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Shortages Under Free Prices: the Case of Ukraine in 1992

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Abstract

This paper examines the coexistence of free prices and shortages for a range of consumer goods in Ukraine during 1992. Enterprises making consumer goods were substantially free to set market-clearing prices. Yet, Ukraine's official consumer market experienced continued shortages, while the same goods traded at higher prices in parallel markets. The paper advances a model of enterprise behavior in an environment of central allocation of inputs at preferential prices. We show that central allocation of key inputs according to perceived "need" creates incentives for excess demand to be perpetuated despite formal price liberalization. The analysis brings forth the importance of abolishing allocation mechanisms for price liberalization to bring its full efficiency effects.

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Summary

During 1992, the recorded retail price level in Ukraine grew more than 20-fold, strongly suggesting that the Soviet-style repressed inflation had been transformed into an open process. Yet, to an important extent, Ukraine remained a shortage economy. Consumers were unable to obtain goods at posted prices in the still-dominant state stores. Similarly, the output of many enterprises was apparently constrained by lack of inputs rather than by insufficient demand for their products at going prices.

The analysis of price policies during 1992 indicates that, despite a whole range of government interventions, many enterprises--particularly those supplying non-food consumer goods--were substantially free to set market-clearing prices for their output. The evidence on persistent shortages of goods with free prices, therefore, suggests that in 1992 at least some producers may have deliberately chosen to maintain excess demand for their goods.

The paper focuses on the role of continued central allocation of key inputs at below-market prices. If central allocators supply inputs in response to perceived "need"--i.e. excess demand--it may be rational for enterprises to set their output prices at less than what the market would bear in order to obtain a greater proportion of inputs centrally. Under plausible circumstances, the reduced costs of inputs through this strategy would outweigh the direct loss of revenue associated with below-market-clearing prices. The main conclusion is that, at least in some sectors of the Ukrainian economy during 1992, continued central allocation of key inputs created incentives for enterprises to perpetuate excess demand despite formal price liberalization.

The analysis in this paper is of direct relevance to those economies in transition which retain central allocation structures. First, an economy in transition that liberalizes prices but continues to allocate some inputs is likely to remain mired in a web of price distortions. While compulsion is removed, strong incentives remain for non-equilibrium pricing. Central allocation mechanisms produce a conduit through which price controls that continue to be applied in some markets spill into liberalized markets.

Second, while the retention of central allocation is frequently justified by the authorities as a way of maintaining output of the state sector, it in fact creates incentives for enterprises to reduce production. In order to signal "need" to the authorities, enterprises appear to restrict both quantity and prices.

I. Introduction

During 1992, the recorded retail price level in Ukraine grew more than 20-fold, strongly suggesting that the Soviet-style repressed inflation had been transformed into an open process. Yet, to an important extent, Ukraine remained a shortage economy. Consumers were unable to obtain goods at posted prices in the still-dominant state stores. Similarly, the output of many enterprises was apparently constrained by lack of inputs rather than by insufficient demand for their products at going prices. In part, this can be seen in the continued existence of parallel markets, where most consumer and many industrial goods traded at prices that were usually much higher than those in the official network.

The aim of this paper is to examine the significance and the sources of the continued price repression in Ukraine. An analysis of price policies during 1992 indicates that, despite a whole range of government interventions, many enterprises--particularly those supplying non-food consumer goods--were substantially free to set market-clearing prices for their output. The evidence on persistent shortages of goods with free prices, therefore, suggests that in 1992 at least some producers may have deliberately chosen to maintain excess demand for their goods.

The analysis in this paper examines why and under what circumstances enterprises would voluntarily seek to establish excess demand in their output markets. Possible explanations include rent- seeking by insiders (managers and workforces), inertia, and the desire to secure political goodwill. This paper focuses on another possible factor: the role of continued central allocation of key inputs at below-market prices. If central allocators supply inputs in response to perceived "need"--i.e. excess demand--it may be rational for enterprises to set their output prices at less than what the market would bear in order to obtain a greater proportion of inputs centrally. We will show that, under plausible circumstances, the reduced costs of inputs through this strategy would outweigh the direct loss of revenue associated with below-market-clearing prices.

The evidence in this paper suggests that in Ukraine in 1992, a type of self-imposed price repression continued to co-exist with open inflation. The main conclusion is that, at least in some sectors of the economy, continued central allocation of key inputs created incentives for enterprises to perpetuate excess demand despite formal price liberalization.

The structure of the paper is as follows: section II describes the evolution of price control policies during 1992; section III presents evidence on shortages and the relationship between official prices and prices in parallel markets; section IV describes the main characteristics of the environment in which state enterprises operated in 1992; section V outlines a broad framework incorporating the incentives and constraints facing enterprises; section VI sets out a formal analysis of the effect of central allocation on the behavior of profit-maximizing enterprises (consistent results are also shown for a model of managerial rent maximization); and section VII brings out the preliminary conclusions and policy implications of the analysis, and describes directions for future research.

II. The Price System

The empirical regularity that we wish to explain is the apparent co-existence of shortages and price liberalization. This section discusses the extent of price liberalization in Ukraine in 1992. The lack of transparency in the conduct of price policy makes it difficult to demonstrate unequivocally that any particular price was free. The prices of every-day consumer goods--such as clothing or TV sets--which are the principal focus of this study, were, however, least likely to be controlled.

During 1992, the system of price regulation in Ukraine was subject to frequent change. It is easy to form an impression of considerable state involvement, with measures at various times through the year including the setting of administered prices, the stipulation of maximum profit or retail margins, and, late in the year, the requirement to obtain prior approval for price increases. Local authorities in various cities and regions also intervened in the pricing of basic food items, such as bread and milk, and of local transport costs. In addition, local authorities imposed sporadic barriers on inter-regional trade within Ukraine in order to increase local supply. These restrictions had indirect effects on prices.

Moreover, the distinction between controlled and "free" prices in the context of an economy such as Ukraine in 1992 requires care. In addition to formal price controls, enterprises faced informal pressures from various levels of Government to keep prices at "reasonable" levels. As far as can be ascertained, these included informal understandings between enterprises and state administrators, perhaps backed by the threat of the imposition of formal price regulations, and the issue of "recommended" prices by various Government bodies. 1/

However, at all times during 1992, enterprises manufacturing non-food consumer goods were in effect free to set prices without direct Government interference. To see this, it is useful to follow through the three major price policy operations of the year. In early January 1992, in the wake of similar moves by Russia, the Government implemented a partial liberalization of prices alongside a significant increase in the levels of administered and regulated prices. Although the scale of reform was rolled back under pressure from Parliament and the labor unions, by early February free prices were estimated by the Ministry of Economy to apply to 26 percent of wholesale, and 21 percent of retail turnover. Items specifically exempted from price regulation included new products, products with a high technological component, import substitutes (as specified by the Ministry of Economy), exports and items produced by co-operatives of disabled workers.

1/ One of the difficulties in considering informal links between enterprises and state bodies is in distinguishing between professional and political aspects of their relationship. Political pressure cannot be inferred simply from observing that an enterprise sets prices on advice from the relevant ministry. Enterprises without direct market experience may find it useful to rely on the relatively greater marketing and pricing expertise of some ministry officials.

Administered prices (i.e. prices directly fixed by the Government) applied to goods and services accounting for about 12 percent of the retail and 17 percent of wholesale turnover. At the producer level, administered prices covered coal, crude oil, gas, electricity, freight transport and communications. At the retail level, the Government continued to set prices of most basic foodstuffs, rents and utilities, and of passenger transportation and communications.

The remaining 57 percent of wholesale and 67 percent of retail turnover consisted of goods and services with regulated prices. 1/ Limits on profit margins of 25 to 40 percent, as stipulated in a presidential decree of January 31, were the main form of regulation. These were particularly intended to apply to monopolies or producers with dominant positions in their respective markets. In the Government's view this appeared to include almost all large manufacturing enterprises.

Nevertheless, in many cases it is unlikely that profit margin regulations provided more than a symbolic constraint. First, the Government's ability to administer regulations was undermined by the lack of experience in price control under decentralized price setting conditions and by delays in the collection of information. Second, enterprises had ample opportunity to inflate their cost base. In particular, in 1992, Ukraine did not have an effective incomes policy, enabling enterprises to circumvent margin controls by increasing wages or other forms of compensation for employees. Third, accounting standards were probably inadequate for the effective monitoring of enterprise financial performance. Finally, the stipulated profitability limits-- particularly towards the 40 percent mark-- may have been sufficiently generous to be relatively ineffective. 2/

The perceived ability of enterprises to escape the regulatory net probably contributed in no small measure to the second major price operation in 1992, namely the abolition of the majority of profit margin limits (except for some consumer items regarded as especially sensitive) in July. Interestingly, and reinforcing the hypothesis that by mid-1992 profit margins may not have been strongly binding, there was no price jump following the lifting of profit margin limits: the average monthly rate of increase of the consumer price index in July and August was 21 percent, compared to an average monthly rate of 20 percent in May and June (Chart 1). 3/ Following this shift in policy, over 70 percent of prices could be regarded as free from formal controls.

1/ Regulated prices, while not fixed by central authorities, are directly influenced by the Government.

2/ According to preliminary data supplied by the Ministry of Statistics in 1992, consolidated enterprise accounts show net profit before tax of krb 2.6 trillion on total costs of krb 7.3 trillion, an average mark-up of 32 percent.

3/ A temporary increase in recorded inflation in July was mainly due to price increases for certain food products, associated with a reduction in subsidies.

Further evidence for the apparent ineffectiveness of profit margin controls is that the acuteness of shortages did not change substantially between the two price operations. In a formal sense, the period between July and December was most free of controls. However, as discussed in the following section, the differential between parallel market and official prices remained fairly constant through the year, falling slightly towards the middle of the year and increasing somewhat in the last quarter. This suggests that effective price regulation between January and June was of about the same magnitude as between July and December.

The period of relative price freedom came to an end in late December 1992, when a third major price operation was implemented by decree under the emergency economic powers granted to the new Kuchma Government. While the scope of administered prices was reduced to about 10-12 percent of total turnover, the category of regulated prices was substantially expanded and the effectiveness of regulation strengthened. Specifically, lists of monopoly enterprises and "sensitive" products were drawn up by the Ministry of Economy and local authorities; the authorities were to be notified in advance of all increases in prices by those enterprises or on those products and could be refused. Officials estimated that about 30-40 percent of retail turnover was covered by this policy, suggesting a reduction to about half of prices that could be regarded as free from formal control.

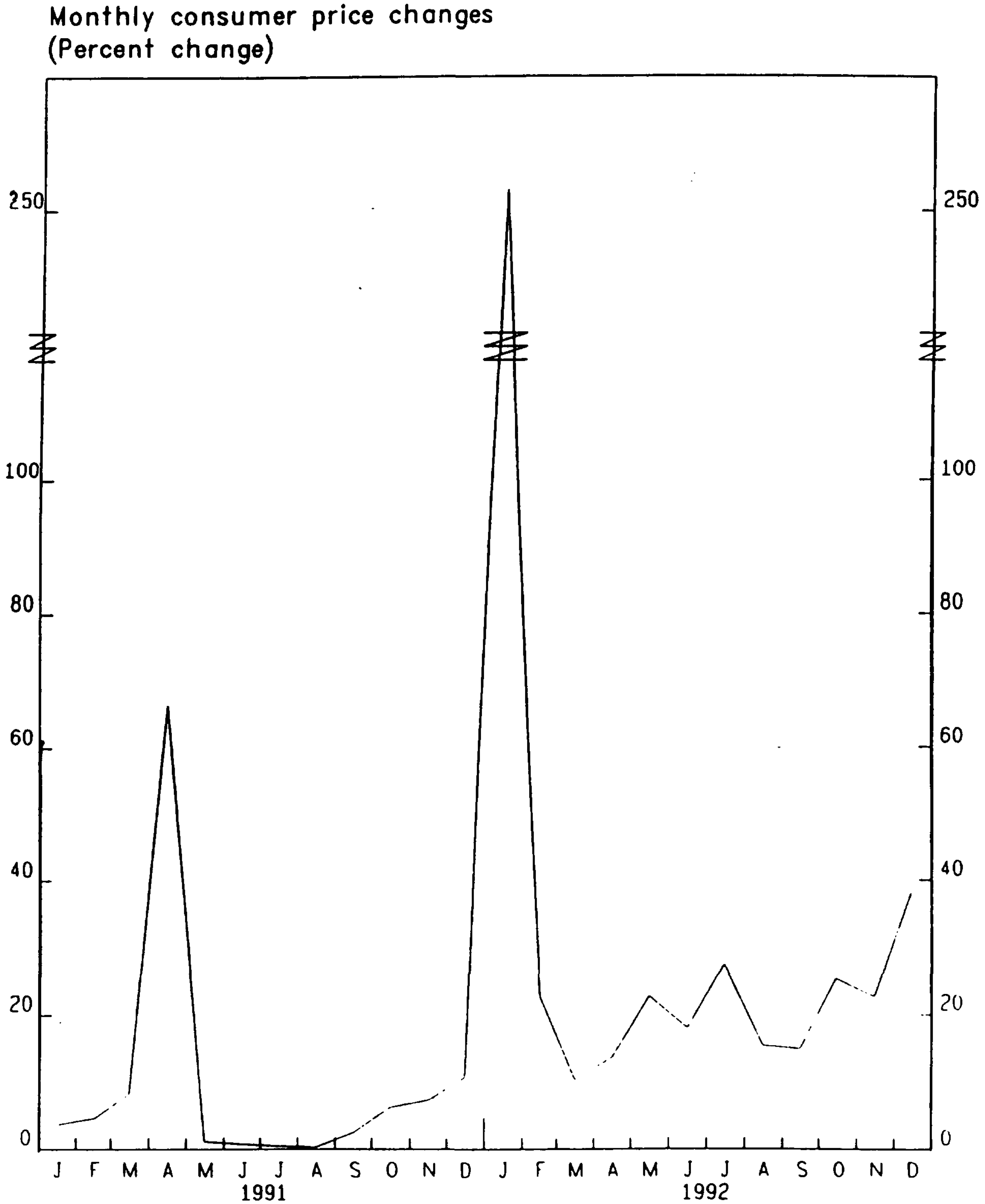
In conclusion, while some more or less explicit price controls continued to be applied by central and local authorities in Ukraine and these may have caused some significant market disequilibria, the evidence in this section demonstrates that a substantial part of the Ukrainian economy in the period between February-December 1992 was clearly free of formal price interventions. The remaining interventions during that period were centered on strategic commodities and large-scale monopolies, leaving enterprises producing consumer goods essentially free of controls. The following section presents evidence of continued excess demand in the markets for the latter goods.

III. Shortages

Throughout 1992, Ukraine retained many of the outward signs of a shortage economy, such as ubiquitous queues and empty shop shelves. Yet there were also thriving weekend markets and a noticeable increase in commercial stores selling both domestic and imported goods. As choices available to consumers increased, prices charged by different outlets increasingly signalled differences in quality and service.

Nevertheless, the distinction between the official retail sector and private trading retained many stark Communist-era features. The official sector, continuing to account for 70 to 80 percent of retail turnover, remained in control of almost all the available handling facilities and real estate. While some private traders acquired permanent retail space, such as street kiosks, most deals appeared to be done the old-fashioned black market way--from backs of cars and trucks, or by displaying goods in entrances and hallways of commercial and apartment buildings. Moreover, much private trading retained an aura of criminality since the re-sale of goods obtained

Chart 1. Inflation, 1991-92



Source: Ministry of Statistics.

through the state distribution network at above state prices remained unlawful.

Any price differential between the official retail sector and parallel markets can, consequently, be divided into three components--a quality differential, a risk premium, and a measure of excess demand at official prices. 1/ The relationship between the price of a sample 2/ of goods in state retail outlets and in parallel markets (including farmers' markets where members of collective farms sell produce from their household plots) is shown in Chart 2. The chart indicates that goods typically continued to cost three to four times more in the parallel market than in the still-dominant state distribution sector.

Quality differences are unlikely to explain much of this differential as every attempt was made to compare like with like. The sample was confined to domestic manufactures, which have a narrow product range and little systematic variation in quality. Equally, the risk premium is unlikely to be substantial. By all accounts, enforcement was only sporadic during the year, and the apparently small risk of being convicted had to be weighed against the benefits of arbitrage and tax evasion. Therefore, it seems safe to interpret the bulk of the price differential as a measure of excess demand for the relevant goods.

The sample of goods for which official and parallel market prices were measured includes both food and non-food consumer goods. The plotted differential for food items is provided here for comparative purposes only, since agricultural prices were both subsidized and relatively strictly regulated. This differential, consequently, tends to measure the impact of Government policies. On the other hand, prices of the non-food consumer goods in the sample were effectively free. Enterprises producing light consumer manufactures, such as irons, men's trousers and women's stockings, tend to be the first beneficiaries of price liberalization, and due to their relative political insignificance, are least likely to be subject to informal pressures. Yet, the goods they produced continued to be sold in the state retail sector at prices which did not reflect their real scarcity.

This suggests that either the producing or retailing state enterprises, or both, chose not to set prices to clear the market, even when able to do

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1/ It makes sense to define shortage in terms of a price differential between official and parallel markets precisely because the bulk of transactions still takes place in the official network. In this case, the price premium in the parallel market can be used as a proxy for the value of time and search effort required to obtain goods in the state sector. By contrast, if most transactions took place in parallel markets, the official posted price would have little significance, and the price differential could no longer be interpreted as a measure of shortage.

2/ The sample consists of 6 food items (such as potatoes and cheese) and 11 non-food goods (including clothes, irons and color televisions). Data were provided by the Ministry of Statistics.

so. 1/ Before discussing the reasons why enterprises may have behaved in this way, it is necessary to set out in more detail the environment in which they operated in 1992; this is done in the next section.

IV. Decision-Making Environment for State Enterprises

In exploring the reasons for continuing shortages after price liberalization, it is useful to consider the constraints and incentives facing enterprises in the process of transition to the market economy. This section describes the key features of the decision-making environment for state enterprises in Ukraine in 1992.

Enterprise decision-making autonomy, initiated in the former USSR in the late 1980s, expanded in independent Ukraine during 1992. The outlawing of the Communist Party and the seizure of its assets removed an important layer of supervision. 2/ The state structure of central planning also weakened. Although a detailed "indicative" plan continued to be prepared by the Ministry of Economy, the scope of central allocation conducted through a system of state orders was reduced from over 20,000 broadly defined categories of goods in 1989 to a shorter list of about 1,200 strategic goods and commodities (mostly intermediate inputs) in 1992. 3/ Moreover, the Government's ability to enforce compliance with state orders had been substantially reduced. For example, in the agricultural sector, which is particularly significant for Ukraine, collective and state farms commonly openly defied government authority and refused to deliver produce at what they regarded as unacceptable prices.

Although sectoral ministries retained nominal ownership of state enterprises, the bonds of authority for day-to-day management and for investment decisions became looser. Those enterprises that before independence were responsible directly to the now defunct all-union ministries became virtually free of administrative oversight. 4/ Those enterprises that had originally been under the republican or local government control faced an unbroken machinery of supervision. However,

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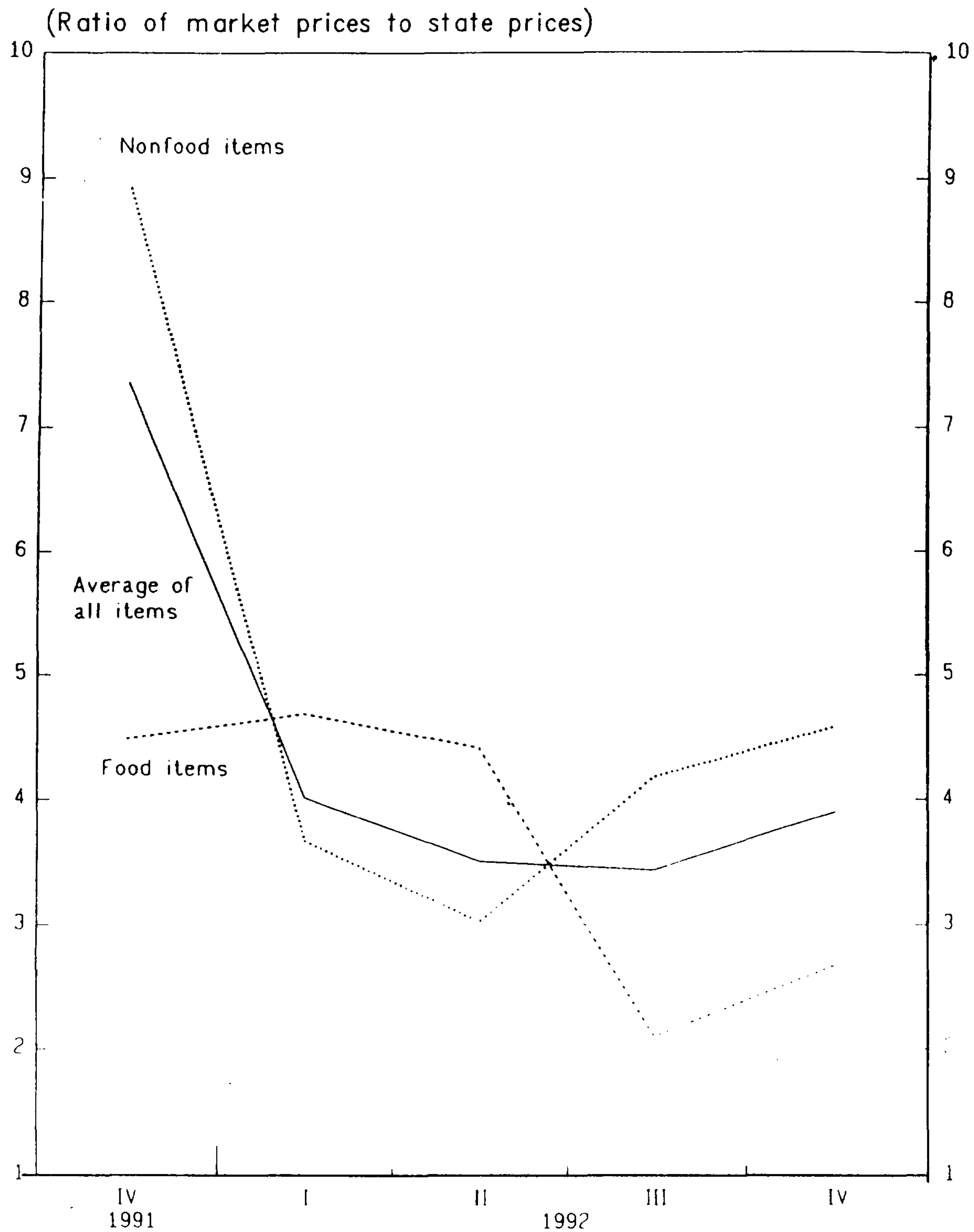
1/ We do not make an analytical distinction between retailers and producers since they faced a broadly similar regulatory environment. Moreover, even if we assume that retailing enterprises faced a greater degree of formal and informal price control, producing enterprises were still able to ensure that markets cleared by increasing the wholesale price of their output.

2/ The Communist Party was later permitted to function again, but as a political organization rather than an organ of the state.

3/ Source: Ministry of Economy

4/ See Johnson and Ustenko (1992, 1993), and Johnson, Kroll and Eder (1992). Johnson and Ustenko (1992) argue that (in 1992) state enterprises "were not subject to effective outside supervision of any kind... These enterprises have no real owners (leaving aside the property rights claimed and exercised by managers and workers themselves), cannot easily go bankrupt and are not subject to effective supervision by the tax authorities."

Chart 2. Relationship of Market to State Prices



Source: Ministry of Statistics.
[1] Market definitions: farmers' markets for food, "black" market for nonfood.

since enforcement mechanisms were substantially weakened, they too appeared largely able to escape close direction. For example, despite the adoption of an ambitious state investment program, backed up with easy credits, fixed investment dropped by over 40 percent in 1992.

This is not to deny that there was considerable consultation between enterprise managers and government officials. However, this relationship should be seen as a fairly subtle process of give and take between enterprises and authorities, rather than a clear administrative hierarchy running from sectoral ministries to enterprise management. Enterprises, in fact, wielded considerable influence, individually at the level of local administrations and as an organized lobby at the republican level. In a major departure from the Soviet-era practice, enterprises did not hesitate, in some instances, to take aggressive legal action against state bodies to exploit loopholes in tax legislation and in trade and foreign exchange regulations.

The Government's main bargaining chip in its relationship with enterprises was the centralized allocation of inputs, including credits, at below market prices. State orders in 1992 accounted for about 75 percent of turnover in industrial inputs. Sectoral ministries played a major role intermediating between enterprises, both to ensure that basic inputs needed to meet the state order were made available, and to allocate goods delivered under state orders to enterprises that required them for further processing. The main objective of this intermediation was to ensure the flow of supplies to perceived priority sectors, such as food and consumer durables.

Despite, or possibly because of, attempts by Government bodies to impose some semblance of order, a typical manufacturing enterprise 1/ in Ukraine in 1992 faced a confusing operating environment--property rights and relative prices were in a state of flux, and the constraints and incentives facing enterprises frequently changed unpredictably. However, the following key institutional features can be distilled from this environment:

(i) Enterprises had to meet a self-financing constraint--income from the sale of its output and access to credits had to match its payment obligations. This is an important departure from pre-independence practices, when enterprises' financial flows were passively accommodated by the authorities to meet physical output targets. Although Ukraine had extremely loose monetary policy in 1992, as reflected in the inflation rate, access to credits was not guaranteed, and insolvency had ceased to be a purely theoretical possibility.

(ii) Insolvency did not mean bankruptcy, closure of the enterprise or even replacement of the management team. It did, however, have fairly dire consequences. Enterprises unable to meet their cash flow constraint had to fall into arrears in wage payments or in payments to their suppliers. While this practice appeared to be fairly common in 1992, it required the goodwill

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1/ We exclude from analysis the military-industrial complex and enterprises involved in the extraction and refining of "strategic" raw materials.

of the workforce and suppliers, which could not be sustained indefinitely. Over time, inability to pay--particularly to suppliers outside Ukraine--implied curtailment of production and loss of face and authority for enterprise managers.

(iii) The need to secure the co-operation of the workforce through preserving employment and providing pay increases to keep up with inflation imposed another key constraint on managerial behavior. In many enterprises, workers had the formal ability to vote managers out of office. Even in the absence of this right, workers had considerable moral clout due to the deeply entrenched culture of life-time association and identification with the enterprise. Moreover, managers faced the prospect of future privatization through a process which was likely to favor the acquisition of majority ownership by the "workers' collective". These effects combined to put pressure on managers to generate income for the enterprise, in a departure from an over-riding focus on production.

(iv) Although most wholesale and retail trade continued to be conducted through state-owned channels, most enterprises (other than those producing for state orders) had no Government-guaranteed markets for their output. The product had to find a willing buyer, and even that was not enough to assure cash flow due to the break-down in payments mechanisms and discipline. Consumer demand and willingness to pay thus began to place a constraint on enterprises' pricing and production decisions which had not existed during the years of central planning.

To a large extent, the environment outlined above resembles the conditions faced by state-owned enterprises during the initial stages of reform in other socialist economies in transition. Two key distinctions emerge between the initial and later stages of the transition process: first, weakening of the owners' ability to supervise managers is only mildly counteracted by some hardening of the budget constraint on enterprises; second, the remnants of the old central allocation system perpetuate bargaining between enterprises and the authorities charged with the allocation of scarce inputs. By contrast, in later stages of transition, the owners' ability to control managers begins to improve, the budget constraint hardens further, and, most importantly, central allocation disappears altogether.

The following sections aim to develop a consistent analytical framework which incorporates these key features of the initial stages of the transition process. The objective is to set up a model that allows us to investigate the significance of central allocation for the shortages observed in Ukraine in 1992.

V. Analytical Framework

At first sight, it would appear that the existence of firms deliberately generating shortages despite free output prices must be due to some weaknesses of the enterprises' decision-making processes. Some intuitive explanations may be sketched briefly. The most obvious culprit would be rent-seeking associated with a conflict of interest between the enterprise's management and its titular owner, the state. Managers may have had the incentive to create a shortage in order to enjoy the benefits associated with the ability to allocate the finished product among competing purchasers. 1/

Enterprises may have also found it politic to exercise a measure of voluntary price restraint in order to participate in trade through official channels. While enterprises would lose some revenue by holding prices down, they could expect that such behavior would earn them the goodwill of the authorities. Continued participation in the official network offered enterprises a measure of comfort and stability in an environment where both relative prices and ownership of assets were in a state of flux. Other explanations in this vein include errors in forecasting demand in a highly changeable economic environment and rapidly rising prices, inertia 2/ or plain irrationality.

These explanations, focusing on the behavior of insiders (managers and workforces) in an environment of imperfect owner control 3/, are indeed plausible, but it is crucially important that shortages under free prices are not observed in those formerly centrally planned economies, where many of the same ownership ambiguities exist as in Ukraine, but where there is little or no remaining centralized allocation of inputs. Shortages remain prevalent in other FSU republics which retain central allocation mechanisms,

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1/ If enterprises were fully autonomous, insiders could extract all available rents by distributing profits among themselves, through higher wage and bonus payments, and by diverting enterprise resources to private uses. In practice, however, insiders faced a number of constraints. The state administration may need to be shown some minimal financial results, even if it does not demand profit maximization. Similarly, some level of supply on the official market will be required, related at least in part to the allocation of inputs. Given these constraints, insiders may seek indirect means of appropriating rents, involving command over goods in short supply.

2/ Johnson and Ustenko (1992) observed price behavior and the availability of some basic food items in Kiev during 1992, and concluded that while price controls had been loosened, prices in state stores continued to be set by administrators, either in the stores themselves or--more usually--in the relevant state wholesale organizations. The authors thought that these administrators responded to price and line length signals only with long and variable lags, and that as a result, prices in state stores exhibited considerable inertia.

3/ See, for instance, Frydman, Phelps, Rapaczynski and Shleifer (1993), Hemming (1992), Bod and Hall (1992).

but unlike Ukraine, they may be explained by the lack of price liberalization.

Consequently, the central allocation of inputs--which has continued to be an important feature of the economic system in Ukraine--must play a key role in any explanation of such shortages. This requires that we analyze the potential for "gaming" that such a system of central allocation presents. To our knowledge, the role of this remnant of the command economy in the initial stage of transition has not been considered explicitly in the literature.

In our analysis, we specify an "allocation function", such that an enterprise gets a greater proportion of inputs at below-market prices if it can demonstrate greater "need"--that is, excess demand-- for its output. In effect, a shortage is taken by the allocators as a signal of scarcity, but this is a signal that can be manipulated by the enterprise. If central allocation of inputs at official prices depends on the degree of perceived *shortage on the output market*, and *free market prices for inputs exceed* official prices, an enterprise with at least some degree of market power with regard to its output may find it profitable to set disequilibrium prices and quantities in order to gain greater access to allocated inputs. An enterprise has an incentive to do so as long as the marginal benefit it derives from the existence of shortage exceeds the marginal reduction in revenue arising from the maintenance of shortage.

It is difficult to confirm the existence of this kind of allocation function directly. The process of central allocation is not transparent, and personal links and pure luck probably play an important role in determining what share of scarce inputs goes to what enterprise. However, interviews with Ukrainian officials confirm that their assessment of "need" is closely linked to "дефицит"--shortage. Therefore, it seems to us plausible that under continued central allocation, enterprises make output and price decisions in part with a view to ensure the level of excess demand needed to obtain inputs. The allocation function could be defined broadly to include not only physical inputs, but also intangibles such as freedom from excessive administrative interference. This would clearly avoid financial costs for the enterprises--which are conceptually similar to the higher price of physical inputs purchased outside central allocation.

The allocation function may also be extended to include the informal price restraints discussed. Enterprises may wish to demonstrate that they are not "exploiting" monopoly power, expecting to be rewarded with more centrally allocated inputs. In this case, a below-equilibrium output price could be an intended, rather than an unintended, consequence of the authorities' policies.

For comprehensiveness, one would want to incorporate the allocation function into a comprehensive framework which includes the analysis of objective functions and constraints facing enterprise insiders. However, the more modest objective here is to focus on the role of the allocation function by incorporating it into a deliberately simple profit-maximization framework. We recognize that profit maximization by state enterprises is a controversial assumption, although it is consistent with a range of behaviour by enterprise insiders--indeed, it may not be too implausible, given that in order to appropriate rents, insiders must be motivated to create them in the first place. 1/

Moreover, the use of a relatively simple model allows us to focus on the essential role of the allocation function in creating an incentive for enterprises to generate shortages. As the next section shows, the interesting conclusion is that this analytical extension alone provides the possibility of shortages under free prices: the observed evidence is, under certain circumstances, consistent with the assumption of enterprise profit maximization.

VI. A Model of Profit Maximization Under Central Allocation

In the foregoing part of the paper, the phenomenon of "free prices with shortages" has been documented, and some possible explanations discussed. In this section, a simple analytical model is developed to examine whether, and under what circumstances, it would ever make sense for a firm deliberately to generate a shortage, despite "free" output prices.

An explanation that will be advanced in this section is that even profit-maximizing firms may deliberately fail to "hit the demand barrier," because of the incentives introduced by the central allocation of inputs whose prices are controlled. In the case examined, the central allocator uses the intensity of shortage in output markets as a signal that more of the controlled input should be allocated to the product that is in short supply. This seems like a sensible rule, encouraging production of goods that are in short supply.

Under some circumstances, even a profit-maximizing firm that has full autonomy in pricing its output might deliberately engineer a shortage, by producing less than would be purchased at the price it sets. (This assumes that the firm has some market power.) This strategy directly entails a sacrifice of revenues, but this sacrifice may be outweighed by the benefits of winning a larger amount of the allocated input at the controlled price.

The firm's choices of whether to create a shortage, and how big a shortage to create, turn out to depend on some intuitively plausible conditions: on how sensitive is the allocator's decision to the shortage, how elastic the firm's demand, and how large are the costs of the controlled input in relation to the firm's total revenues.

The conclusion is that, even if the markets for outputs are free, controlled input prices, together with an apparently sensible rule for allocating inputs may create an incentive for firms to game the system, and generate shortages. This is a mechanism whereby shortages in input markets are transmitted to output markets. It also demonstrates that even well-

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1/ Profit maximization is also a special case of an enterprise whose decisions are determined by bargaining between insiders and the state treasury--see Dinopoulos and Lane (1992), Lane and Dinopoulos (1991).

intentioned intervention in pricing may have unintended adverse consequences.

The model is of a representative firm, which is assumed to have some market power with regard to its output. It faces a demand curve

$$P^d = D(Q) \tag{1}$$

where Q is the quantity sold, and P^d is the price at which this quantity would be demanded.

The firm produces using an input, such that one unit of input is needed for each unit of output. A quantity Z^c of this input is purchased from the central allocator at an official price q^c. The remainder Z^f is purchased on a free market at a price q^f. We assume that the firm has no market power in the input market and takes the input price as given--for example, that cloth producers can influence the market price of cloth but not that of fuel oil. Then the total quantity of the input used is $Z^c + Z^f = Q$.

Next, let us consider how the official allocation of the input is determined. As already discussed, we specify an allocation function which relates the official allocation of the good to the intensity of the shortage, as measured by the gap between the official price P and the demand price P^d:

$$Z^c = A(P^d - P) \tag{2}$$

A( ) is a monotonically increasing function. The intuition behind this function is that the central allocators try to adjust their supplies of the input in order to alleviate shortages. The severity of the shortage is here represented by the gap between official and demand prices--where the latter could be interpreted as parallel market prices. 1/

As discussed earlier, this formulation can also embrace the case in which there is some element of informal price control, whereby enterprises are induced to maintain below monopoly levels by the threat of withdrawal of allocated inputs, or even of an intangible input that is broadly characterized as "goodwill". This interpretation has the same implications for the enterprise's behavior, although it springs from different intentions on the part of the authorities.

1/ Measuring the shortage by the gap between quantities supplied and demanded would give substantially the same results. The present formulation is chosen because it gives slightly simpler results, and because it depends on variables that could be observed (whereas the quantity demanded could not).

For simplicity, we assume that the firm cannot influence the allocation function itself; in particular, we do not take account of the possibility of collusion among enterprises in manipulating the allocation rule. 1/

In addition to input costs, the firm also faces a convex monotonically increasing non-input cost function C(Q). This includes labor and other costs of production.

The firm's objective is assumed to be profit maximization. As discussed in the previous section, this assumption is chosen for three reasons. One is that it enables us to make a strong case for the distortionary effect of the centralized allocation of inputs; we want to show that even under profit maximization, the kind of ad hoc allocation mechanism characterized by (2) lends itself to manipulation by the enterprises, and shortages may be the result. Secondly, it is a special case of some more complex models of socialist enterprises, including models in which insiders appropriate all the rents, and ones in which they bargain with the state Treasury for a greater share. Thirdly, this assumption has the obvious virtue of simplicity.

In addition, we assume that the enterprise sells all its output through the official channels. The parallel market arises from the resale of goods purchased in the state retail outlets. This assumption means that the firm itself does not participate in the parallel market on its own account, although its employees and managers may do so in their private capacity. 2/ In this case, the enterprise's profits are

$$\Pi = PQ - C(Q) - q^f Z^f - q^c Z^c \tag{3}$$

1/ In particular, suppose that what the allocator is looking at is each firm's level of shortage relative to the average. Our analysis assumes that each firm takes other firms' behavior is given. If all enterprises could collude, they could increase their profits by agreeing on very low levels of shortage for all firms. The enforcement of such a collusive arrangement would be difficult, though, since each firm would have the incentive to cheat by engineering a larger-than-agreed shortage to obtain a larger share of the input. One could devise trigger-strategy mechanisms to deter such cheating, but these would seem far-fetched.

2/ An alternative assumption is that the firm can sell a fraction of its output on the black market. The structure of the problem is similar in this case, but the conditions under which a firm chooses to generate a shortage are weaker, since the firm directly receives a fraction of the shortage rents. If the firm can choose what fraction of the output to sell on the free market, the official price becomes fictitious: the firm then sells everything on the free market and reaps all of the shortage rents, setting the official price at zero to maximize its share of the official input allocation. (See also footnote 3 on page 18.)

that is, they depend on total revenues, minus non-input costs, minus input costs, consisting of both official and free-market input purchases. Then substituting from (1) and (2), we can write

$$\Pi = PQ - C(Q) - q^f Q + (q^f - q^c)A(D(Q) - P) \tag{4}$$

Finally, there is the inequality constraint

$$P \leq P^d \tag{5}$$

this condition states that the enterprise cannot set a price higher than the demand price--although it may set a price lower than the demand price and generate shortages. In the case where condition (5) holds with strict equality, the firm is "on the demand curve" and the situation reverts to that of imperfect competition. When the strict inequality holds, the firm is off its demand curve, and we are in the world of artificially-created shortages.

The enterprise maximizes (4) subject to (5). Here, unlike the usual case of imperfect competition, both price and quantity are choice variables, with the level of shortage being determined. The first-order conditions (setting the partial derivatives of the corresponding Lagrangean £ equal to zero) are as follows:

$$\delta £/\delta Q = P - C'(Q) - q^f + (q^f - q^c)A'D' + \lambda D' = 0 \tag{6a}$$

$$\delta £/\delta P = Q - (q^f - q^c)A' - \lambda = 0 \tag{6b}$$

$$\lambda, (P^d - P) \geq 0, \quad \lambda(P^d - P) = 0 \tag{6c}$$

where λ is the Lagrange multiplier associated with inequality (5). Here, A' and D' denote the first derivatives of the functions A( ) and D( ), respectively.

Kuhn-Tucker conditions (6c) demarcate two possible cases. One is that in which there is no excess demand, so $\lambda > 0$ and $P^d = P$, that is condition (5) holds with strict equality. In this case, equating λ in (6a) and (6b), we obtain the following condition:

$$C'(Q) + q^f = P + QD' \tag{7}$$

which is the familiar result that marginal cost equals marginal revenue. Note that the input component of marginal cost is the free price of the input: since the firm is not generating a shortage, the official allocation is already given by A(0) (which may be zero or positive), so producing an additional unit of output requires purchasing an extra unit of input on the free market. In all, the model reverts to the standard case of imperfect competition, where the demand barrier is a binding constraint on the firm.

Next, let us consider the case in which the firm chooses to set the price at a level resulting in a shortage. In this case, inequality constraint (6c) is not binding, so the Lagrange multiplier $\lambda = 0$. This results in two conditions:

$$P - C'(Q) - q^f = -(q^f - q^c)A'D' \tag{8a}$$

$$Q = (q^f - q^c)A' \tag{8b}$$

Condition (8a) states that price exceeds marginal cost by an amount reflecting the benefit of maintaining the shortage, viz. the effect of a unit of output, via the shortage, on the cost of inputs. Combining this with condition (8b), we obtain

$$P + QD'(Q) = C'(Q) + q^f \tag{9}$$

that is, the level of output is still such that marginal revenue equals marginal cost--the standard imperfect competition result. It is interesting that this condition emerges in a case in which there are shortages. Its significance is the following: the enterprise has two choice variables, price and output, the combination of which results in a shortage. Given that it wants to generate a shortage to impress the allocators, it does so in the way that is least costly to itself, by generating a shortage such that marginal cost still equals marginal revenue. Of course, the fact that in this case the firm is operating below, rather than on the demand curve implies that marginal revenues are different than they would be on the demand curve--hence the fact that P rather than P^d appears in equation (9). However, the basic condition indicates that the profit-maximizing firm faces a tradeoff among combinations of price and output reductions that would generate the same shortage; it chooses the combination that achieves a given shortage with a minimum loss of profit.

Next, let us define the elasticity of input allocation with respect to the shortage as

$$\omega = \frac{(P^d - P)}{Z^c} A' \tag{10}$$

Then we can use condition (8a) with this definition to characterize the resulting price distortion:

$$\frac{(P^d - P)}{P} = \frac{q^c Z^c}{pQ} \frac{(q^f - q^c)}{q^c} \omega \tag{11}$$

That is, the intensity of the shortage, expressed as the relative deviation in output prices from their market-clearing levels, is a product of three factors:
(1) the importance of the allocated input, expressed as a share of total revenues;
(2) the distortion in input prices, that is the relative gap between controlled and free market input prices; and
(3) the elasticity of allocation with respect to the shortage--that is, the sensitivity of the allocation rule to the intensity of shortage.

This condition is simple and intuitively plausible. A larger total cost of the allocated input in relation to total revenues, a greater relative cost savings by obtaining the input through official channels, and a greater sensitivity of the input allocation to the shortage all increase the firm's incentive to generate a shortage, to signal to the allocator that it "needs" a larger input allocation.

Condition (11) can also be used to assess whether the model is consistent with observed price configurations, for plausible parameter values. Suppose, for example, that free market input and output prices are both three times the corresponding official levels, and that official input allocation absorbs half of total revenues. These magnitudes are plausible for Ukraine. For this to be consistent with the model would require that $\omega = 2$. Is this value of ω plausible? Here, one must note that the measure of shortage is the price distortion, and the corresponding excess quantity demanded depends in turn on the elasticity of demand. If the firm faces a demand elasticity of 2, for instance, a one-percent price gap is associated with a two-percent quantity gap, so that if the official allocators were trying to increase the input allocation in proportion to the excess demand, this would also yield a two-percent increase in the allocation--thus implying $\omega = 2$. 1/ Thus, for plausible parameter values the model generates gaps between controlled and free-market output prices that are similar in magnitude to those that are observed.

Since the model gives the firm the choice of whether to hit the demand barrier, or whether to operate within it, it is important to specify the conditions under which it would choose each solution. From conditions (6),

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1/ The case of greater-than-unitary demand elasticity would appear to be the relevant one, since at the monopoly outcome, the elasticity of demand is set equal to $P/(P - C' - q^f) > 1$. This is the well-known result that a profit-maximizing monopolist never locates on the inelastic portion of the demand curve.

we can derive the crucial condition for the standard imperfect-competition outcome to be chosen:

$$(q^f - q^c)A' < Q \tag{12}$$

This condition is based on the fact that, starting from the imperfect competition outcome, a one-unit price cut--holding quantity constant--directly lowers revenues by Q units; at the same time, it creates a shortage measured by a one-unit gap between official and free prices. This shortage in turn induces the authorities to increase the input allocation by A' units, each unit of which saves $(q^f - q^c)$ from the firm's input costs. If this reduction in input costs, given by the left-hand side, is less than the direct loss of revenues from the lower price, as given by the right-hand side, the firm chooses the imperfect competition outcome, charging what the market will bear. In the converse case, it sets price and quantity to generate a shortage.

Next, we can consider some comparative static results in the shortage case. These are derived by totally differentiating the system given by (8a) and (8b), and solving for the endogenous variables P and Q. The only exogenous, policy-determined variable in the model is the official price of the input, q^c--although it would be a straightforward matter to extend the model to allow other comparative static exercises. The effects of an adjustment in q^c are

$$\frac{dP}{dq^c} = \frac{A'}{\Delta}[(q^f - q^c)(A'D'' - C'') - D'] \tag{13a}$$

$$\frac{dQ}{dq^c} = \frac{A'}{\Delta} > 0 \tag{13b}$$

where

$$\Delta = [1 - (q^f - q^c)A''D']^2 + (q^f - q^c)[(q^f - q^c)(A'D'' + A''D') - C''] > 0$$

Here, the determinant Δ is positive from the second-order conditions for a maximum; the sign of (13b) follows immediately. Thus, an increase in the official input price unambiguously induces the firm to increase its output. The effect of a rise in input prices on the price charged by the firm is ambiguous; as indicated by (13a), it depends on the curvature of demand and cost functions. However, in a simple linear case, with linear demand and constant marginal cost, it is positive: that is, a rise in official input prices induces the firm to raise its output price toward the market-clearing level.

The effect of input prices on output is easy to interpret. By adjusting the input price, the allocators reduce the firm's incentive to generate a shortage to manipulate the allocation rule; thus, it results in a rise in output. Note that this result runs counter to the usual argument that a rise in input prices could put pressure on firms and lead to a collapse in output. The reason for the discrepancy is that the controlled price essentially generates rent-seeking behavior--the reduction in price and output below the market-clearing level. 1/ Adjusting the controlled price thus reduces this distortion.

These results are an example of the pitfalls of price control. In the model, the official allocators are attempting to direct inputs toward industries whose products are in short supply, an apparently sensible rule. 2/ Their mistake, however, is in assuming that the shortages are independent of their own policies. Experience in all countries shows the ability of economic agents to find ways of manipulating the rules to which they are subject--"Fatta la legge, trovato l'inganno"--and formerly centrally-planned economies are certainly no exception. As a result, controlled input prices may contribute to the very shortages that they are intended to alleviate. The main conclusion is that maintaining price controls in some sectors may vitiate the advantages of price liberalization in others. Liberalization must be fairly comprehensive to bring its full efficiency benefits.

So far, we have used the assumption of profit maximization to build a strong case for the consequences of centralized allocation in creating shortages downstream. The present framework could also be extended to cover other objectives of the enterprise's management. In particular, a simple extension would be to consider a case in which the managers participate directly in the shortage rents. One could assume that they maximize these rents subject to a constraint that the enterprise's profits must not fall below a specified level (which could be negative). 3/ Equivalently, one could assume that the managers' remuneration depends on both the shortage rents and the enterprise's profits. Not surprisingly, the assumption that managers share in the shortage rents results in a greater degree of shortage for given conditions in input markets and for a given rule for the central

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1/ A possible extension would be a case in which the discrepancy between official and market-clearing output prices also gives rise to costly rent-seeking, for instance, as individuals queue up to purchase goods for resale in the black market. In that case, an adjustment of official input prices could entail a further welfare gain.

2/ As already discussed, the analysis could also be interpreted as an example of informal price control, in which the enterprise fears that charging the monopoly price would result in the loss of an intangible input--the authorities' "goodwill". In that case, of course, the below-equilibrium output price would be an intended, rather than an unintended consequence of the authorities' policies.

3/ The optimal degree of shortage from the management's standpoint would then be given by a condition analogous to (11), also incorporating a factor $1/(1-\omega)$, where ω is the manager's share of the shortage rents normalized by the shadow value of the profit constraint.

allocation of inputs. Moreover, in this case it is possible that a shortage could result from managerial incentives alone, even if shortages do not influence the allocation of inputs.

VII. Conclusions and Policy Implications

Evidence on price policies and shortages in Ukraine in 1992 shows that open inflation co-existed with a peculiar form of self-imposed price repression. Enterprises that to all intents and purposes were able to set market-clearing prices frequently chose instead to set prices which generated excess demand for their output. Although most economies in transition share the conflict of interest between managers and the enterprises' titular owner--the state--the key feature that set Ukraine apart in 1992 was the continued comprehensive system of central allocation for inputs together with a formal liberalization of output prices. Accordingly, it is this latter feature that we have stressed in the analytical explanation of the shortage phenomenon.

The conclusions of this paper are of direct relevance to those economies in transition which retain central allocation structures. The research presented here has deliberately focused on the role of central allocation by abstracting from the complexities of the enterprise and insider objective functions, and by imbedding an allocation function in a basic model of profit maximization. The allocation function is a relationship stipulating that enterprises with greater "need"--that is greater excess demand for their output--are able to obtain a greater proportion of their inputs from central allocation authorities at below-market prices.

This analysis brings out the significance of the remnants of central allocation for the price formation process. Three main policy conclusions can be derived from this analysis: first, an economy in transition that liberalizes prices but continues to allocate some inputs is likely to remain mired in a web of price distortions. While compulsion is removed, strong incentives remain for non-equilibrium pricing. Central allocation mechanisms are a conduit through which price controls that continue to be applied in some markets spill into liberalized markets.

Second, while the retention of central allocation is frequently justified by the authorities as a way of maintaining output of the state sector, it in fact creates incentives for enterprises to reduce production relative to what it would have been without this policy. In order to signal "need" to the authorities, enterprises may restrict both quantity and prices.

Finally, the analysis has implications for the relative priorities attached to particular systemic reforms. In particular, improvements in corporate governance are unlikely by themselves to root out disequilibria in the face of continued central allocation.

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