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The Asymmetric Effects of Monetary Policy on Job Creation and Destruction

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Abstract

This paper presents theory and evidence on the asymmetric effects of monetary policy on job creation and job destruction. First, it solves a dynamic matching model and it shows how interest rate changes result in an asymmetric response of job creation and destruction. Second, it looks at how changes in the federal fund rate affect gross job flows in the U.S. manufacturing industry, and it finds evidence of asymmetry. Tight policy increases job destruction and reduces net employment changes. Conversely, easy policy appears ineffective in stimulating job creation.

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Contents

SUMMARY

This paper presents theory and evidence on the asymmetric effect of monetary policy on job creation and destruction. Using the most recent developments in matching theory, the paper shows how job creation and job destruction respond to changes in interest rates.
In a model in which existing firms face idiosyncratic uncertainty and endogenously select the separation rate, a tightening of monetary policy, as described by an exogenous increase in interest rates, is immediately transmitted into higher job destruction. Conversely, easing monetary policy produces a slow response in job creation and, in particular, does not results in a one time jump in job creation like the one time jump in job destruction brought about by higher interest rates. As a consequence, net employment change responds more to increases than to reductions.

The paper implements a standard econometric technique for identifying the stance of monetary policy and shows that the empirical implications of the model are broadly supported by the data. Increases in the federal fund rates significantly affect job destruction, while reductions in interest rates fail to stimulate job creation. Using quarterly data for U.S. manufacturing, there appears to be a clear asymmetric effect of interest rate changes on the process of job creation and destruction.

I. INTRODUCTION

The view that tight and easy monetary policy produces asymmetric effects on economic activity has long been recognized in policy debates and in the academic profession (Johnson, 1962). The behavior of the U.S. economy during the 1990-92 recession, when successive cuts in the federal fund rate failed to produce economic recovery, seemed to confirm the traditional view. Furthermore, recently collected empirical evidence for both the United States (De Long and Summers 1988, Cover 1992, Morgan 1993) and Europe (Karras, 1996) strongly support the hypothesis that negative money-supply shocks and/or increases in interest rates reduce output more than monetary expansions raise it.

Theoretically, the asymmetric effect of monetary policy has traditionally been rationalized in models that assume price rigidity or asymmetric information. Monetary policy has asymmetric effects on real output if prices are less flexible downward than upward. Ball and Mankiew (1994) and Caballero and Engel (1992) propose Keynesian models in which tight policy causes output to falls with little change in prices, while easy policy causes prices to rise with little change in output. Monetary policy may also result in asymmetric output responses if asymmetric information in the banking sector produces binding credit constraints. Jackman and Sutton (1982) show that tight policy makes banks less willing to lend to riskier borrowers when market rates are high. This behavior results in credit rationing and fall in output in a way that does not have a counterpart during periods of easy policy.

The present paper focuses on the labor market and presents theory and evidence on the asymmetric effect of monetary policy on the process of job creation and job destruction. The traditional analysis focuses only on the net effect of monetary policy, and it fails to distinguish the different effects of monetary policy on the job creation and the job destruction margins. Theoretically, we develop a minimalist version of the most recent matching literature developed by Mortensen and Pissarides (1994). [1] With respect to the traditional matching approach (Diamond, 1982 Pissarides, 1990), the new matching models assume heterogeneity in the value of the labor product. The idiosyncratic and job-specific risk for existing jobs is modeled as a jump process characterized by a Poisson arrival frequency and a common distribution of productivity. In equilibrium, existing entrepreneurs endogenously select a reservation productivity at which the continuation of a job is no longer profitable. We show that when interest rates are increased, existing entrepreneurs adjust their reservation productivity and immediately destroy any job that falls short of the newly selected value. Conversely, reductions in interest rates result in higher job creation through a costly and time consuming process. The paper shows that the asymmetry between the hiring and firing technology implies that job creation and job destruction respond asymmetrically to changes in interest rate.

[1] The framework sets forth by Mortensen and Pissarides has been recently expanded by Mortensen (1994), Millard and Mortensen (1994) and Garibaldi (1997).

We analyze empirically the effect of changes in interest rates on the U.S. manufacturing data compiled by Davis and Haltiwanger (1990,1992). To identify a measure of policy stance we use an econometric procedure similar to the one applied in the existing literature on asymmetry (Cover, 1992 and Morgan, 1993). We find evidence that tight policy increases job destruction and reduces net employment changes. Conversely, easy policy appears ineffective in stimulating job creation. These results are broadly consistent with the empirical implications of the model and with the view that monetary policy produces asymmetric effects on job creation and destruction.

The paper proceeds as follows. Section II briefly reviews the existing empirical evidence on the asymmetric effects of monetary policy and Section III introduces concepts and notation. Section IV solves the steady state model, where interest rates are fixed, policy does not switch and unemployment is constant. Section V examines the model under the assumption that policy can be tight or easy and there is an anticipated probability of switching between the two regimes. Section VI looks at the data on job creation and destruction and presents some evidence on the asymmetric effect of monetary policy on job flows. Section VII briefly summarizes the paper and presents the conclusions.

II. THE EXISTING EMPIRICAL EVIDENCE

From the mid 1970s to the mid 1980s most of the work in empirical monetary economics (Barro, 1977 1978, Mishkin, 1982) was concerned with the distinction between expected and unexpected changes in money supply and the related papers tried to determine to what extent output fluctuations were the result of unexpected changes in the money supply. With the paper of Cover (1992), the attention has shifted to the distinction between positive and negative shocks. Cover presents evidence that negative money-supply shocks have a larger and more important effect on output than positive shocks. Technically, he employs the following two-step econometric procedure. The first step implies specifying different money-supply and output processes. From the residual series of shocks from the money process, Cover constructs two distinct series of positive and negative shocks. Regressing output growth on its lagged values and on the constructed variables, one can obtain an estimate of the separate effects of positive and negative shocks. Cover shows that, no matter which specification of the money supply process is used, the only significant effect on output growth is the one originated from the negative shock variable. De Long and Summers (1988) find similar results using annual data and going back to the beginning of the century. In these papers the existence of asymmetry is robust, even though quantitative measures of the effects are difficult to calculate.

To measure the robustness of the results, scholars have considered alternative measures of the stance of policy. Morgan (1993) uses the federal funds rate to identify the stance of policy and, using a two-step procedure similar to the one used by Cover, shows that changes in the federal fund rate appear to have an asymmetric impact on output growth, just as changes in money growth do. In Section VI, when we look at the effects of interest rate changes on job flows, we use a procedure very similar to Morgan (1993).

Karras (1996) examines whether asymmetry, traditionally reported in U.S. data, is also a European phenomenon. Using annual data from 1953 to 1990 he identifies money-supply shocks for a panel of 18 European countries and he shows that various specifications and estimation methods strongly support asymmetry. Similar to the Morgan paper, Karras shows that asymmetry also characterizes interest-rate effects: increases in interest rates result in statistically significant decreases in output while reductions in the discount rate have insignificant output effects.

III. CONCEPT AND NOTATIONS

We consider an economy populated by a fixed quantity of risk-neutral workers normalized to one for simplicity. Workers can be either employed or unemployed and looking for jobs. Jobs can be filled or vacant and each firm is made up of only one job. Existing jobs produce one unit of a homogeneous product with different productivity levels. Each job is characterized by an irreversible technology and produces with a productivity level of ϵ. The idiosyncratic risk is modeled as a simple Poisson process with an arrival rate equal to λ. Conditional on being hit by an idiosyncratic shock, the new productivity is a drawn from a common productivity distribution $F(\epsilon)$, with support over ϵ_l, ϵ_u and with no point mass, other than at the upper support ϵ_u. Firm behavior is described by the choice of a reservation productivity, ϵ_d, below which the continuation of production is no longer profitable.

Job creation comes from the posting of costly vacancies that are slowly matched to unemployed job seekers. We assume that newly created jobs have the option to select the best productivity in the market and create a job at the upper support of the distribution ϵ_u. However, after a job has been created, the technology becomes irreversible and firms can not adjust their productivity levels. The meeting of unemployed job seekers and vacant firms is described by a homogeneous of degree one matching function $m(u,v)$, where u and v are respectively the unemployment and the vacancy rate. In what follows, we shall indicate with

$$q(\theta) = \frac{m(u,v)}{v} \quad \theta \equiv \frac{v}{u},$$

the probability of filling in an existing vacancy, where θ is a measure of market tightness from the firms' stand-point. Similarly, the job finding rate for unemployed job seeker reads

$$\theta q(\theta) = \frac{m(u,v)}{u}.$$

Monetary policy's stance is exogenous and is indicated by the interest rate r. In Section IV monetary policy is fixed and existing firms and unemployed job seeker take as given the interest rate r. Conversely in section V, monetary policy can be tight or easy and there is a probability μ of switching between the two regimes.

With respect to the existing Mortensen and Pissarides (1994) model, we do not model common aggregate shocks and the technology is fully described by the idiosyncratic productivity ϵ. Furthermore, we assume that firms extract all the surplus from the match and fixed the wage at the workers' reservation utility level b. As Diamond (1971) has shown, this outcome is an equilibrium in a wage setting game in which workers search sequentially at some positive cost and have only the power to accept or reject offers. Given this outcome, workers have no incentive to search on the job and their behavior is fully described by the reservation utility level b.

IV. A MINIMALIST MODEL: STEADY STATE

In steady state, with a fixed policy and a constant interest rate r, the asset valuation of a job at productivity ϵ reads

$$rJ(\epsilon) = \epsilon - b + \lambda \int \{max(J(y), 0) - J(\epsilon))\} \, dF(y), \tag{1}$$

where b is the wage rate. (1) is a standard asset valuation equation and it simply says that the return of a job is equal to a dividend, $\epsilon - b$, plus a capital gain term, expressed as the difference between the expected and the current value of a job. The max operator in (1) indicates that the entrepreneur has always the option to close down the job if the new productivity level commands a negative valued asset. Differentiating (1) with respect to ϵ yields

$$J\prime(\epsilon) = \frac{1}{r + \lambda}. \tag{2}$$

If we define the cut-off value ϵ_d, as

$$J(\epsilon_d) \equiv 0,$$

after integrating by parts, the expected value in (1) reads

$$\int_{\epsilon_d}^{\epsilon_u} J(y) dF(y) = \frac{1}{r + \lambda} \int_{\epsilon_d}^{\epsilon_u} (1 - F(y)) dy. \tag{3}$$

Making use of (3), the reservation productivity (or cut-off value) ϵ_d solves

$$\epsilon_d - b = -\frac{\lambda}{\lambda + r} \int_{\epsilon_d}^{\epsilon_u} (1 - F(y)) dy. \tag{4}$$

Equation (4) uniquely solves for the reservation productivity ϵ_d, as a function of the parameters of the model and of the distribution $F(\epsilon)$. The right hand side of equation (4) is negative. A firm is willing to suffer a negative marginal profit as a way to take advantage of future improvements in idiosyncratic conditions without going through a costly job creation. The comparative static results are derived in Appendix I. First, $\frac{\partial \epsilon_d}{\partial r} \geq 0$, higher interest rates increase the marginal productivity. Intuitively, higher discount rates reduce the present value of future returns and make the firm less willing to hold on to existing jobs. Second, $\frac{\partial \epsilon_d}{\partial \lambda} \leq 0$, higher arrival rate of the idiosyncratic shock increases the reservation productivity. Since the persistence of the idiosyncratic shock is $\frac{1}{\lambda}$, higher λ reduces the persistence of each shock and makes the entrepreneur more willing to hold on to existing job.

Job creation comes from the posting of vacancy. An unfilled vacancy yields a return of $-\gamma$ per period and a probability $q(\theta)$ of being filled in at the upper support of the distribution. If we let V be the present value of a vacant job, the asset valuation of a vacancy reads

$$rV = -\gamma + q(\theta)\left[J(\epsilon_u) - V\right]. \tag{5}$$

If there is free entry on the job market and full exhaustion of rents, as in Pissarides (1990), in (5) $V = 0$ and the value of a job at the upper support is equal to the expected searching cost. Making use of (4), the job creation condition is

$$\frac{\epsilon_u - \epsilon_d}{r + \lambda} = \frac{\gamma}{q(\theta)}. \tag{6}$$

Equation (6), given the reservation productivity ϵ_d, uniquely solves for θ. Appendix I reports the comparative static results. In particular, higher interest rates reduce market tightness. Higher interest rates reduce the present value of a new job and makes vacancy posting less attractive.

To close the model we need to introduce unemployment. In steady state job creation $(\theta q(\theta)u)$ is equal to job destruction ($\lambda F(\epsilon_d)(1-u)$) and equilibrium unemployment solves

$$u = \frac{\lambda F(\epsilon_d)}{\lambda F(\epsilon_d) + \theta q(\theta)}. \tag{7}$$

Equation (7) is the Beveridge curve. An increase in interest rate unambiguously increase unemployment. In steady state, changes in the interest rate reduce firm's job creation and rise firm's job destruction and permanently affect equilibrium unemployment. In the paper we are interested mainly with the asymmetric effect of interest rate changes. The next section extend the model and consider a situation in which policy can be tight or easy and, from the agents' view point, randomly fluctuates between the two.

V. THE MODEL WITH TIGHT AND EASY POLICY

This section extends the model of the previous section and considers a situation in which policy can be tight or easy and the system randomly switches between the two states. In what follows we assume that the interest rate can take a high value r^* and a low value r. We assume that in every instant there is an exogenous probability μ that the policy is reversed. From the model of the previous section it is clear that in each policy regime firms' behavior is characterized by a reservation productivity and, in what follows, we shall indicate with ϵ_d^* and ϵ_d the reservation productivity during tight and easy policy. Furthermore, the steady state analysis let us infer that, since $r^* > r$, $\epsilon_d^* > \epsilon_d$. To solve the model, however, we need to specify a policy state contingent value function. For $\epsilon > \epsilon_d^*$ the value of a job during a period of tight policy, $J^*(\epsilon)$, reads

$$r^* J^*(\epsilon) = \epsilon - b + \lambda \int_{\epsilon_d^*}^{\epsilon_u} \{max(J^*(y), 0) - J^*(\epsilon)\}\, dF(y) + \mu\,(J(\epsilon) - J^*(\epsilon)), \quad \epsilon \geq \epsilon_d^*, \tag{8}$$

where at rate λ an idiosyncratic shock arrives and at rate μ a policy switch takes place. Similarly, the value of a job during a period of easy policy, $J(\epsilon)$, reads

$$r J(\epsilon) = \epsilon - b + \lambda \int_{\epsilon_d}^{\epsilon_u} \{max(J(y), 0) - J(\epsilon)\}\, dF(y) + \mu\,(J^*(\epsilon) - J(\epsilon)), \quad \epsilon \geq \epsilon_d^*. \tag{9}$$

For idiosyncratic values below ϵ_d*, a job is operative only during periods of easy policy and $J(\epsilon)$ reads

$$r J(\epsilon) = \epsilon - b + \lambda \int_{\epsilon_d}^{\epsilon_u} \{max(J(y), 0) - J(\epsilon)\}\, dF(y) - \mu J(\epsilon), \quad \epsilon_d \leq \epsilon \leq \epsilon_d^*. \tag{10}$$

Differentiating (8) and (9) with respect to ϵ, yields

$$\frac{\partial J^*(\epsilon)}{\partial \epsilon} = \frac{1}{r^* + \lambda}\frac{r + \lambda + \mu}{r + \lambda} \quad \forall \epsilon \geq \epsilon_d^* \tag{11}$$

and

$$\frac{\partial J(\epsilon)}{\partial \epsilon} = \frac{1}{r + \lambda}\frac{r^* + \lambda + \mu}{r^* + \lambda}. \quad \forall \epsilon \geq \epsilon_d^* \tag{12}$$

Similarly, differentiating (10) with respect to ϵ yields

$$\frac{\partial J(\epsilon)}{\partial \epsilon} = \frac{1}{r + \lambda + \mu} \quad \forall \epsilon : \epsilon_d \geq \epsilon \geq \epsilon_d^* \tag{13}$$

Making use of (11), (12) and (13), after integrating by parts, the reservation productivity during tight policy, ϵ_d^*, solves

$$\epsilon_d^* = -b - \frac{\lambda}{r^* + \lambda}\frac{r + \lambda + \mu}{r + \lambda} \int_{\epsilon_d^*}^{\epsilon_u} (1 - F(y))dy - \frac{\mu}{r + \lambda + \mu}(\epsilon_d^* - \epsilon_d). \tag{14}$$

Similarly, the reservation productivity during easy policy solves

$$\epsilon_d = -b - \frac{\lambda}{r + \lambda + \mu} \int_{\epsilon_d}^{\epsilon_d^*} (1 - F(y))dy - \frac{\lambda}{r + \lambda}\frac{r^* + \lambda + \mu}{r^* + \lambda} \int_{\epsilon_d^*}^{\epsilon_u} (1 - F(y)dy. \tag{15}$$

To obtain market tightness during tight and easy policy it is first necessary to solve for the value of a job at the upper support of the distribution. From (8) and (9) it is possible to write

$$(r^* + \lambda + \mu)J^*(\epsilon_u) = \epsilon_u - \epsilon_d^* + \mu(J(\epsilon_u) - J(\epsilon_d^*)), \quad (16)$$

and

$$(r + \lambda + \mu)(J(\epsilon_u) - J(\epsilon_d^*)) = \epsilon_u - \epsilon_d^* + \mu J^*(\epsilon_u). \quad (17)$$

Equation (16) and (17) form a system of two equations that can be solved for $J^*(\epsilon_u)$ and $(J(\epsilon_u) - J(\epsilon_d^*))$. Similarly, from (10) it is possible to write

$$(r + \lambda + \mu)J^*(\epsilon_u) = \sigma(\epsilon_u - \epsilon_d^*) + \mu J(\epsilon_u). \quad (18)$$

Equation (18), given $J^*(\epsilon_u)$ from (16) and (17), uniquely solves for $J(\epsilon_u)$. Given $J^*(\epsilon_u)$ and $J(\epsilon_u)$ from (16), (17) and (18), an expression similar to (5) of Section IV yields θ and θ^*

To complete the model, we need a differential equation describing the dynamics of unemployment. During periods of tight policy unemployment dynamics is given by the difference between job creation and job destruction and reads

$$\dot{u} = \lambda F(\epsilon_d^*)(1 - u) - \theta^* q(\theta^*)u, \quad (19)$$

while during periods of easy policy the differential equation becomes

$$\dot{u} = \lambda F(\epsilon_d)(1 - u) - \theta q(\theta)u. \quad (20)$$

From (19) and (20) it is clear that since $\epsilon_d^* > \epsilon_d$ there is more job destruction during periods of tight policy than during periods of easy policy. Similarly, since $\theta^* < \theta$, there is more job creation during period of easy policy. Let us now consider what happens when there is a policy switch. Let us first consider a switch from tight to easy policy. On impact, θ jumps upward and ϵ jumps downward. Those jobs whose productivity level is now higher than ϵ_d and lower than ϵ_d^* will not be destroyed and job destruction will fall. The jump in θ causes a jump in the number of vacancies and an increase in job creation through the slow matching process described by $\theta q(\theta)$. This process will continue as long as job creation is equal to job destruction or there is another policy shock. Let us now consider what happens when the policy shifts from easy to tight. As $\theta^* < \theta$, job creation falls in a symmetric way to the increase in job creation during a shift from tight to easy policy. The asymmetric effect produced by policy switches is driven by the behavior of job destruction during a switch from tight to easy policy. First, since $\epsilon_d^* > \epsilon_d$ job destruction is higher. But on impact, as the reservation productivity jumps to ϵ_d^*, all *jobs whose idiosyncratic productivity lies between the two values are immediately destroyed.* This jumps in job destruction does not find a counterpart in the behavior of job destruction during a switch from a tight to an easy regime nor in the behavior of job creation during switches from tight to easy policy. In the model, there is obviously an asymmetric response of gross job flows to changes in interest rates.

To simulate the model's response to policy switches we need to characterize the distribution of employment at each reservation productivity ϵ. Appendix II shows how to obtain the distribution of employment and how to simulate the model when time is discrete and uncertainty is resolved at the beginning of each period. Table 1 gives the parameter values used for the simulations. The choice of the parameter is standard and is in line with the values used by Mortensen and Pissarides (1994) for simulating the U.S. job flows, but in this paper the simulations are meant to be suggestive rather than fully realistic.

Table 1: Baseline Parameter Values

Variables	Notation	Value
Matching Elasticity	α	0.500
friction parameter	k	1
reservation utility	b	0.000
tight interest rate	r^*	0.050
easy interest rate	r	0.020
idiosyncratic shock rate	λ	0.100
price distribution	$F(.)$	uniform
upper support	ϵ_u	1
lower support	ϵ_{lo}	-1
Switching probability	μ	0.100

Source: author calculations.

Figure 1 plots the time profile of net employment changes when the economy moves from easy to tight policy and later returns to easy policy. In correspondence of the switch to tight policy (in period 3 in Figure 1) there is a clear spike in net employment change that does not find counter-part in the behavior of net employment changes when the policy switches back to the easy regime (in period 13 in Figure 1). The model predicts obviously an asymmetric effect of monetary policy on the behavior of net employment changes. Figure 2 reports, for the same time profile of Figure 1, gross job creation and gross job destruction. From figure 2, it is clear that the asymmetric response of net employment changes in interest rates is driven by the jump in job destruction. Furthermore, not only the jump in job destruction does not find similarities in the behavior of job creation during switches to easy policy, but the response of job creation is much smoother, due to the existence of significant matching frictions. The other empirical implication of the model is thus that the effect of tight policy on job destruction should be stronger than the effect of easy policy on job creation. From the next section we turn to the empirical investigation and we test the implications of the model.

VI. EMPIRICAL EVIDENCE

A. The Data

We use two sets of data. Job flows data are the statistics compiled by Davies and Haltiwanger (1990, 1992) for the U.S. manufacturing service between 1972:2 and 1988:4. Gross job creation (destruction) is measured as the sum of all employment gains (losses) at the level of the establishment in a given period in the U.S. manufacturing industry. If we divide job creation (destruction) by the number of jobs in the sample we get the job creation (destruction) rate. The difference between job creation and destruction rate is the traditional measure of net employment changes.

Figure 3 is from Davies, Haltiwanger and Shuh (1996) and plots the quarterly time series of job creation, job destruction and net employment change. The fact that job destruction experiences wider fluctuations than job creation is evident and has stimulated much interest and research (Pissarides and Mortensen 1994, Caballero Hammour 1995, Garibaldi, 1997). Policy data are constructed using the federal fund rate for the United States between 1971:2 and 1988:4, as reported in the International Financial Statistics (line 60b). To carry out the empirical analysis, we need also the growth rate of GDP and the inflation rate, as measured by the Consumer Price Index. In section C, when we check the robustness of our findings, we also use the oil price in U.S. dollars, the growth rate of the money supply (line 34) and the government net borrowing (line 84).

The only problem with the comparability of the data concerns the different definition of quarter in the two data sets. In the flows data the first quarter is defined as the change in employment between end-November of the previous year and end-February. Conversely in International Financial Statistics the first quarter is defined as the traditional end-December end-March period. In what follows we do not adjust the series but we keep in mind that the contemporaneous value of the two time series has approximately one month lag.

B. Evidence of Asymmetry

We employ the econometric procedure developed in the empirical literature on the asymmetric effects of monetary policy (Morgan 1993 and Cover 1992) and briefly discussed in section II. First of all we need to specify the interest rate process. In what follows, we follow Morgan and we regress the level of the federal fund rate on its own lagged values, on current and lagged values of output growth and on current and lagged values of inflation. The federal fund process reads

$$F_t = a + \sum_{i=1}^{i=M} \alpha_i F_{t-i} + \sum_{i=0}^{i=N} \beta_i G_{t-i} + \sum_{i=0}^{i=P} \gamma_i \pi_{t-i} + e_t, \tag{21}$$

where F_t is the federal fund rate, G_t is the real growth of output, π_t is the inflation rate and e_t is a white noise. Following Cover (1992), we define a negative shock in monetary policy as

$$tight = max(e_t, 0), \tag{22}$$

and a positive shock as

$$easy = min(e_t, 0). \tag{23}$$

To analyze the effect of positive and negative policy shocks on job flows we specify the following process for job flows data. Net employment changes are regressed on a constant term, on their own lagged values and on lagged values of the series defined in equations (22) and (23). Formally, the job flow process reads

$$NET_t = \beta + \sum_{i=1}^{i=Q} \delta_i NET_{t-i} + \sum_{i=1}^{i=R} \rho_i tight_{t-i} + \sum_{i=1}^{i=S} \omega_i easy_{t-i} + z_t. \tag{24}$$

As the quarterly definition of NET_t is different than the quarterly definition in F_t, equation (24) does not include the contemporaneous value of shocks $tight_t$ and $easy_t$. A regression similar to (24) can be estimated for Job Creation (JC_t) and for Job Destruction (JD_t).

We estimate the system described by (21) and (24) using two different econometric methods. The first method is the two-step procedure used by Barro (1977,1978) in his study of the effects of unanticipated and anticipated money shocks. In the first step equation (21) is estimated with OLS, and the residuals are used as regressors in equation (24). Several authors, and Mishkin (1982) in particular, have pointed out the advantages of a simultaneous estimation of the system in (21) and (24). Thus, the second method requires the use of multivariate Maximum Likelihood for a simultaneous estimate of the system specified in equations (21) and (24). Nevertheless, from the empirical analysis that follows, it is obvious that the overall results do not depend on the particular method applied.

The first issue we address concerns the specification of the number of lags in equation (21). As a starting point, we used the Akaike information criterion and, from equation (21) we select $M = N = 1$ and $P = 2$. The results are reported in Table 2.

Table 3 reports the results of the second stage of the procedure, i.e. the regression specified in equation (24), using the residual obtained from the regression of Table 2. Table (3) uses job flows data that include employment changes originated in existing establishments as well as in newly created (destroyed) establishments. The second column of Table (3), labeled Net, reports the regression of net employment change (NET) on its own lag value, and on the policy shocks variables and their lags. As predicted, the coefficients on *tight* have a negative sign and the coefficients on *easy* have, overall, a positive sign. Both shocks have a significant effect on net employment changes but the *tight* shock has a bigger (negative) impact than the *easy*

Table 2: Federal Fund Rate Process. 1971:1 to 1988:4

F, Federal Fund Rate F, OLS, Optimal lag structure	
Variables	*Estimate*
Constant	-0.49 (0.54)
F_{t-1}	0.92 *** (0.05)
G_t^a	0.58*** (0.17)
π_t^b	0.49*** (0.17)
π_{t-1}	-0.37** (0.17)

Number of Observations: 71

F(4,66)=110.42

R^2 =0.87

Ar(1) coefficients of the residuals:-0.16 (0.12)

Akaike crituerium: 0.30

a: GDP growth rate

b: Inflation rate

Note. Standard errors are in parentheses.

*, **, and *** indicate

significance at 10, 5 and 1 percent respectively.

^{a} GDP growth rate

^{b} Inflation rate

Source: Author Calculation

shock. Quantitatively, the sum of the coefficients on *tight* are several times bigger than the sum of the coefficients on *easy* and the hypothesis that the sum of the two coefficients is equal is confidently rejected. In particular, the impact of tight policy on net employment changes takes place predominantly in the first lag, while the coefficients on easy policy are significant at both the first and the second lag.

Looking at the regression on job destruction, in the third column of Table 3, there is again some evidence of asymmetry, even though the magnitude of the effect is somewhat smaller. Tight policy increases job destruction more than easy policy reduces it, similarly to what the theory would predicted. Finally, looking at the effect of the *tight* and *easy* variables on job creation, Table 3 finds that easy monetary policy reduces job creation. This finding is certainly counterintuitive, but in Table 3 it is impossible to reject the hypothesis that the overall effects of tight policy and easy policy on job creation are different. Basically, from the last column of Table 3, it is impossible to conclude that there is clear evidence of the effect of monetary policy on on job creation. Table 4 reports results for the same regressions of Table 3, but uses job flows data that exclude the employment changes originated in newly created and destroyed establishments. Overall, the results in Table 4 confirm the results of Table 3, and finds clear evidence of asymmetry in the regressions that use net employment change and job destruction.

Table 5 reports simultaneous estimates of the system specified in (21) and (24) using a multivariate maximum likelihood. The overall evidence on asymmetry is still significant, even though the magnitude of the effect is smaller. The standard errors of the policy coefficients on net employment change are very similar to those of Table 3, but in Table 5 the effect of tight policy is only twice as big as the effect of easy policy. Similar considerations hold for the coefficients on job destruction. In the case of job creation, maximum likelihood estimates show that the negative effect of easy policy on job creation is not statistically significant. From the results of Table 5 it is clear that the evidence of asymmetry does not depend on the particular econometric method applied.

C. Robustness Checks

This section investigates the robustness of the evidence of asymmetry to a number of specifications and generalizations. First, we check whether the results of Section A depend on the particular number of lags of the policy shocks. Second, we change the specification of the federal fund process and we include a higher number of lags. Thirdly, we include in equations (21) and (24) the effect of other variables, such as the dollar price of oil, the government net borrowing and the growth of the money supply.

The model developed in first part of the paper suggests that the transmission of easy policy on job creation takes more time to produce its effect than the transmission of tight policy on job destruction. In this respect, it seems important to check whether the existence of asymmetry depends on the number of lags included in equation (24). Table 6 performs simultaneous maximum likelihood estimates of the system specified in equation (21) and (24), and it include three lags of the policy shocks. With respect to net employment changes, the coefficients on the third lags are not significant and a test on the absence of asymmetry is confidently rejected. In the estimates of job destruction, the overall negative effect of easy policy on job destruction is bigger than the positive effect of tight policy, but the coefficient on the third lag of the policy shock is not significant. In the case of job creation, the presence of further lags in equation (24) does not change the poor performance of the overall regression.

Table 7 estimates the system (21) and (24) using two lags of the federal fund rate, two lags of the gdp growth and two lags of the inflation rate. However, as the number of lags in equation (21) increases, the maximum likelihood estimator has problem of convergence. As an alternative, Table 7 employs OLS estimates. [2] Even though the F-statistics in Table 7 are somewhat smaller than the statistics in Table 3, the overall evidence on asymmetry is still remarkable..

Finally, we check whether the results depend on the particular variables used in the specification of the Federal Fund process. In what follows, to the variable already considered in equations (21) and (24), we add the dollar price of oil, a proxy for supply shocks, the growth of the money supply and the government borrowing requirement in percentage of GDP, aimed at capturing the stance of fiscal policy. Table 8 shows that the evidence of the asymmetric effect of monetary policy on job flows does not depend on the particular specification of the system in (21) and (24). [3] The important result in Table 8 is the fact that the significance of policy shocks on job creation disappears when we include the new regressors. Conversely, tight and easy policy have a significant and asymmetric effect on job destruction and on net employment changes.

VII. CONCLUSIONS

This papers has presented theory and evidence on the asymmetric effect of monetary policy on job creation and destruction. Using the most recent development of the matching theory, the paper has shown that the theory predicts a clear asymmetry between the effect of interest rate changes on job creation and job destruction. In a model in which existing firms face idiosyncratic uncertainty and endogenously select the separation rate, a tightening of monetary policy, as described by an exogenous increase in interest rates, is immediately transmitted into higher job destruction. Conversely, easing monetary policy produces a slow effect on job creation and, in particular, does not produce the one time jump in job creation that higher interest rates produce on job destruction. As a consequence, net employment change responds more to increases in interest rates than to reductions.

Empirically, the paper has implemented a standard econometric technique for identifying the stance of monetary policy and has shown that the empirical implications of the model are broadly supported in the data. Increases in interest rates significantly affect job destruction while reductions in interest rates fail to stimulate job creation. Using quarterly data for the U.S. manufacturing data, there appears to be a clear asymmetric effect of interest rate changes on the process of job creation and destruction.

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[2] The maximum likelihood estimates are very similar but the convergence takes place only with a 1 percent level of tolerance.

[3] Table 8 reports the results for all the variables together. but regressions with each variables were tried and the results did not change

Throughout the paper, the role of monetary policy has been collapsed to an exogenous change in interest rate and the paper was silent on the choice of monetary policy at various stage of the cycle. Caplin and Leahy (1996) propose a policy game between two investors and a policy maker uncertain about the state of the world and they show that gradual reductions in interest rates provide little stimulus to an economy in recession. Caplin and Leahy provide some insight for the apparent failure of monetary policy to end recessions, but their paper does not help explaining why tight policy produces significant reductions in economic activity. Future research should try to endogenize monetary policy in a theoretical framework that implies the asymmetric effect of monetary policy on job flows.

APPENDIX I: SOME COMPARATIVE STATIC RESULTS

In the steady state model, the reservation productivity reads

$$\epsilon_d = -b - \frac{\lambda}{\sigma + r} \int_{\epsilon_d}^{\epsilon_u} (1 - F(y))dy. \qquad \text{(I)}$$

The effect of the interest rate: $\frac{\partial \epsilon_d}{\partial r} > 0$
Differentiating (I) with respect to r, and rearranging yields

$$\frac{\partial \epsilon_d}{\partial r}(r + \lambda F(\epsilon_d)) = \frac{\lambda \int_{\epsilon_d}^{\epsilon_u}(1 - F(y))dy}{r + \lambda}. \qquad \text{(II)}$$

Since the integral in the r.h.s of equation (II) is positive, it follows that $\frac{\partial \epsilon_d}{\partial r} > 0$.

The effect of λ*:* $\frac{\partial \epsilon_d}{\partial \lambda} < 0$.
Differentiating (I) with respect to λ, and rearranging yields

$$\frac{\partial \epsilon_d}{\partial \lambda}(r + \lambda F(\epsilon_d)) = \frac{-(r + \lambda \int_{\epsilon_d}^{\epsilon_u}(1 - F(y))dy - \int_{\epsilon_d}^{\epsilon_u}(1 - F(y))dy}{(r + \lambda)^2}. \qquad \text{(III)}$$

Since the expression in the r.h.s of equation (III) is negative, it follows that $\frac{\partial \epsilon_d}{\partial \lambda} < 0$.

The job creation condition is

$$\frac{\epsilon_u - \epsilon_d}{r + \lambda} = \frac{\gamma}{q(\theta)} \qquad \text{(IV)}$$

The effect of θ*:* $\frac{\partial \theta}{\partial r} < 0$.
Differentiating equation (IV) with respect to θ yields

$$\frac{\frac{\partial \epsilon_d}{\partial r}(r + \lambda) - (\epsilon_u - \epsilon_d)}{(r + \lambda)^2} = \frac{q\prime(\theta)\frac{\partial \theta}{\partial r}}{q(\theta)^2}. \qquad \text{(V)}$$

Since $q\prime(\theta) < 0$, from equation (V), making use of the result in (II), it follows that $\frac{\partial \theta}{\partial r} < 0$.

Equilibrium unemployment reads

$$u = \frac{\lambda F(\epsilon_d)}{\lambda F(\epsilon_d) + \theta q(\theta)}. \qquad \text{(VI)}$$

The effect of the interest rate: $\frac{\partial u}{\partial r} > 0$.
Differentiating equation (VI) with respect to r and rearranging yields

$$\frac{\partial u}{\partial r} = \frac{\lambda f(\epsilon_d)\frac{\partial \epsilon_d}{\partial r}(\theta q(\theta)) - q(\theta)(1 - \eta(\theta))\lambda F(\epsilon_d)\frac{\partial \theta}{\partial r}}{(\theta q(\theta) + \lambda F(\epsilon_d))^2}, \qquad \text{(VII)}$$

where $\eta(\theta)$ is the elasticity of the matching function with respect to θ. With a constant return technology $\eta(\theta) < 1$ and, since $\frac{\partial \theta}{\partial r} < 0$ the second term in the numerator is overall positive. Furthermore, making use of the fact that $\frac{\partial \epsilon_d}{\partial r} < 0$, the overall expression is unambiguously positive.

APPENDIX II: THE DISTRIBUTION OF EMPLOYMENT

To actually simulate the model's dynamics it is first necessary to discretize time and make some assumptions on the behavior of ϵ_d and θ. Firms' behavior is fully characterized by the reservation productivity ϵ_d and the market tightness θ. When there is a change in policy the variables will immediately jump to the new value. Thus in what follow we discretize time and we assume that uncertainty is completely resolved at the beginning of the period and constant throughout. Furthermore, we have to keep track of the distribution of employment over the job-specific productivity. Let us discretize the support of the distribution F over K distinct points $a_1 ..... a_K$ with $a_1 < a_K$ and let $n_t(a_k - a_{k+1})$ represent the measure of workers at jobs with productivity within the interval $a_k - a_{k+1}$. As all existing jobs flow into this set at rate $\lambda(F(a_{k+1}) - F(a_k))$ and flow out at a rate equal to the arrival rate of the productivity shock λ, if $a_k > \epsilon_d$, and $a_k - a_{k+1}$ is sufficiently small, the law of motion of the distribution of employment can be written as

$$n_{t+1}(a_k - a_{k+1}) = (1-\lambda)n_t + \lambda(F(a_{k+1} - F(a_k))(N_t - \int_{\epsilon_l}^{\epsilon_d^i} n_t(x)dx \quad if \quad \epsilon_u > a_{k+1} \quad and \quad a_k > \epsilon_d \tag{VIII}$$

or

$$n_{t+1} = 0 \quad if \quad a_k < \epsilon_d. \tag{IX}$$

In equation (VIII) and (IX), N_t represents total employment at the beginning of period t and ϵ_d^i is the reservation productivity at time t. Note that the most productive jobs, those for which $\epsilon = \epsilon_u$, are excluded. The latter jobs are obtained as the difference between N_t and the integral $\int_{\epsilon_l}^{\epsilon_d^i} n_t(x)dx)$.

Job creation is identical to the rate at which vacant jobs are matched with unemployed workers in the model. Given that every unemployed finds a vacancy with probability $\theta_t^i q(\theta_t^i)$, where θ^i is the market tightness at time t, total job creation at time t is

$$C_t = \theta_t^i q(\theta_t^i)(1 - N_t). \tag{X}$$

If the matching function assumed is log-linear with search input elasticity α, making use of equation (5) in Section III the matching rate reads

$$\theta^i q(\theta^i) = kJ^i(\epsilon_u)^{\frac{\alpha}{1-\alpha}}. \tag{XI}$$

A job is destroyed for one of two reasons. Either the aggregate state worsens and the previous job-specific component ϵ is now below the new cut off value or a new job-specific component falls below the existing component. It follows that

$$D_t = \int_{\epsilon_l}^{\epsilon_d^i} n_t(y)dy + \lambda F(\epsilon_d^i)\left(N_t - \int_{\epsilon_l}^{\epsilon_d^i} n_t(y)dy\right). \tag{XII}$$

Finally, to close the model and obtaining N_{t+1}, we make use of the identity

$$N_{t+1} = N_t + C_t - D_t. \tag{XIII}$$

Figure 1: Net Employment Change in Response to Changes in Policy

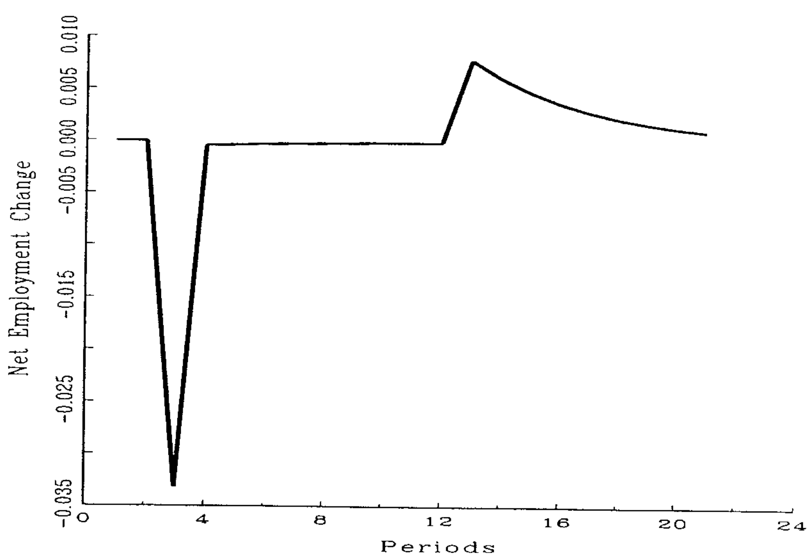


Table 3: Job Flows Estimate 1972:2 1988:4. All firms

	All Firms; OLS		
	NET	JD	JC
Constant	0.37 (0.32)	2.06*** (0.77)	1.66*** (0.67)
$tight_{t-1}$	-1.01*** (0.25)	0.73 *** (0.21)	-0.20** (0.11)
$tight_{t-2}$	-0.12 (0.27)	0.17 (0.21)	-0.06 (0.11)
$easy_{t-1}$	0.99 *** (0.32)	-1.03 *** (0.32)	0.08 (0.14)
$easy_{t-2}$	-0.84*** (0.35)	0.39* (0.34)	-0.38*** (0.14)
net_{t-1}	0.72*** (0.12)	-	-
net_{t-2}	-0.46*** (0.13)	-	
net_{t-3}	0.34*** (0.11)	-	
JD_{t-1}	-	0.64*** (0.12)	-
JD_{t-2}	-	-0.42*** (0.13)	-
JD_{t-3}	-	0.29*** (0.11)	-
JC_{t-1}	-	-	0.55*** (0.12)
JC_{t-2}	-	-	-0.08 (0.13)
JC_{t-3}	-	-	0.18* (0.11)
$SUM(tight)^1$	-1.13	0.91	-0.27
$SUM(easy)^2$	0.15	-0.63	-0.37
$tight = 0^3$	8.48***	9.14***	1.96
$easy = 0^4$	6.96***	8.21***	3.62*
$easy = tight^5$	4.06**	8.40***	0.15

Note. Standard errors are in parentheses

*, **, and *** indicate significance at 10, 5 and 1 percent respectively.

[1] Sum of the $tight$ coefficients

[2] Sum of the $easy$ coefficients

[3] F-statatistic of the hypothesis that the coefficients on $tight$ are jointly zero

[4]3 F-statatistic of the hypothesis that the coefficients on $easy$ are jointly zero

[5] F-statatistic of the hypothesis that the sum of the coefficients on $tight$ equal the the sum of the coefficients on $easy$

Source: Author Calculation

Table 4: Job Flows Estimate 1972:2 1988:4. Continuing Firms

	Continuing Firms; OLS. Second Stage Regression		
	NET	JD	JC
Constant	0.42* (0.30)	2.27*** (0.78)	2.12*** (0.67)
$tight_{t-1}$	-0.99*** (0.22)	0.73 *** (0.20)	-0.16 (0.18)
$tight_{t-2}$	0.02 (0.23)	0.08 (0.20)	-0.09 (0.10)
$easy_{t-1}$	0.92 *** (0.28)	-1.07 *** (0.23)	-0.04 (0.13)
$easy_{t-2}$	-0.91** (0.31)	0.41 (0.29)	-0.37** (0.13)
net_{t-1}	0.72*** (0.12)	-	-
net_{t-2}	-0.51*** (0.12)	-	
net_{t-3}	0.39*** (0.10)	-	
JD_{t-1}	-	0.54*** (0.13)	-
JD_{t-2}	-	-0.40*** (0.12)	-
JD_{t-3}	-	0.26** (0.11)	-
JC_{t-1}	-	-	0.45*** (0.12)
JC_{t-2}	-	-	0.10 (0.11)
JC_{t-3}	-	-	0.1 (0.11)
$SUM(tight)^1$	-0.96	0.82	-0.25
$SUM(easy)^2$	0.01	-0.65	-0.41
$tight = 0^3$	9.06***	11.37***	1.82
$easy = 0^4$	10.15***	8.54***	4.2***
$easy = tight^5$	8.23***	7.74***	0.44

Note. Standard errors are in parentheses

*, **, and *** indicate significance at 10, 5 and 1 percent respectively.

[1] Sum of the $tight$ coefficients

[2] Sum of the $easy$ coefficients

[3] F-statatistic of the hypothesis that the coefficients on $tight$ are jointly zero

[4] 3 F-statatistic of the hypothesis that the coefficients on $easy$ are jointly zero

[5] F-statatistic of the hypothesis that the sum of the coefficients on $tight$ equal the the sum of the coefficients on $easy$

Source: Author Calculation

Table 5: Job Flows Estimate 1972:2 1988:4. Joint Estimates

	All Firms; Maximum Likelihood[a]		
	NET	JD	JC
$tight_{t-1}$	-1.02***	0.75 ***	-0.20
	(0.22)	(0.21)	(0.16)
$tight_{t-2}$	0.04	0.10	-0.06
	(0.23)	(0.21)	(0.17)
$easy_{t-1}$	1.48 ***	-1.21 ***	0.08
	(0.36)	(0.32)	(0.2)
$easy_{t-2}$	-0.97***	0.41*	-0.39**
	(0.38)	(0.34)	(0.42)
F_{t-1}	0.99***	0.98***	0.91***
	(0.04)	(0.04)	(0.04)
G_t	0.49***	0.55 ***	0.56***
	(0.11)	(0.12)	(0.15)
π_t	0.61 ***	0.52 ***	0.47***
	(0.11)	(0.11)	(0.13)
π_{t-1}	-0.55***	-0.43***	-0.34***
	(0.11)	(0.11)	(0.13)
$SUM(tight)^1$	-0.98	0.85	-0.27
$SUM(easy)^2$	0.50	-0.79	-0.38
$tight = 0^3$	22.5***	15.47***	1.89
$easy = 0^4$	21.38***	21.54***	3.80
$easy = tight^5$	5.51*	8.65**	0.09

Note. Standard errors are in parentheses

a Regressions include a constant and three lags of the dependent variable

*, **, and *** indicate significance at 10, 5 and 1 percent respectively.

[1] Sum of the *tight* coefficients

[2] Sum of the *easy* coefficients

[3] Likelihood Ratio of the hypothesis that the coefficients on *tight* are jointly zero

[4] 3 Likelihood Ratio of the hypothesis that the coefficients on *easy* are jointly zero

[5] Likelihood Ratio of the hypothesis that the sum of the coefficients on *tight* equal the the sum of the coefficients on *easy*

Source: Author Calculation

Table 6: Job Flows Estimate 1972:2 1988:4. Estimates with three lags

	All Firms; Maximum Likelihood[a]: 3 lags in *tight* and *easy*		
	NET	JD	JC
$tight_{t-1}$	-1.03***	0.73 ***	-0.17
	(0.04)	(0.19)	(-1.04)
$tight_{t-2}$	-0.23	0.06	-0.16
	(0.27)	(0.29)	(0.17)
$tight_{t-3}$	0.02	-0.07	-0.03
	(0.07)	(0.22)	(0.14)
$easy_{t-1}$	1.12 ***	-1.34 ***	-0.07
	(0.36)	(0.22)	(0.32)
$easy_{t-2}$	-0.83**	0.45*	-0.31
	(0.34)	(0.31)	(0.23)
$easy_{t-3}$	-0.16	-0.26*	-0.31
	(0.4)	(0.35)	(0.23)
F_{t-1}	0.96***	0.99***	0.93***
	(0.04)	(0.04)	(0.04)
G_t	0.57***	0.50 ***	0.57***
	(0.13)	(0.11)	(0.13)
π_t	0.43 ***	0.53 ***	0.47***
	(0.09)	(0.11)	(0.13)
π_{t-1}	-0.30**	-0.43***	-0.27**
	(0.15)	(0.12)	(0.13)
$SUM(tight)$[1]	-1.25	0.72	-0.38
$SUM(easy)$[2]	0.12	-0.15	-0.70
$tight = 0$[3]	17.5***	13.53***	2.51
$easy = 0$[4]	24.38***	18.32***	2.86
$easy = tight$[5]	2.76	7.67**	0.11

Note. Standard errors are in parentheses

a Regressions include a constant and three lags of the dependent variable

*, **, and *** indicate significance at 10, 5 and 1 percent respectively.

[1] Sum of the *tight* coefficients

[2] Sum of the *easy* coefficients

[3] Likelihood Ratio of the hypothesis that the coefficients on *tight* are jointly zero

[4]3 Likelihood Ratio of the hypothesis that the coefficients on *easy* are jointly zero

[5] Likelihood Ratio of the hypothesis that the sum of the coefficients on *tight* equal the the sum of the coefficients on *easy*

Source: Author Calculation

Table 7: Job Flows Estimate 1972:2 1988:4. Two lags of Federal Rate

	All Firms; Two Stages OLS [a]: 2 lags in F,G and P		
First Stage Regression:			
F_{t-1}	0.85***		
	0.12		
F_{t-2}	0.08		
	0.13		
G_t	0.45**		
	0.19		
G_{t-1}	0.34*		
	0.18		
G_{t-2}	0.07		
	0.16		
π_t	0.75***		
	0.23		
π_{t-1}	-0.98***		
	0.40		
π_{t-2}	0.41*		
	0.23		
Second Stage Regression:			
	NET	JD	JC
$tight_{t-1}$	-0.88***	0.70 ***	-0.13
	(0.27)	(0.21)	(-0.12)
$tight_{t-2}$	-0.45	0.38	-0.14*
	(0.29)	(0.22)	(0.12)
$easy_{t-1}$	0.49 ***	-1.05 ***	-0.02
	(0.36)	(0.28)	(0.16)
$easy_{t-2}$	-0.56**	0.21	-0.34
	(0.38)	(0.31)	(0.16)
$SUM(tight)^1$	-1.33	1.08	-0.38
$SUM(easy)^2$	0.37	-0.83	-0.70
$tight = 0^3$	6.99**	6.92**	2.54
$easy = 0^4$	3.71**	7.94***	1.47
$easy = tight^5$	5.95**	11.35***	0.09

Note. Standard errors are in parentheses

a Regressions include a constant and three lags of the dependent variable

*, **, and *** indicate significance at 10, 5 and 1 percent respectively.

[1] Sum of the $tight$ coefficients

[2] Sum of the $easy$ coefficients

[3] F-Statistics for the hypothesis that the coefficients on $tight$ are jointly zero

[4] F-Statistics for the hypothesis that the coefficients on $easy$ are jointly zero

[5] F-statistics for the hypothesis that the sum of the coefficients on $tight$ equal the the sum of the coefficients on $easy$

Source: Author Calculation

Table 8: Job Flows Estimate 1972:2 1988:4. Oil Price Included

	All Firms; Two Stages OLS ^{a}: Include controls for oil prices,money growth and government borrowing; OLS		
	First Stage Regression:		
variable	estimate	variable	estimate
F_{t-1}	0.83*** (0.12)	F_{t_2}	-0.08 (0.14)
G_t	0.31* 0.19	G_{t-1}	0.21 (0.18)
G_{t-2}	0.03 (0.15)	π_t	0.47** (0.24)
π_{t-1}	-0.81 ** (0.39)	π_{t-2}	0.45*** (0.22)
π_{t-2}	0.45*** (0.22)	bg_t	-0.95*** 0.39
oil_t	0.05*** (0.02)	m_t	0.007 (0.04)
m_{t-1}	0.02 (0.04)		
	Second Stage Regression:		
	NET	JD	JC
$tight_{t-1}$	-0.92** (0.31)	0.72 ** (0.24)	-0.17 (0.21)
$tight_{t-2}$	-0.43 (0.31)	0.33 (0.25)	-0.16* (0.13)
$easy_{t-1}$	0.73 ** (0.44)	-0.78 ** (0.35)	-0.07 (0.19)
$easy_{t-2}$	-0.46 (0.44)	0.22 (0.35)	-0.30 (0.19)
oil_{t-1}	0.015 (0.07)	-0.08 (0.05)	-0.01 (0.03)
oil_{t-2}	-0.03 (0.07)	0.01 (0.05)	0.01 (0.03)
$SUM(tight)^1$	-1.35	1.06	-0.33
$SUM(easy)^2$	0.27	-0.56	-0.38
$tight = 0^3$	5.44***	5.38***	1.47
$easy = 0^4$	1.72	2.54	1.50
$easy = tight^5$	3.68*	5.59**	0.019

Note. Standard errors are in parentheses

a Regressions include a constant and three lags of the dependent variable

*, **, and *** indicate significance at 10, 5 and 1 percent respectively.

[1] Sum of the $tight$ coefficients

[2] Sum of the $easy$ coefficients

[3] F-statistics of the hypothesis that the coefficients on $tight$ are jointly zero

[4] 3 F-statistics of the hypothesis that the coefficients on $easy$ are jointly zero

[5] F-statistics of the hypothesis that the sum of the coefficients on $tight$ equal the the sum of the coefficients on $easy$

Source: Author Calculation

Figure 2: Gross Job Flows in Response to Changes in Policy

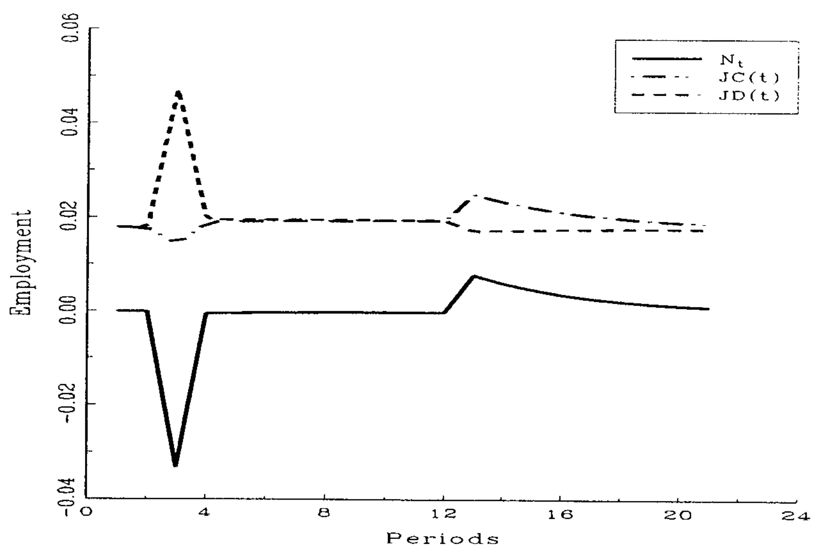
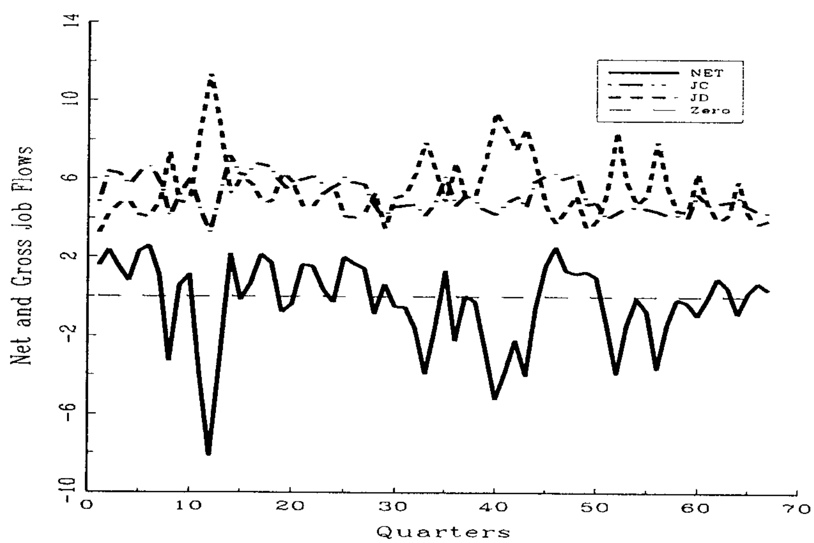


Figure 3: Net and Gross Job Flows in Manufacturing. 1972:2 to 1988:3



REFERENCES

Ball, Laurence and N. Gregory Mankiew, (1994), "Asymmetric Price Adjustment and Economic Fluctuations", *Economic Journal* Vol. 104

Barro, Robert J (1977), "Unanticipated Money Growth and Unemployment in the UNited States," *American Economic Review*, Vol. 67, pp. 101-15

Barro, Robert J, (1978), "Unanticipated Money, Output, and the Price Level in the United States," *Journal of Political Economy*, Vol 86, 549-80

Caballero, R.J. and E. Engel (1992), "Price Rigidities, Asymmetries, and Output Fluctuations." *NBER* Working Paper no. 4091.

Caballero, R.J., and Hammour, M.L., (1995), "The Cleansing Effect of Recessions", *American Economic Review*, Vol.85, No.1.

Caplin, A. and J Leahy (1996) "Monetary Policy as a Process of Search", *American Economic Review*, September, pp. 689-702.

Cover, J.P. (1992), "Asymmetric Effects of Positive ad Negative Money-Supply Shocks", *Quarterly Journal of Economics*, Vol. CVII, pp. 1261-82

Davis, Steven J., and John Haltiwanger (1990). "Gross Job Creation and Destruction: Microeconomic Evidence and Macroeconomic Implications". *NBER Macro Economic Annual.* Vol 5: 123- 168.

---- (1992). "Gross Job Creation, Gross Job Destruction and Employment Reallocation." *Quarterly Journal of Economics.* Vol. 107: 819-863.

Davis, Steven J., John Haltiwanger, and Scott Shuh (1996) *Job Creation and Destruction*, MIT Press: Cambridge.

De Long, B. J. and Summers, L. (1988), "How Does Macroeconomic Policy Affect Output?", *Brookings Papers on Economic Activity*, Vol. 2 pp 433-80.

Diamond, Peter A. (1971). "A Model of Price Adjustment". *Journal of Economic Theory.* Vol.3: pp.156-168.

---- (1982). "Wage Determination and Efficiency in Search Equilibrium." *Review of Economic Studies.* Vol. 49: 217-227.

Garibaldi, Pietro (1997). "Job Flow Dynamics and Firing Restrictions", *European Economic Review*, forthcoming.

Karras, G. (1996) "Are the Output Effect of Monetary Policy Asymmetric? Evidence from a Sample of European Countries", *Oxford Bulletin of Economics and Statistics*, Vol. 58, 267-68.

Jackman, R. and J, Sutton, (1982), "Imperfect Capital Markets and the Monetarist Black Box: Liquidity Constraints, Inflation and the Asymmetric Effects of Interest Rate Policy," *The Economic Journal,* Vol. 92, pp. 108-28.

Johnson, Harry G. (1962) "Monetary Theory and Policy" *The American Economic Review*, Vol 53, pp. 335-84.

Millard, Stephen P., and Dale T. Mortensen (1994). "The Unemployment and Welfare Effects of Labour Market Policy: A Comparison of the U.S. and the UK." Bank of England. Unpublished.

Mishkin, F.S. (1982) "Does Anticipated Policy Matter? An Econometric Investigation," *Journal of Political Economy*, Vol 90, pp 22-51.

Morgan, D.P. (1993), "Asymmetric Effect of Monetary Policy", *Federal Reserve Bank of Kansas City Economic Review,* Vol. 78, 21-33.

Mortensen, Dale T. (1970). "A Theory of Employment and Wage Dynamics." In Phelps et al. *Microeconomic Foundations of Employment and Inflation Theory.* New York: Norton.

____ (1994). "The Cyclical Behaviour of Job and Worker Flows." *Journal of Economic Dynamics and Control.* Vol.18: 1121-1142.

____ (1994). "Job Creation and Job Destruction in the Theory of Unemployment." *Review of Economic Studies.* Vol. 61: 397-415.

Pissarides, C. A. (1990). *Equilibrium Unemployment Theory.* Oxford: Basil Blackwell.