

**HIGH INFLATION:
RESOURCE MISALLOCATIONS AND GROWTH EFFECTS**

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High-Inflation: Resource Misallocations and Growth Effects

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Abstract

Rapid inflation induces buyers to speed up purchases, inhibiting the selection of more adequate trading partners through search. This has the effect of blurring the distinction across agents of different productivities, and leads to resource misallocations. The incentives to become more efficient are thus discouraged, and lower growth results.

1 Introduction

Mainstream economic literature on inflation -as represented by the relevant chapters in the *Handbook of Monetary Economics*- pays little attention to the experiences of high inflation in Latinamerica.¹ Integrating high inflation into mainstream economic literature will benefit both sides. On one direction, a careful formal understanding of economic behavior at high inflation will help us predict what changes will occur in countries that successfully

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¹It also pays little attention to the "microeconomics" of inflation. Among the exceptions, Carlton (1983), Casella and Feinstein (1990) and Reagan and Stultz (1993).

stabilize. On the other hand, cases of extreme monetary instability can give us a clearer understanding of the role that money serves under normal circumstances, and hence allow us to evaluate different strands of monetary theory (and macroeconomics.)

The formal study of high inflation cases can also help to bridge the gap (Driffill et al., 1990) between people's intuition of the costs of inflation, and formal analysis. Furthermore, as Orphanides and Solow (1990, p. 258) observe "the money-and-growth literature generally neglects issues that are taken seriously in studies of hyperinflation. To the extent that inflation damages the efficiency of transactions technology, the net productivity of real capital will be lower and so will the demand for capital. It seems unsatisfactory to treat such questions by simple dichotomy: to say that they matter at "high" rates of inflation and not at all at "low" rates of inflation. A more unified treatment will have implications for monetary growth theory."

Within the agenda of integrating high inflation into the literature, this paper provides a simple general equilibrium model in which inflation affects the allocation of transactions and resources. This, in turn, lowers the incentives to invest in growth enhancing technologies and leads to economic stagnation.

I model product markets as search markets. Depreciation of nominal balances induces buyers to speed up purchases. Hence the selection of more adequate trading partners through search -one of the dynamic mechanisms through which a price system induces more efficient allocations- is inhibited. This is one way of formalizing the implications of the commonly held view that "inflation shortens agents' horizons." To make the case in the simplest way, I study the steady state of a model where inflation is perfectly anticipated.

2 Description of the Economy

I consider a discrete-time economy populated by an infinite sequence of three period lived overlapping generations. (The model can be extended to longer lived agents, but three periods is expositionally more convenient.) Each generation is identical in size and composition and consists of a continuum of agents with unit mass. Each agent is endowed with one unit of an input which he supplies inelastically to a centralized "labor" market.

Each agent is characterized by two parameters: a technology parameter θ and a preference (search) parameter β . Each individual sets up his own firm which produces with the technology

$$X = L/\theta.$$

L is the amount of input employed (purchased in the centralized market) and X is output.

The parameter $\beta \leq 1$ captures a utility cost of search (impatience). In the tradition of the search literature, I use linear preferences²

$$U = X_1 + \beta X_2.$$

X_1 is consumption during the first search period (at age 2) and X_2 is consumption in the second search period (at age 3).

The inverse-of-productivity (input requirement coefficient) θ and the impatience factor β are independently distributed in each generation. In particular, $\theta = \theta_L$ for half of the agents and $\theta = \theta_H$ for the other half with $\theta_H > \theta_L$, and β is uniformly distributed in $[\underline{\beta}, \bar{\beta}]$.

The timing of actions over an individual's lifetime is the following. During the first period he sells his labor in a centralized input market and operates his firm (hiring labor, producing and selling output). In the second period, with cash in his pocket, he is matched to a seller (firm). At that point he has to decide whether or not to purchase from the seller (the decision depends on the price, to be determined). If he accepts the price, given the linearity of preferences, he spends all his cash there. If he rejects the price, in the third period he is randomly matched to another firm.

The product (search) market is where the model's action occurs.³ I describe the monetary side for completeness; we only need that inflation increases in the rate of money creation, and that agents receive their nominal income less frequently than the prices of the goods they purchase change.

²All the results are obtained at the extensive margin, with every agent at a corner—from linear preferences and a continuum of agents. At the cost of some mathematical cluttering, the same aggregate results can be obtained with each risk averse agent at an interior solution.

³Notice that the most vivid descriptions of people's suffering during episodes of hyperinflation are those of product markets. See the quotations from Weimar Germany in Casella and Feinstein (1990) and from high-inflation Latin America in Heymann and Leijonhufvud (1993).

Operationally, I assume the exchange technology depicted in Figure 1. Agents set up their firms at age 1. They receive customers who pay cash and order output. With part of that cash (profits are possible), the entrepreneur buys labor in the centralized input market, and then produces to fill the order. At the end of the period, agents of age 1 have cash (nominal income which equals wages plus profits). Also, some agents of age 2 (those who did not buy) carry their money balances into the next period.

The action starts again next period in which every agent of (now) age 2 (previous firm-owners/workers) receives a government transfer of $\mu^t - \mu^{t-1}$ pesos. This injection of money every period is the source of inflation. (Aggregate nominal money supply at time t equals μ^t , since each cohort has a unit mass of agents.)

3 Consumer Problem

Let I be the consumer's income which is the sum of wages, profits and a (real) government transfer T , which is received at the beginning of the second period of life, right before the first search. All variables will be expressed in terms of real purchasing power of first time searchers, so that

$$I = \frac{w}{\pi} + \frac{B}{\pi} + T, \quad (1)$$

where B are profits and π equals one plus the inflation rate.⁴ Notice that profits and hence income will differ across individuals (wages and government transfers will not). In this section I refers to income of the individual under analysis. Given the simple functional forms chosen (see footnote 2) only average income will matter for equilibrium, so that in the next section I will stand for average (aggregate) income.

In equilibrium, half the sellers charges p_L and the other half charges p_H , $p_H > p_L$. The product market has a "sequential search" structure. Buyers know the distribution of prices but not which price is charged by each store unless they go there and observe the price. A buyer is matched to a seller in his first "search" or "consumption" period and observes the price p_L or p_H . In principle the set of feasible choices for X_1 is $[0, I/p]$, but given the linearity of

⁴I will be looking at a stationary monetary steady state, with a constant inflation rate equal to the rate of money creation.

preferences, the choice set reduces to $\{0, I/p\}$, either not purchasing anything or spending all income. In this simple case of only two prices, consumers will always accept a quotation of p_L – in steady state the distribution of real prices is constant, and there are impatience and inflation losses from waiting to hear another price.

Turning to p_H , if the consumer accepts a high price he receives utility I/p_H , while if he rejects p_H his expected utility is

$$\beta \frac{I}{\pi} E\left(\frac{1}{p}\right) = \beta \frac{I}{\pi} \left[\frac{1}{2} \frac{1}{p_L} + \frac{1}{2} \frac{1}{p_H} \right].$$

With a more general price distribution, the equalization of the values of acceptance and rejection determines a reservation price as a function of parameters β and π . In this two-price distribution, impatient consumers accept any price and patient consumers accept only low prices. The marginal consumer is characterized by

$$\hat{\beta} = \frac{2\pi}{\frac{p_H}{p_L} + 1}. \quad (2)$$

In this class of models (Benabou 1988, Tommasi 1992) consumer welfare is inversely related to reservation prices. In this two-price case, average consumer welfare is negatively related to the fraction Φ of non searchers, which is given by

$$\Phi = \frac{\hat{\beta} - \beta}{\beta - \underline{\beta}}.$$

Two implications are already apparent from (2). First, consumer welfare is increasing in $\frac{p_H}{p_L}$ which is a measure of price dispersion. As common in the search literature, a spread is beneficial given the possibility of truncating the undesirable part of the distribution, as in Benabou (1988). Second, consumer welfare is decreasing in inflation, since $\hat{\beta}$ increases with π . At higher inflation rates more consumers prefer to buy at the high price rather than waiting to hear a second quotation while their purchasing power depreciates.

4 Firms and Equilibrium

In order to compute the expected quantity sold by each type of firm, we have to consider the possible search outcomes for each type of buyer. Consumers

with $\beta < \hat{\beta}$ always accept the price they find in their first search, which equals p_L with probability $1/2$ and p_H with probability $1/2$. Given the stationarity of the environment, the cross sectional distribution of matches for the firms and the time series distribution of matches for buyers are the same. From this we can easily compute the expected (and average) number of buyers that will purchase from any type of firm (i.e., the *extensive margin*). It is given by

$$n_L = \frac{1}{2}\Phi + \frac{3}{4}(1 - \Phi) = \frac{1}{2} + \frac{(1 - \Phi)}{4} \quad (3)$$

and

$$n_H = \frac{1}{2}\Phi + \frac{1}{4}(1 - \Phi). \quad (4)$$

Low price firms have more customers (n_L) than high price firms (n_H) due to the behavior of *searchers* who are more likely to purchase at low prices. It is clear from (3) and (4) that inflation, by increasing the fraction of non-searchers Φ , has a *composition effect* in the wrong direction: more people buy from low productivity firms. In the end, given a limited amount of resources (inputs), this implies lower output and lower welfare.

In order to express total sales by firms of each type (X_L and X_H), we have to incorporate the *intensive margin*—the number of units sold to each buyer— which leads to:

$$X_L = \frac{1}{2} \frac{I}{p_L} + \frac{(1 - \Phi)}{4} \frac{I}{\pi p_L} = \frac{I}{2p_L} \left[1 + \frac{(1 - \Phi)}{2\pi} \right] \quad (5)$$

and

$$X_H = \frac{\Phi}{2} \frac{I}{p_H} + \frac{(1 - \Phi)}{4} \frac{I}{\pi p_H} = \frac{I}{2p_H} \left[\Phi + \frac{(1 - \Phi)}{2\pi} \right] \quad (6)$$

where I is average income (average purchasing power of agents in their second period). X_i represents *total sales* by all firms of type i . Expected sales for an individual firm of type i are $2X_i$.

To simplify the exposition, I assume in the text that firms follow a mark-up rule, so that prices equal $(1 + m)$ times marginal cost. I argue in the appendix that consideration of optimal pricing policies—with m potentially a function of π —will tend to reinforce the results of the paper. Firms will charge

prices $p = (1 + m)\theta w$, where θ is the firm's input requirement coefficient and w the input price.⁵

w is obtained from the labor market equilibrium. Labor supply is inelastic at 1, and labor demand equals

$$X_L(w)\theta_L + X_H(w)\theta_H = \frac{I}{(1 + m)w} \left\{ \frac{1}{2} + \frac{(1 - \Phi)}{4\pi} + \frac{\Phi}{2} + \frac{(1 - \Phi)}{4\pi} \right\}$$

so that

$$w = \frac{I}{2(1 + m)} \left\{ 1 + \Phi + \frac{(1 - \Phi)}{\pi} \right\}. \quad (7)$$

Aggregate profits equal

$$B = mw = \frac{mI}{2(1 + m)} \left\{ 1 + \Phi + \frac{(1 - \Phi)}{\pi} \right\}. \quad (8)$$

Notice that if there is no inflation (no government transfers), then $\pi = 1$ and the wage bill plus profits equals aggregate income, $w(1 + m) = I$.

Transfers from the government equal revenue from the inflation tax,

$$T \equiv \frac{(\mu^t - \mu^{t-1})}{P_t} = (\pi - 1) \frac{\mu^{t-1}}{P_t} = \frac{(\pi - 1)}{\pi} \left[w + B + \left(\frac{1 - \Phi}{2} \right) I \right] \quad (9)$$

where P_t is the price level at time t , $(\pi - 1)$ is the inflation rate and

$$\frac{\mu^{t-1}}{P_t} = \frac{1}{\pi} \left[w + B + \left(\frac{1 - \Phi}{2} \right) I \right]$$

are real balances.

It is easy (though tedious) to verify, using (7), (8) and (9), that aggregate expenditure I equals aggregate income $(w/\pi + B/\pi + T)$. The rate of inflation $(\pi - 1)$ equals the rate of money creation $(\mu - 1)$,⁶ and the demand for real balances μ^{t-1}/P_t is negatively related to the inflation rate, through the dependence of Φ on π . As Casella and Feinstein (1990), I derive endogenously one traditional *assumption* of high-inflation models: a velocity effect.

⁵There is no loss of generality in assuming the markup to be the same across firms with different θ . As explained in the Appendix, the results do not change if $m_L \neq m_H$, as long as $-\infty < \frac{d(\frac{m_H}{m_L})}{d\pi} < \frac{\frac{m_H}{m_L} + 1}{\pi}$ in equilibrium.

⁶As stated before, I am ignoring all (expectationally-induced overlapping generations) equilibria other than the stationary monetary one.

5 The Effect of Inflation on the Efficiency of the Price System

It is widely believed, yet seldom analyzed formally,⁷ that inflation affects the efficiency of the price system. Axel Leijonhufvud and David Laidler⁸ have been advocating for a long time the view that inflation strikes at the heart of the price system in a monetary economy. More recently, Ball and Romer (1992) and Tommasi (1992) stress that one of the implications of (high) inflation is a reduced ability of the price system to screen out less efficient agents. They argue that, given that real prices are less stable at higher inflation, agents are more likely to enter the "wrong" relationships. In this paper I obtain a similar implication from the fact that inflation makes consumers eager to get rid of their money holdings. This increases the average reservation value at which they buy in such a way that the relative demand for goods from low-productivity firms increases – a *composition effect*.

It is clear from (5) and (6) that inflation increases the relative demand of high-cost firms. Given a limited amount of inputs (labor in this case), such a composition effect decreases output and welfare.⁹ Total output is the sum of output from low- and high-cost firms. From (5) and (6)

$$\frac{\partial(X_L + X_H)}{\partial\pi} = \frac{I}{2} \left[\frac{1}{p_H} - \frac{1}{2\pi} \left(\frac{1}{p_L} + \frac{1}{p_H} \right) \right] \frac{\partial\Phi}{\partial\pi} - \frac{1 - \Phi}{4\pi^2} \left(\frac{I}{p_L} + \frac{I}{p_H} \right).$$

The second term captures the *intensive margin* and is, of course, negative. In regards to the first term, notice that for $\pi < \bar{\pi} = (p_L + p_H)/2p_L$,

$$\frac{\partial\Phi}{\partial\pi} = \frac{2p_L}{(\bar{\beta} - \beta)(p_H - p_L)} > 0$$

⁷Notable exceptions are Cukierman (1982) and Katz and Rosemberg (1983). See also Carlton (1983) and Cukierman (1984).

⁸See for instance Leijonhufvud (1981) and Laidler (1978).

⁹The heterogeneous productivities in this model can be reinterpreted as firms having the same physical productivity (units of output per unit of input), but producing units of different quality (utility value). Alternatively, we can have heterogeneous tastes along a product space. In each of these interpretations, measured output can still be independent, but welfare decreasing in inflation. A close analog would be a marriage market in which we introduce an extra element of impatience. We will still have the same number of marriages, but people will end up with less desirable partners on average.

and $\left[\frac{1}{p_H} - \frac{1}{2\pi} \left(\frac{1}{p_L} + \frac{1}{p_H} \right) \right] < 0$, so that the first term is also negative (*extensive margin*). For $\pi \geq \bar{\pi}$, all consumers become non-searchers and further inflation has no extensive margin effect ($\frac{\partial \Phi}{\partial \pi} = 0$ when $\Phi = 1$).

6 High Inflation and Economic Growth

High inflation has a negative effect on economic growth. Recent papers that report such a finding are Cardozo and Fischlow (1989), Cooper (1993), De Gregorio (1992), Fischer (1991), Grier and Tullock (1989), Kormendi and Meguire (1985), and Wynne (1993). De Gregorio (1993) concludes that if inflation rates in Latin America had been half of 1950-1985 levels, per capita GDP growth would have been at least 25 percent higher.

Orphanides and Solow (1990) review the conventional Tobin-Sidrauski literature and conclude that Tobin-like effects are unlikely to be quantitatively significant when compared to the disorganizing consequences of rapid inflation. More recently, authors have been searching for channels through which high inflation negatively affects growth. Azariadis and Smith (1993) emphasize the impact of inflation on financial markets.¹⁰ De Gregorio (1993) shows, following Stockman (1985) that the increased cost of holding money, which is used to purchase new capital, increases the total cost of capital. Also, inflation tends to be associated with general macroeconomic uncertainty which Pindyck and Solimano (1993) show reduces the incentives to invest. (See also Huizinga 1993.) Another channel is the direct reallocation of resources (mainly entrepreneurial) to inflation-related activities, such as speculation and rent-seeking as firms and individuals spend valuable time trying to accelerate collections, delay payments, keep informed of the evolution of the exchange rate, etc. Sturzenegger and Tommasi (1993) study the growth implications of the allocation of entrepreneurs' time with special reference to Argentina.

¹⁰There is also an effect of high-inflation on financial markets that operates through the phenomenon I characterize here: inflation introduces noise in the price system in such a way that makes it more difficult to screen agents of different productivity. De Gregorio and Sturzenegger (1993), building on the model of this paper, show how inflation moves the financial market in the direction of pooling equilibria (the ability of financial intermediaries to screen heterogeneous firms is reduced) which compounds the negative welfare effects described here.

This paper highlights an understudied channel by which inflation hurts growth. The “static” inefficiencies described in the previous section reduce the profitability of growth-enhancing entrepreneurial activities. One of the main implications of the model of the previous section is that the difference in profits between low-cost and high-cost firms is reduced.¹¹ Notice that profits of a firm of type i are

$$B_i = m\theta_i 2X_i \quad (10)$$

where $i = L, H$ and w is normalized to 1. From (5), (6) and (10) the difference in profits between low- and high-cost firms is $(1 - \Phi) \frac{mI}{(1+m)}$ which is decreasing in Φ and, therefore, in π .

From that blurring effect it is easy to see why high inflation negatively impacts growth. Following Grossman and Helpman (1991) and Schumpeter (1942), imagine that growth is the outcome of deliberate efforts by firms to improve their technology: lower costs, increase quality and/or create new products. In the model I will concentrate on lowering production costs.

Before setting up production the entrepreneur/firms can spend resources trying to lower production costs which is an activity subject to an uncertain return. Assume for simplicity, that if a firm devotes effort e (investment), it has a chance $\lambda(e)$ of lowering its costs from θ_H to $\theta_L = \theta_H/G(e)$. There is a utility cost (leisure) of such effort, $c(e)$. I impose the standard assumptions that $\lambda' > 0$, $\lambda'' < 0$, $G(0) = 1$, $G' > 0$, $c' > 0$ and $c'' > 0$.

The entrepreneur faces the decision of how much to invest trying to lower costs. Formally,

$$\text{Max}\{\lambda(e)B(\theta_H/G(e)) + [1 - \lambda(e)]B(\theta_H) - c(e)\}$$

by choice of e . The solution requires equalization of the marginal cost and expected marginal benefit of investment:

$$c'(e) = \lambda'(e)[B(\theta_L) - B(\theta_H)] - \lambda(e)B'(\theta_L)\theta_H/G^2(e).$$

¹¹Inflation tends to blur the distinction among agents of different productivities. Several authors have argued that the inflation tax is a regressive one, given a superior ability of the rich to avoid it. Notice that I provide in this paper an argument by which inflation hits harder on more productive (hence richer) agents. There is evidence that, even after controlling for possible trade-offs with unemployment, people's aversion to inflation is increasing in income (see Mueller 1989, p. 289.)

Using the second order condition, it is easy to show that investment e in cost reduction is decreasing in the profit differential, and hence in the inflation rate.

To formalize the growth implications assume that old technologies can be copied freely by new firms (with a one period lag, not contemporaneously), so that $\theta_{Ht} = \theta_{Lt-1}$ and $\theta_{Lt} = \theta_{Lt-1}/G(e)$.

Notice that now the number of low- and high-cost firms becomes endogenous. I analyze a symmetric (stationary) Nash equilibrium¹² in which all firms in all generations invest the same amount e . The number of (ex-post) low-cost firms equals $\lambda(e)$, so that there is an extra composition effect that compounds the effects of inflation on output and efficiency described in the previous section. Furthermore, now inflation negatively affects growth. To see this, notice that aggregate output equals $\lambda(e)X_{Lt} + [1 - \lambda(e)]X_{Ht}$. It is easy to show that

$$\frac{X_{Lt+1}}{X_{Lt}} = \frac{\theta_{Lt}}{\theta_{Lt+1}} = G(e) = \frac{\theta_{Ht}}{\theta_{Ht+1}} = \frac{X_{Ht+1}}{X_{Ht}},$$

thus the rate of growth of the economy, $G(e) - 1$, is decreasing in inflation.

7 Concluding Remarks

Academic macroeconomists have been traditionally concerned with the possibility of (positive) effects of inflation on output in the short run. On the other hand development economists (and most policy practitioners) agree on the negative impact of inflation on output and growth in the long run. This paper takes the task of formalizing some of these latter views, via comparative statics on the inflation rate in a model of steady inflation.

Inflation affects transaction technologies in ways that blur some of the efficiency properties of a market economy. In this paper traders speed up transactions to avoid the inflation tax. Hence, they spend less time in the search for an adequate match - which in the paper is a high productivity firm, but it represents any instance in which the social surplus of the transaction is match-specific. Aggregate welfare diminishes due to inadequate matching.

¹²The equilibrium is a fixed point in π since now $\pi = \mu - g$ and the rate of growth g is itself a function of π through $\hat{\beta}(\pi)$ and hence the differential profitability of low and high-cost firms.

If growth is the result of entrepreneurs who try to distinguish themselves through better products, lower prices, etc., and inflation flattens the profile of rewards, then entrepreneurial activity and growth will be dampened.

8 Appendix: Optimal Pricing Policies; Search, Bargaining and the Paradox of Diamond.

The results in the paper were obtained under the assumption that (real) prices are determined as a fixed markup over marginal cost. As usual, this was chosen for tractability. In this appendix I explain some of the complications of more sophisticated price determination mechanisms, and I argue that such mechanisms are unlikely to revert the results of the paper. The discussion is based partly on McMillan and Rothschild (1993) and Bagwell and Ramey (1992).

It would be standard to analyze a product market like the one in the paper with an equilibrium sequential search (ESS) model. That is, firms playing a Nash noncooperative game among themselves and a Stackelberg game against the buyers, who take prices as given. There are several problems in trying to apply such protocol to this model. First, given the nature of the intensive margin (customers with unit-elasticity demands, fixed total expenditure), the optimal price with constant unit cost will tend to be infinite. (This is particularly easy to see in the case of old consumers.) Hence, we will need to add some frictions in order to get finite “monopoly” prices. Even after that, we face the problem known as the paradox of Diamond: if all buyers have strictly positive search costs, the equilibrium cannot be characterized by a price distribution; furthermore, the unique price will be the same that a monopolist would charge. The usual way out in these cases, consists in assuming that some consumers have zero cost of search. In our model, the counterpart of search cost is the discount factor β . In order to obtain a dispersed price equilibrium we need $\bar{\beta} = 1$. But in our model, the effective discount factor is $\frac{\beta}{\pi}$ (formalizing the commonly held view that inflation shortens agents’ horizons.) As soon as there is any inflation ($\pi > 1$), the equilibrium explodes to the monopoly price. Contrary to equilibrium search models in the “menu-cost” tradition (Benabou 1988, Diamond 1993), where inflation is necessary for dispersion, here dispersion can only survive at zero

inflation. Taking this stark case, we conclude that as long as there is any inflation, there will be no price dispersion, all firms will charge the highest possible price and welfare will be at its minimum.

In order to obtain more monotonic results, we have to take an alternative route. A natural one is to recognize that the ESS model is a special case of bargaining protocol for a pairwise meeting of a *money trader* (buyer) and a *commodity trader* (seller). In ESS, the seller makes the first and only offer, hence the tendency to the monopoly outcome with the seller getting all the surplus. On the other extreme we have the “Bertrand” protocol of having the buyer making the first and only offer and hence getting all the surplus (price equal marginal cost). In between, we have a plethora of possible prices, depending on who makes the first offer and which is the interval between offers. Under any bargaining protocol, the price will depend on the fallback (reservation) utilities of the parties. Fall back values, in turn, depend on the whole distribution of prices (and hence alternatives.) Such fixed point, while probably feasible will be quite involved and will unnecessarily distract from the more transparent results in the text.¹³ For that reason, I restrict myself to some heuristics to show that it is unlikely that the results will be reverted in the full blown analysis.

It is clear that inflation, by weakening the position of money traders, will lead to higher real prices (as in Casella and Feinstein 1990) and lower output. This reinforces the direct effect of inflation (depreciation of past income) in our paper. Our more interesting results, though, are the indirect effects through the redistribution of production towards less efficient firms.

Notice that the composition effect operates through $\hat{\beta} = \frac{2\pi}{\frac{p_H}{p_L} + 1}$, which is increasing in inflation. For the results to be reverted, it has to be the case that $\frac{p_H}{p_L}$ be rapidly increasing in inflation (in the bargaining game) so as to overcome the direct effect of π . But there is nothing in the environment that suggests that inflation will affect the bargaining position of buyers differentially vis a vis the two types of firms. Intuitively, the price ratio should be more or less independent of inflation, and hence $\hat{\beta}$ increasing in π as necessary

¹³See Trejos and Wright (1993) for a review of recent search-bargaining analysis of monetary exchange. Another complication in our case will derive from the multiple dimensions of buyer heterogeneity -age, discount factor- which will bring either the complications of bargaining with asymmetric information, or equilibria with more than two prices (if we assume those characteristics to be observable.)

for the results.¹⁴

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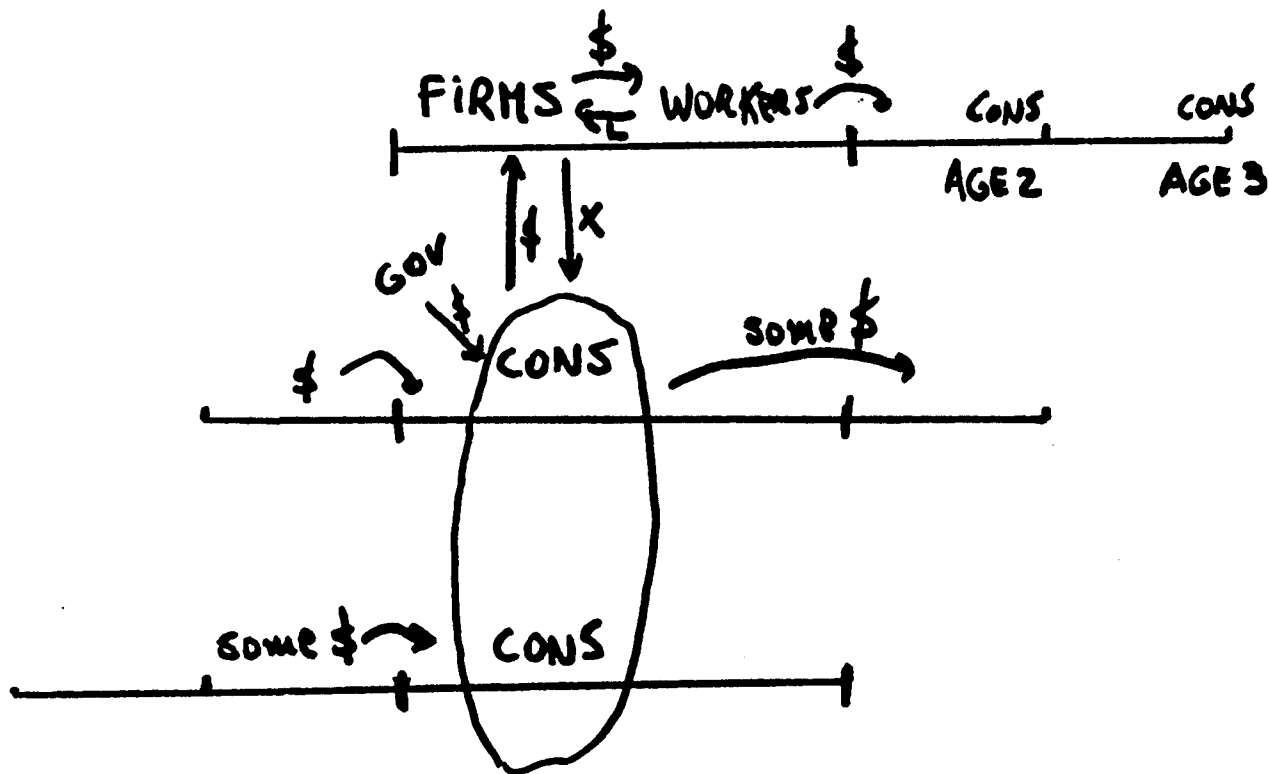
¹⁴More precisely, the composition effect will go in the desired direction (Φ increasing in π) as long as $-\infty < \frac{d(\frac{PH}{PL})}{d\pi} < \frac{PH+1}{PL\pi}$ in equilibrium.

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TIME $t-1$ t $t+1$ $t+3$



GENERATIONS

FIGURE 1