoffs may be either downward-sloping or upward-sloping. It has been shown that the inflation-unemployment impact of a sectoral government demand which effectively constrains production activity (e.g. government investment demand in the non-market-clearing scenario above) differs from the impact of a sectoral government demand which does not constitute a binding constraint on production (e.g. government consumption demand in the non-market-clearing scenario above). The effect of the former type of sectoral government demand on inflation and unemployment depends on the relative factor profitabilities and the relative factor intensities of the various sectors.

Although the analysis above has been conducted exclusively in terms of sectoral government expenditures, it is apparent that analogous arguments can be made with regard to sectoral taxes. Thus, we may draw the more general conclusion that different sectoral fiscal policies -- regardless of whether they constitute outlays or receipts of the government -- generate different Phillips curves.

For this reason, intersectoral fiscal policies may prove to be useful instruments of economic planning in capitalist economies. Nowadays most capitalist economies are plagued by the twin problems of inflation and unemployment, and insofar as these problems arise from a non-market-clearing

scenario, intersectoral fiscal policies may be appropriate to treat them. To devise an intersectoral breakdown of government expenditures and taxes for this purpose, it is necessary to construct an economic plan in which the shortages and surpluses of the various sectors are identified and in which the factor profitabilities and factor intensities of these sectors are computed. Input-output analysis appears to be well suited for this task. Yet it must be noted that the treatment of inflation and unemployment is emphatically not the only planning objective of capitalist economies, and thus the formulation of intersectoral fiscal policies should not be geared solely to these two problems. Hence, the above analysis of the inflation-unemployment effects of intersectoral fiscal policies is meant to be illustrative of how these policies operate, but not suggestive of how they should be used.

F O O T N O T E S

1. "F" stands for "factor" and "PF" stands for "price of the factor".

2. For simplicity, we assume that the firm does not face intermediate-good supply constraints and that the firm attaches no value to inventories of the two goods.

3. Real money balances enter the utility function since they are a constituent of expendible wealth whereby future consumption goods may be purchased. Yet this consideration appears to contradict our implicit assumption that the household, like the firm, maximizes its objective function over a single time period. If the household takes future time periods into account as well, its behavior may be modeled by maximizing its utility over several time periods and including money balances only in an intertemporal budget constraint and in a period-by-period liquidity constraint. However this avenue would greatly complicate our algebraic manipulations without appreciably affecting the conclusions of our analysis. Thus, we adopt the expedient of placing real money balances in the utility function.

4. We assume that the government's consumption demand has priority over that of the household and that $\bar{G}_2$ never exceeds the net amount of the consumption good produced (i.e. the gross amount minus intermediate demand).

5. For simplicity, we assume that the household never faces a money supply constraint.

6. The "effective" demands and supplies are to be distinguished from the "notional" demands and supplies which occur in Walrasian general equilibrium systems. This is the standard

terminology, used by Clower (1965), Barro and Grossman (1976), and others.

7. The effective supply constraints in the market under consideration do not enter the definition of demand, since otherwise demand and supply curves could not be distinguished from one another.

8. The production levels which satisfy Equation System (9) represent the optimal solution of Program (1) only if the profits per unit of capital accruing to the firm from the production of Q_1 exceed the profits per unit of capital accruing to the firm from the production of Q_2, i.e. only if $(\tilde{\alpha}_1/b_{11}) > (\tilde{\alpha}_2/b_{12})$. For if the former term falls short of the latter, the optimal solution of Program (1) is generated by a binding capital services constraint and a binding nonnegativity constraint for Q_1.

9. In accordance with the general definition provided at the end of Section 2, the effective supply of investment goods is the amount of these goods which the firm wishes to sell at the prevailing market prices, given its capital constraint. The effective demand for investment goods is given by $(\bar{D}_1 + \bar{G}_1 + a_{11} \cdot Q_1 + a_{12} \cdot Q_2)$. It is transparent that the effective supply exceeds the effective demand.

10. Households have a reduced incentive to supply labor services if the consumption goods they wish to purchase are less available.

REFERENCES

1. Alchian, Armen A., "Information Costs, Pricing and Resource Unemployment," in E. Phelps et al. (1970), pp. 27 - 52.
2. Arrow, K. J. and L. Hurwicz, "Decentralization and Computation in Resource Allocation," in R. Pfouts (ed.), Essays in Economics and Econometrics in Honour of Harold Hotelling, Chapel Hill, N.C., University of North Carolina Press, 1960.
3. _____ and M. Kurz, Public Investment, the Rate of Return and Optimal Fiscal Policy, Baltimore, Md.: Johns Hopkins Press, 1970.
4. Azariadis, Costas, "Implicit Contracts and Underemployment Equilibria," Journal of Political Economy, 83, December 1975, pp. 1183 - 1202.
5. _____, "Escalatory Clauses and the Allocation of Cyclical Risks," Journal of Economic Theory, 18, June 1978, pp. 119 - 155.
6. Bailey, Martin N., "Wages and Employment Under Uncertain Demand," Review of Economic Studies, 41, January 1974, pp. 37 - 50.
7. Barro, Robert J., "A Theory of Monopolistic Price Adjustment," Review of Economic Studies, 39(1), January 1972, pp. 17 - 26.
8. _____ and Herschel I. Grossman, "A General Disequilibrium Model of Income and Employment," American Economic Review, March 1971, 61)1), pp. 82 - 93.
9. _____ and Herschel I. Grossman, Money, Employment and Inflation, New York and Cambridge: Cambridge University Press, 1976.
10. Carlton, Dennis W., "Market Behavior with Demand Uncertainty and Price Inflexibility," American Economic Review, September 1978, pp. 571 - 87.

11. Cass, D., "Optimum Growth in an Aggregative Model of Capital Accumulation," Review of Economic Studies, 32, 1965, pp. 233 - 40.
12. Clower, R. W., "The Keynesian Counterrevolution: A Theoretical Appraisal," in F. Hahn and F. Brechling (eds.), The Theory of Interest Rates, London: Macmillan, 1965.
13. Dixit, A. K., "Optimal Development in the Labor-Surplus Economy," Review of Economic Studies,35, Jan. 1968, pp. 23 - 34.
14. Friedman, Milton, "The Role of Monetary Policy," American Economic Review, March 1968, 58, pp. 1 - 17.
15. Gale, D., "On Optimal Development in a Multi-Sector Economy," Review of Economic Studies, 34(1), Jan. 1967, pp. 1 - 18.
16. Gordon, Donald F., "A Neoclassical Theory of Keynesian Unemployment," Economic Inquiry, 12, December 1974, pp. 431 - 459.
17. Grossman, Herschel I., "Risk Shifting and Reliability in Labor Markets," Scandinavian Journal of Economics, 79(2), 1977, pp. 187 - 209.
18. _____, "Risk Shifting, Layoffs and Seniority," Journal of Monetary Economics, 4, November 1978, pp. 661 - 686.
19. Hahn, Frank, "On Non-Walrasian Equilibria," Review of Economic Studies, February 1978, 45, pp. 1 - 17.
20. Heal, G. M., "Planning without Prices," Review of Economic Studies, 36(3), 1969.
21. Kornai, J. and T. Liptak, "Two-level Planning," Econometrica, 33, 1963.
22. Lange, O., "On the Economic Theory of Socialism," Review of Economic Studies, 4, 1936.
23. Lucas, R. E., Jr., "Some International Evidence on Output-Inflation Tradeoffs," American Economic Review, June 1973, 63(3), pp. 326 - 34.
24. _____, "An Equilibrium Model of the Business Cycle," Journal of Political Economy, December 1975, 83(6), pp. 1113 - 44.

25. Malinvaud, E., "Decentralized Procedures for Planning," in E. Malinvaud and M. O. L. Bacharach, Activity Analysis in the Theory of Growth and Planning, London: I.E.A./ Macmillan, 1967.

26. _____, The Theory of Unemployment Reconsidered, Oxford: Basil Blackwell, 1977.

27. McCall, J., "Economics of Information and Job Search," Quarterly Journal of Economics, February 1970, 84(1), pp. 113 - 26.

28. Mortenson, Dale T., "A Theory of Wage and Employment Dynamics," in E. Phelps et al. (1970), pp. 167 - 211.

29. _____, "Job Search, the Duration of Unemployment and the Phillips Curve," American Economic Review, December 1970 b, 60(5), pp. 847 - 61.

30. Negishi, T., "Monopolistic Competition and General Equilibrium," Review of Economic Studies, 28, 1960.

31. Parsons, D. O., "Quit Rates Over Time: A Search and Information Approach," American Economic Review, June 1973, 63(3), pp. 390 - 401.

32. Phelps, E. S., Golden Rules of Economic Growth, New York: Norton, 1966.

33. _____, "Money Wage Dynamics and Labor Market Equilibrium," in E. Phelps et al. (1970), pp. 124 - 66.

34. _____, et al., Microeconomic Foundations of Employment and Inflation Theory, New York: Norton, 1970.

35. Ramsey, F., "A Mathematical Theory of Saving," Economic Journal, 38, December 1928, pp. 543 - 59.

36. Salop, S. C., "Systematic Job Search and Unemployment," Review of Economic Studies, April 1973, 40(2), pp. 191 - 202.

37. Samuelson, P. A., "A Catenary Turnpike Theorem Involving Consumption and the Golden Rule," American Economic Review, 55, 1965, pp. 486 - 96.

38. Sargent, T. J., "Rational Expectations, the Real Rate of Interest and the Natural Rate of Unemployment," Brookings Pap. Econ. Act., 1973(2), pp. 429 - 79.

39. Sheshinski, E. and Y. Weiss, "Inflation and Costs of Price Adjustment," Review of Economic Studies, June 1977, pp. 287 - 303.
40. Siven, Claes-Henric, "Consumption, Supply of Labor and Search Activity in an Intertemporal Prespective," Swedish Journal of Economics, March 1974, 7(1), pp. 44 - 61.
41. Snower, Dennis J., "The Inflation-Unemployment Dilemma and Intersectoral Fiscal Policies," Working Paper 78 - 28, Department of Economics, University of Maryland, Nov. 1978.
42. Taylor, F. M., "The Guidance of Production in a Socialist State," American Economic Review, 19, 1929.
43. Weiss, Y., "On the Optimal Lifetime Pattern of Labor Supply," Economic Journal, December 1972, 82(328), pp. 1293 - 1315.
44. Weitzman, M., "Iterative Multi-level Planning with Production Targets," Econometrica, 38, 1970.