The Benefits of Imperfect Competition under Price Controls

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Abstract

I study the welfare implications of imperfect competition in a general equilibrium model of a monetary economy in which binding price controls lead to queuing and the black market. In this endowment economy, money is introduced through a cash-in-advance constraint on black market purchases. The Dixit-Stiglitz (1977)-Ethier (1982) "love for variety" on the part of black market buyers, who use a continuum of intermediate inputs to produce a final good, as well as the presence of fixed costs, make black market sellers unique monopolists. I show that the lower the substitutability of intermediate inputs in the production of the final good and, hence, the more monopoly power the sellers of these inputs have, the higher the welfare. This result obtains because, as is well-known, an increase in the monopoly power decreases labor demand. But since labor is used in queuing and transacting on the black market, lower labor demand increases leisure and, thus, welfare.

Key words: price controls, queuing, black market, imperfect competition, "love for variety", welfare.

JEL Classification Number: 311, 611, 027, 052

1. Introduction

The ongoing events in Eastern Europe have stimulated a great interest in the distorted economics of command systems. Not surprisingly, several recent studies have focused on the two effects of price controls, i.e., queuing and the black markets. See e.g., Osband (1992) and Polterovich (1993).

This work is part of a project, which asks whether the presence of price controls has any particular implications for the welfare effects of some *other* distortions. Elsewhere (1993), I show that, in the price-controlled economies, an increase in the rate of the money growth and, hence, in the black market inflation, could actually be welfare improving. Here, I study a case in which price controls coincide with imperfect competition in the black market.

More precisely, I study the welfare implications of imperfect competition in a general equilibrium model of a monetary economy in which binding price controls lead to queuing and the black market. In this endowment economy, money is introduced through a cash-in-advance (CIA) constraint on black market purchases. The Dixit-Stiglitz (1977)-Ethier (1982) "love for variety" on the part of black market buyers, who use a continuum of intermediate inputs to produce a final good, as well as the presence of fixed costs, make black market sellers unique monopolists. I show that the lower the substitutability of intermediate inputs in the production of the final good and, hence, the more monopoly power the sellers of these inputs have, the higher the welfare. This result obtains because, as is well-known, an increase in the monopoly power decreases labor demand. But since labor is used in queuing and transacting on the black market, lower labor demand increases leisure and, thus, welfare.

The rest of the paper is organized as follows. The model is developed in section 2. Section 3 concludes.

2. The Model

Consider the following general equilibrium model with money. The economy is populated by infinitely-living ex ante identical families, whose members are: a store-keeper, a speculator, a producer and, finally, a shopper/worker. There's a continuum (on a unit interval) of symmetric perishable intermediate goods, which are indexed by i. The family is endowed with the same constant amount of these goods, y.

The store-keeper sells the endowments of intermediate goods, each at a competitive price, which cannot be higher than some state-controlled level, $\bar{p}_i$ (same for all i). If he chooses so, the speculator buys the quantity s_i of any intermediate good i on the official market only to immediately resell it on the black market at a price p_i. Selling on the black market is illegal and, therefore, costly. In order to sell any amount in any period, the speculator has to hire F hours of "lookout service" at the competitive wage w. F is a fixed number, which reflects the given extent of police enforcement of the "anti-speculation laws".

It is not difficult to show that in a symmetric equilibrium any speculator will operate on a market for just one distinct good and, so, he will be unique monopolist and possibly earn positive profits. This outcome crucially depends on two assumptions: a given number of intermediate goods and a fixed cost. Recall from Dixit and Stiglitz (1977) that, even under increasing returns, if the number of inputs were endogenous, then the Chamberlinian monopolistic competition will adjust it so as to drive any profits to zero.

Before proceeding further, note that $\bar{p}_i$ is the maximal but <u>not</u> the minimal price. The official market always clears. If, at $\bar{p}_i$, there is an aggregate excess supply, then the price will fall <u>below</u> $\bar{p}_i$. However, if there is an excess demand, i.e., the price controls are binding ($\bar{p}_i < p_i$), then the price on the official market will be equal $\bar{p}_i$ and, in addition, buyers would queue to purchase the good.

Waiting in line is performed by the professionals earning competitive wage w per hour. The total line is linear in the quantity bought, meaning that queuing is a constant returns to scale activity. A unitary purchase of good i requires q_i hours of waiting, and the speculator takes q_i as given.

The representative producer buys all intermediate goods on the black market and combines them using the Dixit-Stiglitz (1977)-Ethier's (1982) constant-returns-to-scale production technology to make a nonstorable consumption good, which he then sells at a competitive price p.

The final good producer maximizes profit, Π_1, by solving:

$$(1) \quad \max_{s_i} \; p\left(\int s_i^{\mu} di\right)^{1/\mu} - \int s_i p_i di \;,$$

where $0 < \mu \leq 1$.

Note that the elasticity of substitution between any two factors equal to $1/(1-\mu)$, so it decreases in μ. It will turn out momentarily that, not surprisingly, lower μ implies more monopoly power for the sellers of intermediate goods. Note that perfect competition and constant-returns technology ensure that the equilibrium Π_1 is always zero.

The inverse demand for any particular input is:

$$(2) \quad p(s_i/S)^{\mu-1} = p_i$$

where $S \equiv (\int s_i^{\mu} di)^{1/\mu}$.

Each speculator takes p, S and the demand curve, (2), as given. Therefore, maximizing his profit, Π_2, amounts to solving:

$$(3) \quad \max_{s_i} \; p s_i^{\mu}/S^{\mu-1} - (\bar{p}_i + q_i w)s_i - Fw \; .$$

The efficiency condition requires that the marginal revenue be no larger than the marginal cost, i.e.,

$$(4) \quad p\mu s_i^{\mu-1}/S^{\mu-1} \le \bar{p}_i + q_i w \; ,$$

and in the symmetric equilibrium, in which s is the same for all i and equal to S, it becomes

(5) $p_i\mu \leq \bar{p}_i + q_i w$.

Clearly, for s_i to be positive it must also be the case that the speculator at least covers the fixed cost, i.e.,

(6) $s_i p_i - s_i(\bar{p}_i + q_i w) - Fw = s_i(1-\mu)p - Fw \geq 0$

(5) and (6) implicitly define the demand for labor by the speculators (i.e., $s_i q_i$). It is zero when either the marginal revenue is below marginal cost or profit is negative. Only if (5) holds as an equality and (6) is true, then s_i is positive. In this case, the speculator charges a constant markup over his marginal costs and, as expected, the demanded quantity of labor varies negatively with the real wage. The main result of this paper follows from the well-known fact that a decrease in μ and, hence, an increase in the monopoly power, decreases the demand for labor.

The shopper/worker sells n hours of his labor to the domestic employers as well as buys the consumption good, c, on the black market at price p. The only two assets in this economy are outside money, M, and (zero net supply) private nominal bonds, B. The interest on these bonds is i. Money is held because purchases on the black market are subject to a cash-in-advance constraint. The supply of money is assumed constant. As will be seen in a moment, money demand and supply considerations are introduced to nail down the black market price level.

The family derives utility from consumption and leisure. The total endowment of time is normalized to unity. The utility function, $u(c, 1-n)$, has standard properties (including the Inada conditions) but, in addition, consumption and leisure are assumed to be normal goods.[1]

The representative family's lifetime utility maximization problem can be written as:

$$(7) \quad \max_{c,n,B,M} \int_0^\infty u(c, 1-n)\exp(-\delta t)dt \quad ,$$

subject to

$$(8) \quad \dot{A} = Ai - iM + wn + \hat{\Pi}_1 + \hat{\Pi}_2 - cp \quad ,$$

$$(9) \quad M = \alpha cp \quad ,$$

$$(10) \quad A = M + B \quad ,$$

$$(11) \quad \lim_{t\to\infty} A\exp(-\int_0^t i d\tau) = 0 \quad \text{(no Ponzi games)} \quad ,$$

where: $\delta > 0$ is the subjective rate of time preference; $A \equiv$ the stock of nominal assets; $\hat{\Pi}_1$ and $\hat{\Pi}_2$ are the optimal values of profits earned in the production of final good and speculation; the formulation of CIA constraint in continuous time, (9), was originally derived by Feenstra (1985); the time subscripts are suppressed to economize on notation;

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1 Normality means that $u_{22}u_1 - u_{12}u_2 < 0$ and $u_{11}u_2 - u_{12}u_1 < 0$.

Substitute (9) into (8) and denote by λ the marginal utility of nominal wealth (i.e., the multiplier on (8)). The first-order conditions for an interior optimum include:

$$(12) \quad u_1(c, 1-n)/u_2(c, 1-n) = (1 + \alpha i)/(w/p)$$

$$(13) \quad \dot{\lambda}/\lambda = \delta - i$$

(12) implicitly defines the upward-sloping supply of labor, while (13) describes the optimality in the accumulation of assets.

In equilibrium, (the official and black) goods, labor as well as money markets all clear. When s_i is positive, this means:

$$(14) \quad y = s_i = S = c$$

$$(15) \quad n = F + s_i q_i = F + yq$$

$$(16) \quad M = \alpha y p \ ,$$

where (14) is true for each i.

As I have indicated earlier, since all the families are alike, the private bonds are always in zero net supply.

$$(17) \quad B = 0 \ .$$

The equilibrium i is equal to δ, since both the equilibrium price level and consumption are constant.

I will now demonstrate an inverse relationship between welfare and the substitutability of the intermediate inputs and, hence, between welfare and the monopoly power of the speculators.

To do that, I will first discuss when neither queuing nor the black market will occur. A sufficient condition is easy to find, since, when s_i is positive (and, hence, equal to y), it follows from (5), (9) and (14) that if

$$(18) \quad \bar{p} \geq \mu p = \mu M/\alpha y \ ,$$

then the speculator's marginal cost ($\bar{p}$ + qw) is necessarily higher than his marginal revenue (μp). Therefore, if μ is lower or equal to $\alpha\bar{p}y/M$, then no speculation will take place. In such a case, the producers of the final good will simply buy the inputs directly on the official market, which will clear without queuing. The absence of speculation/queuing means that no leisure is wasted in waiting in line (sq) nor selling on the black market (F) and, hence, welfare necessarily increases. Therefore, sufficiently low substitutability completely neutralizes the distortion introduced by price controls. One might also note that when there is no black market, money ceases to be held.

Suppose now that (18) is violated. As just argued, this is a necessary condition for the speculation. Solving for the real wage, w/p, from (5) and substituting the resulting expression as well as the the equilibrium conditions into (11) yields an equation, which implicitly determines the unitary queue, q^*,

$$(18)\quad u_1(y,1-F-yq^*)/u_2(y,1-F-yq^*) = (1+\alpha\delta)/(w/p) =$$

$$= q^*\{(1+\alpha\delta)/[\mu-(\bar{p}/p)]\} =$$

$$= q^*\{(1+\alpha\delta)/[\mu-(\bar{p}\alpha y/M)]\} .$$

Whether or not speculation/queuing will actually occur, and q^* will be determined by (18), depends on there being nonnegative profits in the speculation business. Substituting the equilibrium conditions into (6) allows me to rewrite this condition as:

$$(19)\quad y(1-\mu) \geq F[\mu-(\bar{p}\alpha y/M)]/q^* .$$

I make implicit assumptions on the parameters α, M, $\bar{p}$, as well as the curvature of preferences, which ensure that (19) is satisfied.

Implicit differentiation of (18) gives:

$$(20)\quad dq^*/d\mu > 0 .$$

Thus, as intermediate inputs become less and less substitutable in the production of the final good, thus increasing the monopoly power of their sellers, the unitary queue falls. Given constant endowments of intermediate inputs and, hence, a constant output of the final output, the total amount of time wasted in lines falls as well. Therefore, more monopoly power unambiguously means higher welfare.

The intuition behind this result is simple. As already discussed, for fixed $\bar{p}/p$ (which is the case here), a decrease in μ reduces the demand for labor. The fact that monopolization lowers labor demand is well known. In economies without price controls this reduces welfare. The point here is that such a shift is welfare-improving in economies in which the social return to labor is negative.

Conclusions.

In a typical price-controlled economy, public anxiety seems to be often caused by the monopoly power allegedly enjoyed by the black market speculators. This anxiety, itself occasionally used (and even fueled) by the government to divert attention from other issues, might explain public support for the events like the unbelievably strict Polish "anti-speculation laws" in the 1950s and 1960s (which e.g., led to hanging of several meat speculators) or the nation's "anti-speculation campaign" in 1982-1983. In sharp contrast, I have formally shown that, under price controls, monopoly power could be a blessing rather than a curse, since, at least in the endowment economy, the more monopoly power the speculators have, the higher the overall welfare.

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