A Note on The Benefits of Inflation in The Economies with Price Controls and The Cash-in-Advance Black Markets

by

Kazimierz Stanczak

Working Paper # 665
Department of Economics
University of California, Los Angeles
July 1992

July 1992

A Note on The Benefits of Inflation in The Economies with Price Controls and The Cash-in-Advance Black Markets

Kazimierz Stanczak

Department of Economics
University of California at Los Angeles
(310) 825-5665
E-mail: stanczak@econ.sscnet.ucla.edu

Abstract

I extend the classical rationing-by-waiting arguments in Barzel (1974) into a dynamic general equilibrium model with money. In the model, the binding price controls give rise to queuing and the (competitive) black market. Purchases on the black market are subject to the cash-in-advance (CIA) constraint. In a sharp contrast to a commonly-held view, I show that an unanticipated permanent increase in growth rate of the money supply reduces rather than increases the waiting lines. This obtains due to an effect typical in the CIA economies, i.e., an inflation-induced substitution towards the inflation-tax-free leisure (see Wilson (1979)). If output, and hence consumption are unaffected by the fall of the labor supply (e.g., because, in the aggregate, they depend on the mandated, as opposed to freely chosen, working time), then inflation unambiguously increases welfare. I also argue that inflation may still be welfare-improving even if lower labor supply does cause a fall in output and consumption.

1. Introduction

Perhaps no other features display so well the distorted economics in the socialist countries as queuing and the black markets. Not surprisingly, the precise numbers on queuing and the black markets are hard to find. Shleifer and Vishny (1991) quote the Soviet sources suggesting that waiting in line takes about one forth of waking time of every adult. Podkaminer (1988) reports that in 1984 in Poland the black market prices of the popular automobile and the tv set were, respectively, 107% and 75% higher than the official prices. These markups reflect both the line and the opportunity cost of time. Thus knowing them alone does not allow for a precise estimation of the deadweight loss of leisure due to queuing. I am not aware of any evidence on wages that can be earned by queuing for somebody else. Interestingly, professional queuing was one of the few privately-provided and unregulated services in the socialist economies. The scope of this activity was not insignificant. Some unconfirmed evidence suggests that in the early 1990s as many as 60 000 Soviet citizens were actually working as professional "waiters".

There seems to be a presumption that in a presence of price controls, a faster money growth leads to more queuing. Kolodko and McMahon (1987) even call this phenomenon a shortageflation. In a sharp contrast, I show that an unanticipated permanent increase in growth rate of the money supply reduces rather than increases the waiting lines.

The model may be thought of as an extension of the classical rationing-by-waiting arguments in Barzel (1974) into a dynamic general equilibrium model with money. The presence of the cash-in-advance (CIA) constraint on the black market purchases implies that the effective cost of consumption includes the inflation tax paid on money balances held in advance of the acquisition of goods. An increase in the opportunity cost of money increases the relative price of consumption in terms of inflation-tax-free leisure, thus resulting in an inward shift of the labor supply. This result, originally due to Wilson (1979) (see also Aschauer and Greenwood (1983)), is typical in the CIA economies. In the model, labor is hired by the speculators to perform queuing services on the official market. It follows from the free entry and the implied competitive pricing in the queuing/resale business that, at any given real wage, the speculator's demand for labor varies negatively with the ratio of the official to black market prices. At any instant of time, this ratio is predetermined as it reflects the initial conditions and the respective past rates of inflation. It follows that, on impact, the unanticipated changes in the growth of the money supply do not affect the labor demand. Given that the labor supply shifts inward, an acceleration of inflation instantaneously lowers the waiting line. I also show that, as long as the price controls are always binding, the high money growth stationary equilibria are characterized by the low amount of queuing. Therefore, if output and consumption are unaffected by the inflation-induced fall in the labor supply (e.g., because, in the aggregate, they depend on the mandated as opposed to freely chosen working time), then inflation unambiguously increases welfare. Hence the title of this note. Further, it can be argued that inflation may be (locally) welfare-improving even if lower labor supply does cause a fall in output and consumption.

The remainder of this note is organized as follows. The model is developed and discussed in section 2. Section 3 concludes.

2. The Model

I consider the following perfect foresight model set up in continuous time. An infinitely-living representative family consists of four members: a store-keeper, a speculator, a worker, and a shopper. The store-keeper sells the family's constant endowment of a perishable good, y, at the state-controlled price, $\bar{p}$. The speculator buys s goods on the official market only to resell them on the black market at price p. Binding price controls (i.e., $\bar{p} < p$) imply that the official market clears through queuing. The total line is linear in the quantity bought. Precisely, a unitary purchase requires q hours of waiting. Quite realistically, waiting is performed by the professional "waiters" hired by the speculator. The "waiters" earn a competitive nominal wage W zlotys per hour. The shopper buys the consumption good on the black market at price p. These black market purchases are subject to the cash-in-advance (CIA) constraint. The worker sells n hours of his labor to the domestic employers. In addition to money, the households hold privately-issued real bonds, b, each yielding an instantaneous real return ρ. In each instant of time the representative household receives from the government a lump sum transfer of nominal money, T. The nominal money stock (M) and the official price are continuous and growing at the rates of σ and η, respectively (i.e., $\dot{M}/M = \sigma$ and $\dot{\bar{p}}/\bar{p} = \eta$).

The family maximizes a life-time integral of the discounted intraperiod utilities defined over consumption and leisure. The total endowment of time is normalized to unity. The intraperiod utility function, $u(c,1-n)$, has the standard properties. Consumption and leisure are both assumed to be normal goods.[1]

Formally, given M_0 and b_0, each family solves:

$$(1) \quad \max_{c,n,s,m,b} \int_0^{\infty} u(c,1-n)\exp(-\delta t)dt$$

subject to:

$$(2) \quad \dot{a} = a\rho - (\rho+\pi)m + y(\bar{p}/p) + (w/p)n - s[(\bar{p}/p) + q(w/p)] + s - c + t$$

$$(3) \quad m = \alpha c$$

$$(4) \quad a = m + b$$

$$(5) \quad \lim_{t\to\infty} a\exp(-\int_0^t \rho d\tau) = 0 \quad \text{(no Ponzi games)}$$

where: $\delta > 0$ is the subjective rate of time preference; $a \equiv$ the stock of real assets; the formulation of CIA constraint in continuous time, (3), was originally derived by Feenstra (1985); $m \equiv M/p \equiv$ the real balances of money; $\alpha > 0$; $t \equiv T/p \equiv$ the real value of money transfers; $w/p \equiv$ the real wage; the time subscripts are suppressed to economize on notation;

It is convenient to substitute (3) into (2). Denote by λ the marginal utility of real wealth (i.e., the multiplier on (2)). The

---

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

first-order conditions consist of (2)-(5) and

$$(6)\quad u_1(c,1-n) = \lambda[1 + \alpha(\rho+\pi)]$$

$$(7)\quad u_2(c,1-n) = \lambda(w/p)$$

$$(8)\quad 1 - (\bar{p}/p) + q(w/p) \le 0 \quad (= 0 \text{ if } s > 0)$$

$$(9)\quad \dot{\lambda}/\lambda = \delta - \rho$$

$$(10)\quad \lim_{t\to\infty} a\lambda\exp(-\delta t) = 0$$

As usual, (6) and (7) implicitly define the demand for consumption and leisure (and, hence, the supply of labor), respectively. The (implicitly) imposed Inada conditions ensure that the choices of c and 1-n are interior. Note that the effective cost of consumption includes the inflation tax paid on money balances held in advance of the acquisition of goods. The zero profit condition, (8), implicitly defines the demand for labor by the speculators (i.e., sq). It is easily seen that this demand is zero if the official price is at least as high as the current black market price. When $\bar{p} < p$, then the demanded quantity of labor varies negatively with the real wage. Also, an increase in $\bar{p}/p$ shifts the labor demand downward. (9) is the costate equation, and (10) is the transversality condition. Combining (6) and (7) yields:

(11) $u_1/u_2 = [1 + \alpha(\rho+\pi)]/(w/p)$

that is, at the optimum, the marginal rate of substitution between consumption and leisure is equal to the respective relative price. Clearly, the higher the opportunity cost of money, $\rho+\pi$, the higher the wedge between the relative price of consumption (leisure) and the inverse of the real wage (the real wage).

In equilibrium the following must be true:

(12) $y = s = c$

(13) $n = sq = yq$

(14) $m(\sigma-\pi) = \dot{m}$

(15) $b = 0$

(12), (13) and (14) say that the (official and black) goods, labor and money markets clear. Because all the families are alike, the privately-issued bonds are necessarily in zero net supply. Hence (15). The constancy of y, (8) and (3) jointly imply that:

(16) $\dot{m} = 0$

and thus

(17) $\pi = \sigma$

It is now easy to show that in the equilibrium the real interest rate must be equal to the subjective rate of time preference. Simple notice that, for any given σ, (12), (17) and (6) jointly imply a negative relationship between λ and ρ. It follows that the differential equation (9) is unstable. Therefore, if at any instant of time ρ were different than δ, then either the transversality condition would be violated, or the marginal utility of real wealth would become negative in finite time. Neither of these situations can be an equilibrium.

Solving for q from (8) and substituting the resulting expression and (12)-(13) into (11) gives:

(18) $u_1(y, 1-yq)/u_2(y, 1-yq) = q[1 + \alpha(\delta+\sigma)]/[1-(\bar{p}/p)]$

$\equiv q[1 + \alpha(\delta+\sigma)]/K$

I am interested in the effects of unanticipated changes of σ on q. K reflects the initial conditions (i.e., $\bar{p}_0$ and M_0) as well as the past growth rates of money and the controlled prices, and hence is predetermined. Under the assumed normality of consumption and leisure the total differentiation of (18) yields:

(19) $dq/d\sigma < 0$

that is, on impact, an increase in the money growth ambiguously cuts the queue. As already explained, the fall in q is due to a decrease in the labor supply caused by a substitution towards leisure. What happens to q following an initial fall can be established as follows. If the speed of adjustment of the official prices, η, is higher than the money growth, σ, then $\bar{p}/p$ is rising over time. Therefore while there are no further shifts in the labor supply, the labor demand continues to shift inward implying a gradual decline in the waiting line. Once $\bar{p}/p$ hits unity, the queue falls to zero. If $\sigma = \eta$ then $\bar{p}/p$ and, consequently, q are both constant on the transition. In the realistic case the controlled prices do not keep up with the money growth, i.e., $\eta < \sigma$. Thus over time $\bar{p}/p$ (the labor demand) is declining (shifting outward). Accordingly, following an initial drop, the line is increasing. However, it is easy to see that the amount of queuing is bounded, i.e., there cannot be a hyperqueuing. This is because once $\bar{p}/p$ becomes zero the queue becomes implicitly given by:

$$(18') \quad u_1(y,1-yq)/u_2(y,1-yq) = q[1 + \alpha(\delta+\sigma)]$$

Clearly, as long as at the pre-inflation $\bar{p}/p$ was positive, the terminal q defined by (18') may or may not be lower than the pre-inflation q. However, it seems more relevant to compare the queues in the steady-state equilibria that obtain for a fixed value of $\sigma - \eta$. Naturally, the assumption is that $\sigma - \eta \geq 0$, since otherwise the terminal queue is zero. When $\sigma = \eta$, then the stationary queue, q^*, is implicitly determined by (18), except that it follows from (3) that K is now equal to $1 - \alpha\bar{p}_0 y/M_0$. When $\sigma > \eta$, then q^* is given by (18'). In either case one gets:

(20) $dq^{*}/d\sigma < 0$

that is, the long run deadweight loss of leisure is lower in the economies with the higher money growth (and thus inflation). Continuity implies that if the money growth (and inflation) were infinite then the economy would be queue-free!

The intuition behind the preceding result is simple and by now well known. While the steady-state labor demand does not depend on the rate of the money growth (because, terminally, $\bar{p}/p$ becomes a constant), the steady-state labor supply declines in the rate of the money growth reflecting the inflation-induced substitution towards the inflation-tax-free leisure. It is the latter effect that lowers the waiting in lines.

If, as I assumed here, output and consumption are unaffected by the inflation-induced fall in the labor supply, then inflation unambiguously increases welfare. However, if output and consumption fall as the labor supply falls, then the conclusions on welfare become ambiguous. Aschauer and Greenwood (1983) showed that in the CIA economy without price controls inflation lowered welfare (see also Cooley and Hansen (1989) who actually estimate the size of the loss in a real business cycle/CIA economy). In the CIA economy with price controls inflation has benefits (less queuing) and costs (i.e., a distorted labor/leisure choice leads to the overconsumption of leisure and the underproduction of consumption goods). However, for certain functional forms of preferences and the production function it is still possible to show that, at least locally, inflation is welfare-improving.

3. Conclusions

I have studied a monetary economy in which binding price controls give rise to queuing and the (competitive) black market. The black market purchases are subject to the cash-in-advance constraint. In contrast to a common presumption, I show that a faster money growth lowers - both on impact and in the long run - the amount of time wasted in the waiting lines. This result follows from the effect characteristic of the CIA economies, namely, an inflation-induced substitution towards the inflation-tax-free leisure. In an endowment economy a decline in the lines unambiguously increases welfare. I have argued that inflation can be locally welfare-improving even in the production economy.

References

Aschauer, D., and J. Greenwood, 1983, A Further Exploration in the Theory of Exchange-Rate Systems, Journal of Political Economy 91, 875-878.

Barzel, Y., 1974, A Theory of Rationing by Waiting, The Journal of Law and Economics XVII, 73-95.

Cooley T., and G. Hansen, 1989, The Inflation Tax in a Real Business Cycle Model, The American Economic Review 79, 733-748.

Feenstra, R., 1985, Anticipated Devaluations, Currency Flight, and Direct Trade Controls in a Monetary Economy, American Economic Review 75, 386-401.

Kolodko G., and W. McMahon, 1987, Stagflation and Shortageflation: A Comparative Approach, Kyklos 40, 176-197.

Podkaminer, L., 1988, Disequilibrium in Poland's Consumer Markets: Further Evidence on Intermarket Spillovers, Journal of Comparative Economics 12, 43-60.

Shleifer A., and R.W. Vishny, 1991, The Waste of Time and Talent under Socialism, mimeo, Harvard University.

Wilson , C., 1979, An Infinite Horizon Model with Money, in: J. Green and J. Scheinkman eds., General Equilibrium, Growth, and Trade: Essays in Honor of Lionel McKenzie (New York: Academic Press).