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Uncontrolled Markets and the Inflationary
Process in a Centrally Planned Economy

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Abstract

This paper analyzes the inflationary process in a centrally planned economy which has an uncontrolled market where prices can move more freely. The maintenance of controls over prices and rationing in the economy leads to the emergence of forces that generate inflation in the uncontrolled market, and that cause shrinkage of the controlled economy as resources move into the uncontrolled market. Decontrol of prices and production of the controlled market is the optimal policy. The adoption of this policy facilitates an increase in income and aggregate demand, which raises the equilibrium prices and total production in the economy.

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Summary

This paper analyzes the inflationary process in a centrally planned economy (CPE) which has an uncontrolled market where commodity and factor prices are freely determined. Using a simple macroeconomic disequilibrium model the analysis indicates that the adoption of a policy of repressed inflation through a system of controls and allocations cannot eliminate the inflationary gap that typically is evident in CPEs and prevents open inflation from balancing investment with saving. The inelasticity of labor supply under repressed inflation plays an important role in determining the inflationary gap from the supply side. If demand is reduced through restrictive fiscal and monetary policies to remove this gap and balance investment with saving, such an economy regresses into a low-level equilibrium trap, characterized by output falling below potential.

An uncontrolled market does reduce excess demand but it cannot eliminate the inflationary gap because of repressed inflation in the controlled market. The persistence of repressed inflation in the controlled market unleashes pressures that generate an inflationary process which causes market prices and wage-rates to increase continually in the uncontrolled market; simultaneously it causes shrinkage of the controlled economy as resource move into the uncontrolled market. The optimal policy is to decontrol prices and production in the controlled economy. This policy eliminates the inflationary gap and establishes a stable equilibrium where prices may rise once and for all to a higher level, but output will be higher as well.

I. Introduction

In centrally planned economies (CPEs), price stability has been an overriding policy objective so much so that it is regarded as a systemic feature of socialism and one of its claims to superiority over the capitalist system. Nevertheless, the shortages and the persistence of unsatisfied demand at the official prices in most CPEs have long been recognized by the officials and the public inside these countries, as well as by outside observers. In recent years, open inflation has emerged in a number of the CPEs, and the authorities in these countries now consider inflation as representing a major challenge to their economic reforms. 1/

The issue of inflation in the CPEs has been discussed by economists from both the Western and East European countries. Most Western economists stress excess demand as the principal cause for the hidden and repressed inflation. The standard argument is that the planned investment outstrips the available savings and results in inflationary pressures, which are then repressed under central planning through the imposition of price controls and rationing. The East European economists also subscribe to the idea of excess demand inflation, or at least an excess demand-generated inflationary gap, but they stress that excess demand is institutionalized with incentives that influence enterprises to strive to expand production at all costs. The latter reflects the general drive to achieve the output plan targets by the enterprises. This excess demand stems from the conviction that cost overruns will be absorbed through higher budgetary subsidies, lower taxes, price increases, etc. Since every enterprise behaves this way, aggregate excess demand is generated. 2/

More recent attempts to refine the explanation of the inflationary gap has been to link investment by enterprises to excess demand. Enter-

1/ Among others, China and Vietnam are experiencing rapid price increases. In China the general retail price index rose by 19 percent in 1988, compared with an annual average rate of about 5 percent in 1983-87 (State Statistical Bureau, People's Republic of China). In Vietnam, the rate of inflation, which reached the triple digits during 1986-88, remains high.

2/ The edifice of the East European economists' explanation on inflation rests on the work of Kornai (1971, 1979). He describes enterprise excess demand behavior as "suction" that is made possible by a "soft budget constraint". The latter implies that production decisions by enterprises become independent from their financial performance. He strengthens the repressed inflation case by arguing that an inflationary gap is created on both sides of demand/supply relationship. Supply bottlenecks result as supplies of material inputs lag behind demand, particularly consumer demand. Consequently, not only is the demand for consumer goods greater than planned due to unplanned wage increases, but also the supply is often smaller than planned due to input shifts stemming from policy preferences for investment goods.

prise managers are risk averse; they evaluate growth possibilities, with reference to the present and expected future plans targets from the viewpoint of minimizing the risk of their nonimplementation. Consequently, enterprises prefer expansion through investment rather than innovation in technology and management. Even if innovation results in increased production, the risk associated with introducing it would lead managers to avoid noninvestment methods of expansion. Thus, enterprises presenting their investment proposals to the planners often underestimate the costs of proposed investment projects or overestimate production in order to obtain the necessary funds. This leads to excess demand.

In discussing the issue of inflation in CPEs, the existence of a two-tier market, consisting of controlled and uncontrolled segments, has been recognized. Although the uncontrolled market is discussed as the second economy, 1/ the impact of repressed inflation on operation of the uncontrolled market has been largely neglected despite the rapid expansion of this market in a number of CPEs in recent years.

The purpose of this paper is to analyze the inflationary process under repressed inflation. The analysis is based on the interaction between the centrally-controlled market and an uncontrolled market. Section II discusses the key institutional features of the controlled and uncontrolled markets, and the microeconomic elements of labor supply under repressed inflation. Against this backdrop, Section III presents a simple disequilibrium model of the controlled economy and discusses the inflationary gap under repressed inflation. Section IV analyzes the impact of repressed inflation on the inflationary process in the uncontrolled market through an extension of the basic model. The paper ends with a few concluding remarks.

II. Markets Under Repressed Inflation

1. The controlled market

The controlled market operates under the dictates of central planning. The allocation and utilization of resources are determined with the longer-term economic priorities and annual central plans. The latter specify, with considerable detail, input and output targets for enterprises. In principle, the annual plans balance the available resources (plan production, imports and initial stocks) with their utilization (planned consumption, investment and final stocks). In practice, production plans tend to be overambitious and inconsistent; the supply of goods are generally overestimated while the demand for goods underestimated. Consequently, imbalances of supply and demand are systemic under central planning. Unlike in market economies, where domestic open inflation and exchange rate depreciation eliminate such imbalances, in CPEs prices, wage-rates and the exchange rate are rigidly controlled

1/ See G. Grossman (1977); O'Hearn (1980).

so that inflationary pressures are "repressed". Continued repression encourages the emergence of black markets--a phenomenon which is also present in markets, such as the foreign exchange market, in many developing countries. In order to eliminate the black market, officially sanctioned uncontrolled markets have been allowed to operate in CPEs 1/ just as parallel exchange markets are allowed to operate in a number of developing economies.

Under central planning prices are fixed to balance supply and demand at two levels. First, the plan attempts to balance personal income with the value of goods and services at the official prices. Second, prices are set to clear individual markets. Attempts at both levels are usually frustrated. Unplanned wage increases and household decisions between consumption and saving upsets the first balance. Lack of information, changing consumer tastes and unforeseen factors make it very difficult to set market-clearing prices. Consequently, market disequilibrium, which in the aggregate manifests as excess demand, is repressed through controls and rationing.

2. The uncontrolled market

The uncontrolled market, which is officially recognized, is free of controls and legal provisions that affect prices and wage-rates. The supply and demand conditions in the uncontrolled market are largely determined by the level of activity in the controlled economy owing to resource constraints. These conditions form linkages with the controlled economy and allow feedbacks between the two markets to occur.

Supply in the uncontrolled market is limited by the demand for factor inputs and services in the controlled economy. The traditional sources of supply are re-trading of controlled goods and non-controlled production. 2/ However, with economic reforms and liberalization of the controlled economy in a number of CPEs, the source of supply is substantially widened as enterprises are officially permitted to sell their above-quota production in the uncontrolled market. 3/

1/ After World War II, all the Soviet-block countries adopted a two-tier market system to ensure a proper distribution of the scarce consumer goods. The rationing system, based on low prices, was supplemented by a commercial market where goods were available at much higher prices. The commercial market provided a way for the government to get hold of a large part of the profits which the black-marketeers were making.

2/ Traditionally uncontrolled production would mean production outside the collective farm.

3/ Each enterprise is provided with the necessary inputs in exchange for the delivery of specified quantities (quota) of output. Enterprises can sell their above-quota production at negotiated prices to the state (i.e. the controlled economy) or in the free market.

Demand in the uncontrolled market is determined by factor incomes, including unplanned wage increases. Since the controlled economy is characterized by shortages of goods at the official prices, the uncontrolled market provides an outlet for this excess demand. The outlet is not only just for consumer goods but also for production goods.

3. Labor supply ^{1/}

Labor supply in a CPE is determined by standard leisure-income-saving relationships. Under repressed inflation, consumer demand exceeds the available supply. The excess income must be saved as there is nothing available on which to spend. The saving is involuntary in the sense that people would rather spend. The inability to spend savings in the future makes leisure or other ways of spending time preferable. In contrast, the opportunities to spend in an uncontrolled market must influence the necessity to save as consumption in excess of the amount of the ration is permitted. Thus, the presence of an uncontrolled market influences both factor and goods markets under repressed inflation.

In a free economy, labor will be willing to exchange greater effort for additional income, and hence savings, until it maximizes welfare, because income can be disposed of freely and savings accumulated in any manner. In a permanent and universally repressed economy (henceforth a completely repressed economy), prices are held constant through controls and all goods and items are rationed. Labor will be forced to save all income received above that amount necessary to purchase the available quantity of rationed goods. Savings can never be utilized because there would be nothing available on which to spend. It is rational that the individual will discount all savings to zero and limit his effort only to earn the necessary amount of income. If the wage rate is increased, he will reduce effort until he earns just the necessary amount of income to purchase his ration and vice versa if the wage rate is reduced.

In an economy that is not completely repressed, savings will be discounted less than fully, as there is expectation that the amount of rationed goods will increase in the future. Savings will be discounted even less in a partially controlled economy (i.e., with an uncontrolled market) since goods in excess of the rationed amount are available. Thus labor will be willing to offer additional effort in exchange for savings.

The above indicates that the supply curve of labor is most elastic in a free economy, while it is inelastic at that level of effort which is just sufficient to purchase the available rationed goods at the given prices and wage-rates in a completely repressed economy. ^{2/} Between the

^{1/} See Charlesworth (1956) for an in-depth microeconomic analysis of labor supply and consumer behavior under repressed inflation.

^{2/} The inelasticity of labor supply in a repressed economy is consistent with unemployment. The latter is voluntary and therefore can co-exist with labor shortage under repressed inflation.

two polar cases, the elasticity of the supply curve of labor depends on the degree of repressed inflation. 1/

III. Analysis of Repressed Inflation

The analysis of repressed inflation is based on a simple one-good model of a CPE in which the inelasticity of labor supply occupies an important place. Despite the one-good limitation, the model provides an adequate framework for disequilibrium analysis of the inflationary gap-- that is the level of excess demand--and of the forces generating the inflationary process in the uncontrolled market under repressed inflation.

1. A simplified disequilibrium model 2/

The model is based on the following assumptions:

- (1) All prices and wage-rates are constant in the controlled market. Changes in the prices can only be prescribed by the central authorities;
- (2) control of investment and allocations to investments are carried out by the enterprises under the guidelines of the central plans;
- (3) production for the controlled economy is aggregated into a single commodity, with labor as the only variable input so that there is an aggregate marginal cost curve and an average controlled price, which changes only when the individual controlled prices are adjusted; and,
- (4) there are no inventories in the economy.

Based on these assumptions, the model of a CPE is described in Figure 1. The price line, A_1p_0 , represents the controlled price (p_0) at which enterprises expect to sell their output; it is the expected marginal revenue curve. The planned supply of commodities is given by the aggregate marginal cost curve $mc(w_0)$, which is constructed on the assumption of

1/ The unwillingness of labor to offer additional effort under repressed inflation also affects factor use and efficiency. Production costs tend to rise as enterprises are forced to use other factors even if they are expensive to produce a given quantity of goods. Efficiency of factor use is thus impeded under repression.

2/ The model is based on the general model of repressed inflation first discussed by Bent Hansen in a classic study on inflation (1951).

a given wage rate, w_0 . ^{1/} This curve is assumed to be accurately known to the planners, who set the production plan target at Q_0 , where the expected marginal revenue equals the expected marginal cost. The plan sets targets for the allocation of production for consumption and productive uses in line with the socio-economic objectives of the authorities. The expected value of production ($p_0Q_0 = A_1OQ_0C_1$) corresponds to the planned national income, comprising the planned wage payments ($w_0L_0 = A_2OQ_0C_1$) and the expected income (gross profits) of enterprises ($A_1A_2C_1$).

The planned production Q_0 is assumed to be unrealizable because of labor shortage. If the actual number of workers (L_1) who offer themselves for hire at the given wage rate is less than the planned employment (L_0), then the actual wage payments (w_0L_1) are less than the planned wage payments (w_0L_0). Hence, the actual production Q_1 must be at the point on the expected marginal cost curve ($A_2OQ_1B_2/w_0 = L_1$) which is to the left of the plan target ($A_2OQ_0C_1/w_0 = L_0$). The actual sales value is $p_0Q_1 = A_1OQ_1B_1$ and the actual gross profit is $A_1A_2B_2B_1$, which is less than the expected income of enterprises by an amount $B_1B_2C_1$. But enterprises are willing to extend production corresponding to the point C_1 , where their expected marginal cost equals the expected marginal revenue (equal to the price). However, labor is unwilling to offer additional effort beyond L_1 , which is determined by individuals' decision under repressed inflation in the controlled market.

The purchases of commodities by the buyers for consumption and investment purposes at alternative prices are shown by the planned demand curve DD. This curve is constructed differently from an ordinary demand

^{1/} The marginal cost function and factor shares can be derived from the quantity of production as a function of price for a given wage-rate. Thus, if $Q = \phi(p/w_0) = f(p;w_0)$ where the price p satisfies the optimum condition: $p = \text{marginal cost}$. If E_0^C and E_0^W represent the expected income of enterprises and workers' respectively, then for a given wage-rate (w_0), we have

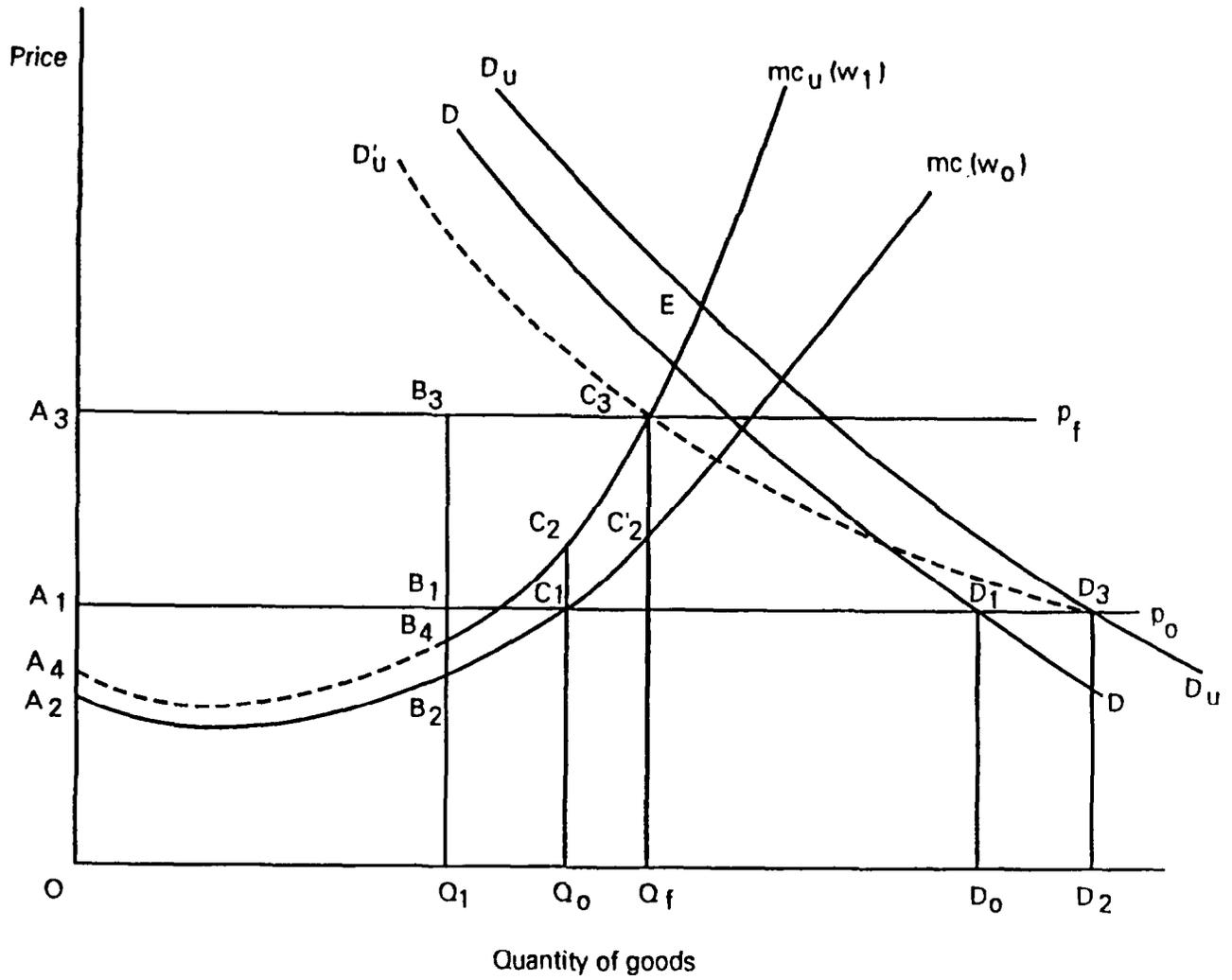
$$E_0^C(p;w_0) = \int_a^p f(r;w_0)dr$$

$$E_0^W(p;w_0) = pQ - E_0^C(p;w_0)$$

where $a = OA_2$ in Figure 1. At the quantity of production Q_1 , the marginal cost, say p_1 is less than the fixed price p_0 . Hence, the actual wage payments at the wage rate w_0 at Q_1 is

$$\begin{aligned} E_0^W(p_1;w_0) &= p_1Q_1 - E_0^C(p_0;w_0) \\ &= A_2OQ_1B_2 \end{aligned}$$

Figure 1. Price Determination Under Repressed Inflation with an Uncontrolled market



curve. ^{1/} The latter describes the quantity that is planned to be purchased at specified prices, with other things remaining the same. But a change of price, because of a fixed wage rate, would alter the distribution of income (as shown by the mc-curve). Such alterations imply a displacement of the ordinary demand curve. The demand curve DD is constructed in such a way that it takes account of this displacement. At each price, the total expected income and its distribution between wage earners and enterprises is determined and the corresponding quantity of consumption goods is specified on the demand curve. The demand for investment goods is added to yield the total effective demand for commodities corresponding to the given price.

As noted earlier, under central planning the demand for goods is generally non-synchronized with the plan allocations. Since enterprises are often striving to overachieve the plan, their intended purchases of investment goods exceed the planned production of investment goods. Also, the planned production of the controlled goods for consumption lags behind consumer demand, which is unrestricted. Total effective demand and the plan physical targets are thus generally inconsistent and the inconsistency further aggravated by the shortfall in planned production. This is shown in Figure 1. At the fixed price, the quantity of planned demand (D_0) exceeds the quantity of plan production (Q_0) and the demand is restricted at the quantity of actual production (Q_1). The non-synchronization between demand and the production target combined with the actual shortfall in production give rise to excess demand and the inflationary gap under repressed inflation.

2. Excess demand and the inflationary gap

In the model of a CPE without an uncontrolled market (Figure 1), the excess demand, $E(D)$, is defined as the excess of the planned demand over the actual production at the price p_0 .

$$\begin{aligned} E(D) &= D_0 - Q_1 & (1) \\ &= (D_0 - Q_0) + (Q_0 - Q_1) \end{aligned}$$

^{1/} See Bent Hansen (1951) Section 5, Chapter IV for the properties of the planned demand curve. For a given wage rate (w_0), the planned demand at any price p is given by

$$\begin{aligned} D &= \psi(p/w_0) = D(p;w_0) \\ &= \frac{\alpha_c}{p} E_0^C(p;w_0) + \frac{\alpha_w}{p} E_0^W(p;w_0) + \frac{I_0}{p} \text{ (or } Q_0^I) \end{aligned}$$

where $\alpha_c < \alpha_w$ = average propensity to consume of enterprises and workers, respectively. Investment is fixed in value, I_0 (or Q_0^I is fixed in quantity).

where $D_0 - Q_0 =$ ex ante commodity-gap $\underline{1/}$, and
 $Q_0 - Q_1 =$ the factor gap $\underline{1/}$

The ex ante commodity-gap arises because the planned production falls short of the planned demand. The factor-gap indicates the shortage of labor at the given wage rate since enterprises are willing to extend production up to the point where $mc = p_0$. In a free economy, enterprises would bid up the factor prices, causing the mc curve to shift up until increases in production costs eliminate the factor-gap. In a completely repressed economy, the supply of labor is determined by the rationed quantity of consumer goods at the given prices and wage-rates, and the factor gap persists.

The value of the excess demand is defined as the inflationary gap and it is a measure of repressed inflation. In a free economy, the wider this gap the larger is the expected rise in prices required to eliminate the underlying excess demand. In a CPE, this gap can not be eliminated by open inflation, which is prevented from occurring by the adoption of controls and rationing. The inflationary gap, $R(D)$, is thus the excess value of the planned purchase over the value of actual production at the controlled price: $\underline{2/}$

$$R(D) = p_0 D_0 - p_0 Q_1 \quad (2)$$

$$= \left[p_0 D_0 - p_0 Q_0 \right] + \left[p_0 Q_0 - p_0 Q_1 \right]$$

Equation (2) can be expressed in terms of Figure 1 as:

$$p_0 D_0 - p_0 Q_1 = A_1 O D_0 D_1 - A_1 O Q_1 B_1 = B_1 Q_1 D_0 D_1 \quad (2)$$

$$p_0 D_0 - p_0 Q_0 = A_1 O D_0 D_1 - A_1 O Q_0 C_1 = C_1 Q_0 D_0 D_1$$

$$p_0 Q_0 - p_0 Q_1 = A_1 O Q_0 C_1 - A_1 O Q_1 B_1$$

$$= A_2 O Q_0 C_1 - A_2 O Q_1 B_2 + A_1 A_2 C_1 - A_1 A_2 B_2 B_1$$

$$= B_2 Q_1 Q_0 C_1 + B_1 B_2 C_1$$

where

$\underline{1/}$ The conceptual basis for the ex ante commodity-gap and the factor-gap has been fully developed and discussed in Bent Hansen (1951). The annual central plans and the actual (realizable) outcomes can be thought of as the respective ex ante and the ex post magnitudes of economic aggregates.

$\underline{2/}$ See Hansen (1951), Chapter III, for a detailed analysis of the inflationary gap.

- $A_1O_0D_1$ - the value of planned demand for commodities
 $A_1OQ_1B_1$ - the value of actual production (available supply)
 $A_1OQ_0C_1$ - the value of planned production (the central plan)
 $A_2OQ_0C_1$ - the value of planned wage payments (planned employment)
 $A_2OQ_1B_2$ - the value of actual wage payments (actual labor supply)
 $A_1A_2C_1$ - the expected income of enterprises
 $A_1A_2B_2B_1$ - the actual income of enterprises
 $B_1Q_1D_0D_1$ - the inflationary gap in the commodity-markets
 $C_1Q_0D_0D_1$ - the ex ante commodity-gap
 $B_2Q_1Q_0C_1$ - the factor-gap
 $B_1B_2C_1$ - unexpected loss of income of enterprises

Combining these into (2), it is seen

$$R(D) = B_1Q_1D_0D_1 \tag{3}$$
$$= C_1Q_0D_0D_1 + B_2Q_1Q_0C_1 + B_1B_2C_1$$

or,

the inflationary-gap in the commodity-markets = the ex ante commodity-gap
+ the factor-gap
- unexpected increase of
income of enterprises

This measure of inflationary-gap in the commodity-markets is related to the traditional ex ante inflationary gap. The latter is defined as the excess of the planned investment over the planned supply of savings. By definition, the latter excludes unexpected increase of enterprises' income (which arises from the factor-gap in the labor market). The ex ante inflationary gap can be written as:

$$I_o - S_o = \text{the ex ante commodity-gap} + \text{the factor-gap} \quad (4)$$

This, in terms of Figure 1, is

$$I_o - S_o = B_2 Q_1 D_o D_1 C_1 \quad (5)$$

Hence,

$$R(D) = I_o - S_o + B_1 B_2 C_1 \quad (6)$$

The equations (5) and (6) show that the equality between planned investment and planned saving is a necessary condition but not sufficient for the absence of an inflationary pressure in the commodity-markets. Both $R(D) = 0$ and $I_o - S_o = 0$ have to be satisfied to eliminate an inflationary gap.

The above conditions are extremely important under repressed inflation. In Figure 1, if through restrictive financial policies, the demand curve DD were to intersect the price line at B_1 so that $D_o = Q_1$ then $R(D) = 0$ but it is seen that $I_o \neq S_o$ unless $B_1 B_2 C_1 = 0$. Although there is no inflationary gap in the commodity-markets, the marginal cost is less than the price at Q_1 , hence enterprises are willing to expand production up to the point Q_o where $mc = p_o$, but the unwillingness of labor to offer additional effort prevent this expansion, causing the factor-gap. The ex ante commodity-gap, the factor-gap and the unexpected loss in enterprise income have to be zero for equilibrium to exist. The demand curve DD must intersect the mc curve at B_2 to achieve equilibrium under repressed inflation (without an uncontrolled market). This would imply that the controlled price has to be reduced by $B_1 B_2$ to equal the marginal cost at B_2 . Such an equilibrium may be viewed as a low level equilibrium trap where output is below potential production. In the CPEs the official prices have been adjusted periodically in order to avoid the equilibrium trap.

IV. Impact of Repressed Inflation

The impact of repressed inflation in the presence of an uncontrolled market can be analyzed in a straightforward fashion by extending the basic model. Additionally, it is assumed that production for the uncontrolled market is carried out by enterprises, which produce uncontrolled goods outside the specified quota for the controlled market. Input and output prices and wage rates are determined by market forces. The uncontrolled goods are aggregated into the same single commodity so that the same

concepts of aggregate marginal cost curve and average market price apply. ^{1/} The aggregate supply and demand curves for the uncontrolled market are constructed in the same way as for the controlled market in the preceding section. The linkages between the controlled and the uncontrolled markets are preserved within the model, which permits the transmission of economic effects of repressed inflation in the goods and factor markets.

1. Uncontrolled market and the inflationary gap

In Figure 1, the marginal cost curve mc_u and the demand curve D_uD_u represents the uncontrolled market. These are placed upwards compared with the ones in the controlled economy. The higher position of the marginal cost curve for the uncontrolled market is primarily due to a higher wage rate; additional labor effort is induced with a higher real wage. The other reasons are: the inelasticity of the supply curve of labor with respect to monetary inducements under repressed inflation, as compared with a free economy; faster depreciation of the existing capital stock because of more intensive use; and the growing presence of bottlenecks in obtaining the complementary factor inputs. All these contribute to higher production costs. The higher position of the planned demand curve for the uncontrolled market reflects the higher wage rate (and thus higher incomes).

The linkages between the controlled and the uncontrolled markets influence the level of operation in both markets. Because of the excess demand in the controlled market, the market price (not necessarily equal to the marginal cost) in the uncontrolled market is higher than the fixed price (p_0). As long as the marginal cost of production (mc_u) is below the market price, enterprises will expand uncontrolled production by paying higher wage rates. The latter, together with the persistence of shortages in the controlled economy, act as a disincentive to work efficiently in the controlled market where productivity declines. This decline is reinforced by other factors including a faster depreciation of the capital stock, which is made to work longer hours in order to expand uncontrolled production. All these factors have the effect of increasing production costs, shifting up the marginal cost curve mc and reducing production below Q_1 for the same amount of labor in the controlled market. Since the enterprises are mandated to meet the quota requirements (Q_1) for the controlled goods, the difference is covered by diverting the uncontrolled goods to the controlled market at the fixed price, p_0 . The diversion causes a deadweight loss of the profit as the goods could have been sold at the market price if there were no control. The deadweight loss in the profit causes the planned demand curve D_uD_u to tilt to the left from the point D_3 . ^{2/}

^{1/} The limitation imposed by the single good assumption on saving is ignored in the sense that it is reflected in the magnitude of average propensity to consume.

^{2/} A proof of this statement can be provided by the author upon request.

The expansion in the size of the uncontrolled market, the upward shift in the marginal cost curve mc , the shrinking of production in the controlled market, and the increase in the deadweight loss and the leftward tilt in the planned demand curve $D_u D_u$ continue until the marginal cost curve mc merges with the marginal cost curve mc_u in the uncontrolled market where the wage rate rises to w_1 and the tilt of the $D_u D_u$ curve stops at the new position $D_3 D_u$. In Figure 1, the mc_u curve intersects the $D_3 D_u$ curve at C_3 . At this point, the total production is Q_f , of which the quantity Q_1 is sold to the controlled market at the price p_0 where the deadweight loss is $(p_f - p_0) Q_1$. The remainder $(Q_f - Q_1)$ is sold in the uncontrolled market at the price p_f , which is equal to the marginal cost mc_u . The latter implies that the quantity of realizable production Q_f is actually produced by the two markets.

The operation of the uncontrolled market will affect the inflationary gap in the commodity (controlled and uncontrolled) markets. With the merger of the expected marginal cost curves, the effective marginal cost curve for the whole economy becomes mc_u , and the effective demand curve becomes $D_3 D_u$. In Figure 1, the excess demand in the controlled market is given by: 1/

$$\begin{aligned} E_u(D) &= D_2 - Q_f - D_0 - Q_1 + (D_2 - D_0) - (Q_f - Q_1) \\ &= E(D) + (D_2 - D_0) - (Q_f - Q_1) \end{aligned} \quad (6)$$

As seen in (6), the operation of an uncontrolled market reduces excess demand only if the increase in total production exceeds the increase in planned demand. It is possible that the increase in total production falls short of the rise in demand so that the excess demand for the controlled goods at the fixed price, which is well below the market price, increases with the operation of the uncontrolled market.

The inflationary gap in the commodity markets can be defined as the excess value of the planned purchases in the controlled market over the value of the actual production in both the controlled and uncontrolled markets. Since the actual production in the uncontrolled market $(Q_f - Q_1)$ is sold at the market price p_f , the inflationary gap in the commodity markets, $R_u(D)$, is given by:

$$\begin{aligned} R_u(D) &= p_0 D_2 - (p_0 Q_1 + p_f (Q_f - Q_1)) \\ &= R(D) + (p_0 (D_2 - D_0) - p_f (Q_f - Q_1)) \end{aligned} \quad (7)$$

1/ Strictly, if we adhere to the definition of excess demand for a given price then $E_u(D) = D_2 - Q_1$. But this is not valid when there is price discrimination as between the controlled and the uncontrolled markets. Equation (6) becomes relevant since excess demand is a quantitative concept.

which, in Figure 1 is:

$$\begin{aligned} R_u(D) &= B_1 Q_1 D_2 D_3 - B_3 Q_1 Q_f C_3 \\ &= C_1 Q_o D_o D_1 + D_1 D_o D_2 D_3 \\ &\quad - \left\{ (B_3 B_4 C_3 - B_1 B_2 C_1) + B_4 B_2 C_1 C_2 + C_2 Q_o Q_f C_3 \right\} \end{aligned} \quad (8)$$

where

$C_1 Q_o D_o D_1$ = the ex ante commodity-gap.

$D_1 D_o D_2 D_3$ = the increase in the ex ante commodity-gap.

$B_3 B_4 C_3 - B_1 B_2 C_1$ = total income of enterprises from the uncontrolled production less unexpected loss in income from the controlled market operation.

$B_4 B_2 C_1 C_2$ = unplanned increase in the payment of wages to cover the shortfall in the planned production ($Q_o - Q_1$).

$C_2 Q_o Q_f C_3$ = the payment of wages for the uncontrolled production in excess of the planned production ($Q_f - Q_o$).

Several observations on the inflationary gap in the commodity markets with an uncontrolled market are in order. First, the inflationary gap in the commodity markets may be greater than or less than before according to whether the increase in the ex ante commodity-gap ($D_1 D_o D_2 D_3$) is greater than or less than the market value of the uncontrolled production ($B_3 Q_1 Q_f C_3$). If the rise in the wage rate is sufficiently high, it is plausible that $R_u(D) > R(D)$, despite the increased availability of goods. 1/ Second, the inflationary gap in the commodity markets arises from the ex ante commodity-gap since the factor-gap in the controlled market is more than compensated for by uncontrolled production. 2/ Third, a part of the higher wage payments reflects the unplanned increase in wage payments

1/ This can happen when earnings from the uncontrolled market are used to purchase the controlled goods, thus increasing the excess demand for the controlled goods.

2/ Indeed, the factor-gap in the controlled market has increased with the shrinkage of production of the controlled goods.

($B_4B_2C_1C_2$) that arise from uncontrolled production to cover the shortfall in the physical plan target (Q_0). Fourth, the expected income of enterprises from uncontrolled production is greater than the unexpected loss of income of enterprises ($B_1B_2C_1$) that occurs from the shortfall in realizing the planned production in the controlled economy. This implies that the presence of an uncontrolled market permits a greater volume of investment and consumption than in a completely repressed economy. Finally, a deadweight loss of expected income arises from the sale of the controlled goods (Q_1) at the controlled price. This loss is given by $A_3A_1B_1B_3$, the difference between the market price and the controlled price at which the quantity Q_1 is sold. This is the principal reason for the lack of mobilization of resources that could be channeled to generate higher income and production.

2. The inflationary process

The persistence of repressed inflation in the controlled economy implies that the market clearing price at C_3 in Figure 1 cannot be a static equilibrium. This is because the repressed inflation in the controlled market creates a tension in the form of an excess demand in the uncontrolled market.

The excess demand in the uncontrolled market can be expressed as

$$E_{um}(D) = D - Q \quad (9)$$

where

$$Q = \phi(p/w); \phi' > 0 \quad (10)$$

$$D = \psi(p/w); \psi' < 0 \quad (11)$$

are the quantities of production and demand as functions of the price-wage ratio, (p/w) . The functions ϕ and ψ become identical to the planned production functions implied by the expected marginal cost curve, $mc(w_1)$, and the planned demand curve, D_uD_u , for the wage rate w_1 . ^{1/} In a market economy, the price-wage flexibility would eliminate the excess demand for an equilibrium price and wage rate combination (p^*, w^* or p^*/w^*). However, under repressed inflation, the deadweight loss by selling uncontrolled production in the controlled market would persist and it would prevent production to exceed Q_f despite the price-wage flexibility in the

^{1/} The planned quantities of production and demand functions, ϕ and ψ , also become identical to those implied by the expected marginal cost curve $mc(w_0)$, and the planned demand curve DD , for the wage rate w_0 in the controlled economy.

uncontrolled market. Thus, under repressed inflation, the nature of price-wage dynamics in the uncontrolled market can be analyzed by reformulating Equation (9) as follows:

$$E_{um}(D) = (D - Q_f) - (Q - Q_f) \quad (12)$$

where Q_f is a constant level of production (corresponding to C_3 in Figure 1) such that

$D - Q_f$ = the ex ante commodity gap

$Q - Q_f$ = unrealizable production, or the factor-gap

Thus the conditions

$$D - Q_f = 0 \quad (13)$$

$$Q - Q_f = 0 \quad (14)$$

must be satisfied for the elimination of excess demand and for the existence of a static equilibrium in the uncontrolled market. These conditions can be used to set up two dynamic equations for price p and wage rate w , respectively:

$$\frac{dp}{dt} = h (D - Q_f) \quad (15)$$

$$\frac{dw}{dt} = g (Q - Q_f) \quad (16)$$

where $h(0) = g(0) = 0$ and $h' > 0$ and $g' > 0$. These conditions imply that h and g are monotonic and they ensure the stability of equilibrium of the system (10) and (11).

Since Q_f is constant under repressed inflation, the nature of h and g are such that the price-wage dynamics cannot alter the relation between price p and wage rate w , or in other words the (p/w) ratio remains fixed. That is

$$\frac{d(p/w)}{dt} = \frac{\frac{dp}{dt} - (p/w) \frac{dw}{dt}}{w^2} = 0 \quad (17)$$

is implied under repressed inflation. If we substitute (15) and (16) into (17) and rearrange, we can express the price-wage ratio (p/w) in the uncontrolled market as:

$$(p/w) = \frac{h(D - Q_f)}{g(Q - Q_f)} \quad (18)$$

assuming $g(Q - Q_f) \neq 0$.

Equation (18) may be used as a condition to show that the level of production Q_f in Figure 1 is a quasi-equilibrium under repressed inflation in the controlled market. The quasi-equilibrium system is given by

$$Q_f = \text{constant} \quad (19)$$

$$Q = \phi(p/w) \quad (10)$$

$$D = \psi(p/w) \quad (11)$$

$$p/w = \frac{h(D - Q_f)}{g(Q - Q_f)} \quad (18)$$

with the four unknowns Q_f , Q , D , and (p/w) . The speed of rise in the price and wage rate from (15) and (16) together with the condition (17) is such that in quasi-equilibrium

$$\frac{p}{w} \cdot \frac{dp}{dw} = 1 \quad (20)$$

Equation (20) implies that the equilibrium at C_3 in Figure 1 is a quasi-equilibrium in the sense that as long as there exists an

inflationary gap in the controlled market, the market price and wage rate will move in tandem, leaving the real variables unchanged. 1/

The forces generating the inflationary process described by the quasi-equilibrium system can now be explained. The persistence of excess demand in the controlled market is perceived by enterprises as an excess demand for the whole economy. Although the uncontrolled market is cleared, enterprises plan to extend production further since they perceive the public is willing to pay higher market price to purchase uncontrolled goods in order to satisfy the excess demand. 2/ This perception is validated as the tension created by the persistence of excess demand in the controlled market causes the market price to rise. Enterprises attempt to expand production in anticipation of satisfying the excess demand. However, labor demands higher money wages in order to maintain the real wage. The rise in the uncontrolled wage rate implies an upward shift in the mc_u curve and a relative decline in the real wage in the controlled economy. The workers in the controlled economy respond with a decline in productivity until the real wage rates are equalized between the markets. The decline in productivity causes further shrinkage of the controlled economy so that the expansion in uncontrolled production is diverted to meet the quota requirements for the controlled economy, leaving the total production unchanged at Q_f . Meanwhile, the higher wage rate in the uncontrolled market pushes both the planned demand curves $D_u D_u$ and $D_3 D_u$ to the right until the new $D_3 D_u$ curve intersects the new mc_u at a position above C_3 on the extended line $Q_f C_3$. In real terms, nothing has changed; the real wage implied by the new mc_u curve remains unchanged and so is the total production at Q_f .

As long as controls over prices and wage-rates and allocations through rationing are maintained, the inflationary gap will not be eliminated in the controlled economy. The market forces arising from repressed inflation will thus continue pushing up prices and wages in the uncontrolled market, generating an inflationary process. Simultaneously, resources will be shifting to the uncontrolled market, as labor works harder and longer hours for uncontrolled production while

1/ The stability of the quasi-equilibrium production level can be discerned from the condition (17). Let the quasi-equilibrium values of Q , D , and (p/w) be Q_0 , D_0 and $(p/w)_0$. Then, by using the condition (17) it can be shown that when $(p/w) < (p/w)_0$, then $\frac{d(p/w)}{dt} > 0$, and conversely

when $(p/w) > (p/w)_0$, then $\frac{d(p/w)}{dt} < 0$. Thus, any movement away from the

quasi-equilibrium position is accompanied by a tendency to return to that position.

2/ The quasi-equilibrium production is regarded by enterprises as being short of what the combined markets can bear since it is not realized that it is the deadweight loss of income that has depressed demand.

productivity in the controlled economy declines. This decline shrinks the relative size of the controlled market and sustains the inflationary process in the uncontrolled market.

How is the inflationary process affected when the controlled prices and wage rates are altered in response to the inflationary gap in the commodity-markets? Assume that the controlled price is raised by Δp_0 , with no change in the controlled wage rate. The demand for the controlled goods declines, implying a reduction in excess demand. The total value of the controlled goods is increased by $\Delta p_0 Q_1$, which will be reflected entirely in profits, since wage payments in both the markets remain unchanged. The increase in profits reduces the deadweight loss ($A_3A_1B_1B_3$) by the same amount. The reduction in the latter increases the demand for the uncontrolled goods, causing a rightward tilt of the demand curve $D_3D'_u$. Uncontrolled production is increased to satisfy the rise in demand, resulting in an increase in the market price until it equals the higher marginal cost at the intersection of the mc_u curve with the new position of the $D_3D'_u$ curve.

Despite a reduction in the excess demand, any change in the size of the inflationary gap in the commodity markets depends upon the new value of the ex ante commodity gap. Even if this gap narrows, the inflationary gap in the commodity markets exists as long as there are shortages of controlled goods. The increase in both the controlled and the market prices lower the real wage of workers engaged in production of the controlled goods relative to workers engaged in production of the uncontrolled goods. To avoid withdrawals of labor effort and a decline in productivity, the controlled wage rate has to be raised, increasing production costs, and, in turn, causing an upward shift in the marginal cost curve mc , thereby causing it to move closer to the mc_u curve. Each increase in the controlled price, while reducing the excess demand for the controlled goods, causes profits to increase through a further reduction of the deadweight loss. The income effect from the increase in profits outweighs the price effect, causing a rise in the demand for the uncontrolled goods. The latter begins to reverse the leftward tilt of the demand curve $D_3D'_u$, which moves rightward closer to the D_uD_u curve.

This interactive process of price and cost increases comes to an end when the expected marginal cost curve mc coincides with the expected marginal cost curve mc_u as the real wage equalizes between the two markets and the demand curve $D_3D'_u$ coincides with the demand curve D_uD_u . There prevails a single marginal cost curve (mc_u) and a corresponding planned demand curve (D_uD_u). Their intersection gives the market price. This is the equilibrium price, which is equal to the marginal cost and is higher than the market price before the unification of the markets and there is no deadweight loss of income. Correspondingly, the equilibrium production is higher than the quantity Q_f .

This inflationary process is necessary to arrive at the equilibrium at E. There is no further tendency for prices and wage rates to move,

since both the controlled and the uncontrolled markets are unified into a single market.

IV. Concluding Remarks

The analysis in this paper indicates that the adoption of a policy of repressed inflation through a system of controls and allocations cannot eliminate the inflationary gap that typically is evident in CPEs. This gap arises whenever the planned expenditures on factor services by enterprises are greater than the planned voluntary release of factors through savings. In a repressed economy, open inflation is prevented from eliminating the inflationary gap and balancing investment with saving. The imbalance leads to misallocation and underutilization of resources. If demand is reduced through policy action to match supply such an economy regresses into a low level equilibrium trap with output below productive capacity.

An uncontrolled market reduces excess demand but it can not eliminate the inflationary gap because of repressed inflation in the controlled market. Stable equilibrium is unattainable in such a partially controlled economy. The persistence of repressed inflation unleashes pressures that generate an inflationary process which causes market prices and wage rates to increase continually; simultaneously, it causes shrinkage of the controlled economy as resources shift to the uncontrolled market. The optimal policy is thus to decontrol prices, wages, and production in the controlled economy. Decontrol eliminates excess demand and the associated inflationary gap and establishes a stable equilibrium. In reaching the equilibrium, prices and wages rise to a higher level (once and for all), while output expands to its potential consistent with efficient utilization of resources.

References

- Adam, J., Wage Control and Inflation in the Soviet Block Countries (London: Macmillan, 1979).
- Barro, R. and Grossman, H., "A General Disequilibrium Model of Income and Employment," American Economic Review Vol. 61, (March, 1971), pp. 62-83.
- Brus, W and Laski, K., "Repressed Inflation and the Second Economy Under Central Planning," Conference on "The Economics of the Shadow Economy," (Bielefeld: 1983).
- Charemza, W. and Quandt, R. E., "Models and Estimation of Disequilibrium for Centrally Planned Economies," Review of Economic Studies, Vol. 49, (January, 1982), pp. 109-16.
- Charlesworth, H. K., The Economics of Repression (Allen and Unwin, 1956).
- Drazen, A., "Recent Developments in Macroeconomic Disequilibrium Theory," Econometrica, Vol. 48, (March, 1980), pp. 283-306.
- Dreze, J., "Existence of an Exchange Equilibrium Under Price Rigidities," International Economic Review, Vol. 16, No. 2, (June, 1975), pp. 301-320.
- Ericson, R. E., "The Second Economy and Resource Allocation Under Central Planning," Journal of Comparative Economics, No. 31, (March, 1984), pp. 1-26.
- Feltenstein, A., "A General Equilibrium Model of a Traditional Soviet-Type Economy," Journal of Comparative Economics, Vol. 1, (June, 1977), pp. 147-165.
- _____, "Inflation, Price Controls and Fiscal Adjustment--A Survey of Literature and Analytical Framework," (unpublished manuscript, May 1989).
- Grossman, G., "The Second Economy of the USSR," Problems of Communism, pp. 25-40, September-October, 1977; also in Vito Tanzi, The Underground Economy in the U.S. and Abroad, (Massachusetts: Lexington, 1982).
- Hansen, B., A Study in the Theory of Inflation, (London: Allen and Unwin Ltd., 1951).
- Howard, D. H., "A Note on Hidden Inflation in the Soviet Union," Soviet Studies, Vol. XXVIII, No. 4 (October, 1976).

- Katz, B. G., and Owen, J., "Disequilibrium Theory, Waiting Costs, and Saving Behavior in Centrally Planned Economies: A Queuing-Theoretic Approach," Journal of Comparative Economics, Vol. 8, (September, 1984), pp. 301-321.
- _____, "An Equilibrium Model of a Second Economy Market in a Centrally Planned Economy," Journal of Comparative Economics, Vol. 12, (December, 1988), pp. 546-569.
- Kornai, J. Anti Equilibrium, (Amsterdam, North-Holland: 1971).
- _____, The Economics of Shortage, (Amsterdam, North-Holland: 1980).
- Latham, R., "Quantity Constrained Demand Functions," Econometrica, Vol. 48, No. 2 (March, 1980), pp. 307-313.
- Malinvaud, E., The Theory of Unemployment Reconsidered, (Oxford, England: Basil Blackwell, 1977).
- Muellbauer, J., and Portes, R., "Macroeconomic Models With Quantity Rationing," Economic Journal, Vol. 88, (December, 1978) pp. 788-821.
- Nutti, D. M., "Hidden and Repressed Inflation in Soviet-Type Economies: Definitions, Measurements and Stabilization," Contributions to Political Economy, Vol. 5, (1986), pp. 37-82.
- O'Hearn, D., "The Consumer Second Economy: Size and Effects," Soviet Studies, Vol. XXXII, No. 2, (April 1980), pp. 218-234.
- Pindak, F., "Inflation Under Central Planning," Reprinted in Societe Universitaire de Recherches Financieres (S.U.E.R.F.) Reprint Series No. 29, (Tilberg, 1984), pp. 1-39.
- Podkaminer, L., "Macroeconomic Disequilibria in Centrally Planned Economies: Identifiability of Econometric Models Based on the Theory of Household Behavior Under Quantity Constraints," Journal of Comparative Economics, Vol. 13, (March, 1989), pp. 47-60.
- Portes, R. and Winter, D., "The Supply of Consumption Goods in Centrally Planned Economies," Journal of Comparative Economics, Vol. 4, (December, 1977), pp. 351-365.
- Portes, R., "Macroeconomic Equilibrium and Disequilibrium in Centrally Planned Economies," Economic Inquiry, Vol. 19, No. 4, (October, 1981), pp. 559-578.
- Winiecki, J., "Inflation Under Central Planning: Sources, Processes, and Manifestations" Konjunkturpolitik, 31 Jharg H. 4/5, (1985).

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