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Inflation and Establishment Turnover

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Inflation and Establishment Turnover*

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Abstract

We study a channel through which inflation can have effects on the real economy. Using job creation and destruction data from U.S. manufacturing establishments from 1973-1988, we show that both jobs created by new establishments and jobs destroyed by dying establishments are negatively correlated with inflation. These results are robust to controls for the real-business cycle and monetary policy. Over a longer time frame, data on business failures confirm our results obtained from job creation and destruction data. We show that a financial-markets explanation and a nominal-wage rigidities explanation are both consistent with our empirical evidence.

Keywords: Inflation, Job Creation and Destruction, Turnover.

JEL-codes: E31, J63, E32, E24

1. Introduction

It is generally believed that inflation has real effects on the macroeconomy. We complement existing studies by offering evidence on the real effects of inflation using micro-level data on establishment births, deaths, employment expansions, and employment contractions. Specifically, we provide evidence that both jobs created by new establishments and jobs destroyed by dying establishments are negatively correlated with inflation. We also show, over a longer time frame, that business failures are negatively correlated with inflation. These relationships do not appear to be driven by the real-business cycle, oil-price shocks, or monetary shocks.

We consider two possible mechanisms through which inflation may affect establishment turnover, although others could be taken into account. We consider a financial-markets explanation in which inflation affects establishment turnover by affecting real interest rates. We then consider a nominal-wage rigidities explanation in which inflation affects establishment turnover through the labor market. Both of these mechanisms have important testable implications for establishment-level job creation and destruction data, although distinguishing between the two with our data is difficult.

The idea that inflation can have real effects by affecting financial markets is not new. Mundell (1965) and Tobin (1965) note that inflation may lower the real interest rate by lowering the real return to holding money. This hypothesis is supported by a wealth of evidence that inflation and the real ex-ante return to saving are negatively related. Examples include Boudoukh and Richardson (1993) and Fama and Schwert (1977) for stock-market effects and Kandel, Ofer, and Sarig (1996) and Fama (1990) for bond-market effects.

Several authors have considered the macroeconomic implications of the interaction between inflation and financial markets. Azariadis and Smith (1996) and Choi, Smith, and Boyd (1996) model the channels through which inflation may exacerbate financial-market frictions when inflation is above a certain threshold. The predictions of these models are consistent with the empirical results of Bullard and Keating (1995) and Bruno and Easterly (1998)—starting from zero inflation, small policy-induced increases in inflation increase long-run real output, but further increases in inflation reduce real output.

We also consider nominal-wage rigidities as a potential explanation of our empirical findings. There is considerable evidence that nominal-wage rigidities may affect the wage-setting process. Survey results from Campbell and Kamlani (1997) indicate that firms are reluctant to make nominal-wage cuts, which accords well with econometric evidence from Altonji and Devereaux (1999); Lebow, Saks, and Wilson (1999); Card and Hyslop (1997); and others who find that nominal-wage rigidities have important effects on wages.

Akerlof, Dickens, and Perry (1996) consider the macroeconomic effects of nominal-wage rigidities. They calibrate a model in which firm-specific productivity shocks affect the wages firms offer their employees, subject to constraints imposed by nominal-wage rigidities. Their results suggest that reducing inflation to zero would significantly increase the steady-state unemployment rate since binding nominal-wage constraints would be pervasive.

The model used in Akerlof, Dickens, and Perry (1996) relies on an important lesson from the microeconomic literature of job creation and destruction. Evidence from Davis, Haltiwanger, and Schuh (1996) and others shows that aggregate statistics for the U.S. mask important churning at the microeconomic level. They show, for instance, that large employment expansions and contractions occur at establishments in both strong and weak economies. Foster, Haltiwanger, and Krizan (1998) show that these job reallocations explain a significant share of aggregate productivity growth.

Recent work suggests important roles for establishment births and deaths in particular. Spletzer (2000) shows that births and deaths account for roughly half of job creation and destruction over a triennial time frame. Foster, Haltiwanger, and Krizan (1998) show that establishment births and deaths account for a significant share of aggregate productivity growth in certain service industries. Taking a different approach, Greenwood and Jovanovic (1999) show that new entrants account for a disproportionate share of the positive stock-market returns observed in the 1980s and 1990s.

There is also evidence of significant labor reallocations following inflation-stabilization programs. Bruno and Meridor (1991), for instance, find that the successful 1985 Israeli inflation-stabilization program led to an increase in firm bankruptcies and liquidations. Based on aggregate employment and output statistics, they conclude that labor must have been reallocated to other firms. Tommasi (1999) addresses the issue of hyperinflation with a theoretical model in which inflation reduces the incentives of consumers to search, which lowers the incentives of firms to increase productivity. An implication of Tommasi's model is that establishment turnover should be high following a successful inflation-stabilization program.

In this paper, we provide evidence on a mechanism through which inflation may have real effects. In particular, we provide evidence that both jobs created by establishment births and jobs destroyed by establishment deaths are negatively related to inflation, even after controlling for the effects of the real-business cycle. Using a different data source, we show this relationship also holds for the percent of businesses that fail. We also conclude that both monetary policy and oil-price shocks are unlikely candidates to explain our results. We show that both a financial-markets model and a nominal-wage rigidities model can explain these results.

The organization of the rest of the paper is as follows. In section 2, we present a financial-markets model that might explain our empirical results. In section 3, we review the model contained in Akerlof, Dickens, and Perry (1996) and discuss how their model could also explain our empirical results. In section 4, we describe our job creation and destruction data and present simple figures that are suggestive of our empirical results. In section 5, we describe our empirical methodology and present our main empirical results. In section 6, we present additional results intended as specification checks. In section 7, we offer our conclusions and note some of the important questions that we cannot address with our data.

2. A Financial Markets Model

In this section, we present a simple model in which inflation affects the birth and death rates of firms by affecting real rates of return. Although the model is quite simple, it highlights the intuition behind a potential relationship between inflation and establishment turnover.

We consider an overlapping-generations model in which each generation is populated by a continuum of agents of unit mass. Each generation lives for three periods and consumes only when old. There is one consumption good in the economy, which cannot be stored from one period to the next. In addition, each agent has a young-period endowment of ω and no endowment in other periods.

In order to carry their endowments from youth to old age, agents can hold fiat money; lend to other agents; or use an investment technology that transforms time t consumption into time $t+1$ consumption.[1] We assume that money is introduced in the economy by a government

[1] We assume agents have standard preferences over the consumption good.

that utilizes seignorage to finance consumption. Specifically, the government follows a money supply rule of the type

$$M_{t+1} = \sigma M_t,$$

where M_t is the money supply in time t and $\sigma > 1$. This rule implies a government budget constraint of the form

$$g_t = \frac{M_t - M_{t-1}}{p_t} = \frac{M_t}{p_t}\left(\frac{\sigma - 1}{\sigma}\right),$$

where g_t is government consumption in time t.

We model investment technologies as follows. Agent $i \in [0,1]$ can invest x units of the consumption good at t (when young) and obtain iq_1 units at time $t+1$. When in middle age, agent i can invest x to have a return of iq_2 when old. We assume that $x < q_2 < q_1$. This assumes that middle-aged agents are, on average, less-efficient producers than are young agents. In addition, we assume that the scale of investment is fixed at a level such that internal finance is never sufficient to cover the expense of the whole investment. Each agent must therefore borrow to become an investor. We assume that the credit market is perfectly competitive. The interaction between inflation and the credit market allows us to study the relationship between inflation and firm turnover.

The agent's decision problem

Credit markets allow the economy to reach an equilibrium in which the more-productive agents become investors, while the less-productive agents become lenders. In the first and second period of her life, an agent has to decide how she will allocate her savings. The arbitrage condition that has to hold in credit markets simply states that the marginal agent will be indifferent between being a borrower or a lender. For a young agent this implies

$$i_t^y q_1 - R_t(x-\omega) = r_t \omega, \tag{1}$$

where R_t and r_t are the gross borrowing and gross lending interest rates and i_t^y indicates the young agent whose productivity makes her indifferent between being a borrower or a lender.

The same marginal condition for a middle-aged agent is[2]

$$i_t^m q_2 - R_t\left[x - \left(i_t^m q_1 - R_{t-1}(x-\omega)\right)\right] = r_t\left(i_t^m q_1 - R_{t-1}(x-\omega)\right). \tag{2}$$

Equilibrium

In equilibrium, competition will force lending and borrowing rates to be equal. Hence, for every t

$$R_t = r_t. \tag{3}$$

Moreover, in order for money to be held in equilibrium, money must yield the same return as loans. Therefore

$$R_t = \frac{p_t}{p_{t+1}}. \tag{4}$$

A monetary equilibrium in this economy is given by sequences

$$\left\{ i_t^y, i_t^m, g_t, R_t, r_t, \frac{p_t}{p_{t+1}} \right\}_{t=0}^{\infty}$$

such that arbitrage conditions given in equations 1-4 hold, and money and credit markets clear. Market clearing requires that the supply of savings equal the demand for credit plus the real money supply. That is,

[2] This condition holds when all young lenders become middle-aged lenders, which holds in any steady-state equilibrium since $q_2 < q_1$.

$$
\begin{aligned}
&i_t^y\omega + i_{t-1}^y R_{t-1}\omega + \int_{i_{t-1}^y}^{i_t^m} \left(i_t q_1 - R_{t-1}(x-\omega)\right) di_t - \frac{M_t}{P_t} = \\
&\left(1-i_t^y\right)(x-\omega) + \int_{i_t^m}^{1} \left[x - \left(i_t q_1 - R_{t-1}(x-\omega)\right)\right] di_t .
\end{aligned}
\tag{5}
$$

Steady-state equilibrium

In this paper, we only analyze the steady-state equilibrium of the model. In steady state, i_t^y, i_t^m, R_r, and r_t are constant over time. Moreover, $\frac{p_t}{p_{t+1}} = \frac{1}{\sigma}$. Using equations 1 and 2, we obtain

$$
i^y = \frac{Rx}{q_1} \text{ and } i^m = \frac{Rx}{q_2}.
$$

Finally, equation 5 determines the steady state value of the money stock, and therefore the steady state level of government consumption.[3]

Firm turnover in steady state

In each period there are $1-i^y$ young agents in the economy who invest. We refer to these projects as young firms. Moreover there are $1-i^m$ middle-aged agents who invest, that is, there are $1-i^m$ continuing firms.[4] The fraction of new firms over the total (the birth rate) is given by

$$
B = \frac{1-i^y}{2-i^y-i^m}.
$$

All $1-i^m$ continuing firms exit at the end of every period. In addition, some continuing firms decide to exit at the beginning of every period. These voluntary exits are due to the loss of

[3] It is easy to show that with an example that a steady-state equilibrium can exist. In particular, choose $\sigma = 1.1, x = 1, \omega = 0.75,\ q_1 = 1.2,$ and $q_2 = 1.1.$ These parameters result in a steady state in which $R = 0.91, i^y = 0.76, i^m = 0.83, B = 0.58,$ and $\frac{M}{p} = 1.05.$

[4] In steady state, no middle-aged agents will start a new firm since $q_1 > q_2$.

productivity that all firms experience over time ($q_1 > q_2$). The sum of all firms exiting in every period must be equal to i^y *in steady state*. Hence, the steady state death rate of firms is also given by B.

We are interested in evaluating how the birth rate and death rate of firms in this economy are affected by the rate of inflation. Using the equilibrium levels of i^y and i^m, and $R = \frac{1}{\sigma}$, we obtain

$$B = \frac{1 - \frac{1}{\sigma}\frac{x}{q_1}}{2 - \frac{1}{\sigma}\frac{x}{q_1} - \frac{1}{\sigma}\frac{x}{q_2}},$$

which implies that

$$\frac{\partial B}{\partial \sigma} = q_1 q_2 x \frac{q_2 - q_1}{\left(2\sigma q_1 q_2 - q_1 x - q_2 x\right)^2} < 0.$$

It is worth stressing the intuition behind this simple result that inflation is negatively correlated with birth and death rates. By construction each agent has access to an investment technology, that is, each young agent has the option to start a firm that lasts either one or two periods. Over the course of their lifetimes, firms are assumed to become less productive. Nonetheless a fraction of them will survive because they remain profitable. An increase in inflation alters conditions in credit markets by lowering the rate of interest at which firms can borrow. Both young and middle-aged agents want to borrow more when the real interest rate is low. Inflation therefore increases the fraction of both young and middle-aged agents who operate firms.

Assuming $q_1 > q_2$ guarantees that middle-aged agents are more homogeneous in terms of productivity than are their younger counterparts. Intuitively, since middle-aged agents are more homogeneous, a given change in real interest rates will affect the decisions of a larger fraction of middle-aged agents. Inflation-induced interest-rate reductions therefore have a larger effect of keeping middle-aged agents in business than they have of enticing young agents into business.

3. Nominal-Wage Rigidities

In this section, we summarize the implications of the model contained in Akerlof, Dickens, and Perry (1996) for data on establishment births and deaths. The intuition behind their model is as follows. Wages are partially determined by bargaining, that is, owners and employees share the rents of their enterprises. Establishments in economic distress are therefore typically able to alleviate this distress by lowering real wages. When inflation is low, establishments that are in economic distress cannot lower real wages without lowering nominal wages. This barrier may drive these establishments out of business, which makes room for new establishments to enter the market. These new establishments have an important advantage over existing establishments; they have no wage history to bind them.

We offer no formal nominal-wage rigidities model since such a model is presented in Akerlof Dickens and Perry (1996). We simply note that their model is consistent with an empirical finding that high inflation is associated with low rates of establishment births and low rates of establishment deaths.

4. Data Description

All of our job creation and destruction data can be downloaded from John Haltiwanger's web page at http://www.bsos.umd.edu/econ/haltiwanger/download.htm. We use two annual data sets that differ only in their levels of aggregation. Each of our data sets covers the manufacturing sector from 1973-88, and includes the following job creation and destruction variables:

1. The percent of total jobs that were created by new establishments.

2. The percent of total jobs that were created by existing establishments.
3. The percent of total jobs that were destroyed by dying establishments.
4. The percent of total jobs that were destroyed by continuing establishments.

We use aggregate data for the entire manufacturing sector (N=16), as well as data aggregated at the two-digit industry level within nine regions (N=2736).[5] We attach the percent change in the consumer price index (urban unadjusted), the percent change in real GDP (chained 1992 dollars, seasonally adjusted), the percent change in the producer price index for crude oil (relative to the PPI for all commodities), and the real federal funds rate to our data.

We need to discuss the formulas for our variables more precisely. The denominator of all job creation and destruction variables is the average employment from the current and previous year. For example, the denominator for all job creation and destruction variables from aggregate 1973 data is the average of total manufacturing employment in March of 1972 and March of 1973.[6] Our GDP, CPI, and oil-price measures use the more standard definition of percent change; the denominator is the previous year's level.

We also need to discuss the timing of our data. The job creation and destruction variables are measured as percent changes from March 12 of the previous year to March 12 of the current year. For example, 1973 data represent changes from March 12, 1972 to March 12, 1973. We attempt to match this time frame as closely as possible for all of our variables. We measure inflation and oil-price changes from March to March, GDP from the second quarter of the previous year through the first quarter of the current year, and the federal funds rate from March 13 of the previous year through March 12 of the current year.

[5] See Table 8 for a list of the nineteen Census two-digit industries and see Table 9 for a list of the nine Census regions.

Finally, we need to discuss our CPI measure since it differs from official BLS figures. There have been important revisions to the calculation of the CPI in recent years, most notably the treatment of housing. Our measure of CPI, called CPI-UX1, matches CPI-U (urban unadjusted) exactly for calendar years 1983 on. For calendar years prior to 1983, CPI-UX1 incorporates the current methods for valuing homeowner costs, which significantly reduces measured inflation prior to 1983.

Table 1 reports descriptive statistics for both of the job creation and destruction data sets used in this paper. Note that all of the variables exhibit considerable variation, making this time period ideal for our study. Fortunately, inflation is not highly correlated with the real-business cycle over this period, which allows us to separate the effects of inflation from the effects of the real-business cycle.

We plot inflation and the percent of total manufacturing jobs created by new establishments from 1973-88 in Figure 1. It appears that the two series are negatively correlated throughout the time period. Subsequent regressions will bolster this assertion. We plot inflation and the percent of total manufacturing jobs created by existing establishments in Figure 2. Note that the two series do not appear to be correlated. We further elaborate on this point by plotting the percent change in real GDP and the percent of total manufacturing jobs created by existing establishments in Figure 3, which shows that job creation by existing establishments is positively related to the real-business cycle.

Taken together, Figures 1-3 suggest that job creation from establishment births is negatively related to inflation, while job creation by existing establishments is positively related to the real-business cycle. We will show that the estimated impact of inflation on jobs created by

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[6] This method treats employment expansions and contractions symmetrically. Using this method, percent changes can range from –200% to 200%. If we use the previous year's employment in the denominator, percent changes can

births is essentially unchanged by including controls for the real-business cycle, as suggested by Figures 1-3.

Figures 4-6 are analogous to Figures 1-3, with job destruction by dying establishments and job destruction by continuing establishments substituted for the job creation variables in the earlier figures. Again, Figures 4-6 suggest that job destruction by dying establishments is negatively related to inflation. Job destruction by continuing establishments looks uncorrelated with inflation, but negatively correlated with the real-business cycle. We will show that the estimated impact of inflation on jobs destroyed by deaths is essentially unchanged by including controls for the real-business cycle, as suggested by Figures 4-6.

5. Empirical Methodology and Results

When we use aggregate manufacturing data, our results come from simple regression models. When we use our disaggregated data set (19 industries and 9 regions), we need to worry about contemporaneous correlation of the error terms since key variables like inflation and GDP growth provide one observation per year.[7] To address this concern, we assume a variance-covariance matrix of the form:

$$\Omega = \begin{bmatrix} \sigma_1^2 I & \sigma_{12} I & \cdots & \sigma_{1J} I \\ \sigma_{12} I & \sigma_2^2 I & \cdots & \sigma_{2J} I \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{1J} I & \sigma_{2J} I & \cdots & \sigma_J^2 I \end{bmatrix}$$

be as low as -100% with no upper bound.

[7] Since we are using time-series data, serial correlation might also be a concern. Correcting for an AR(1) process using aggregate manufacturing data does not affect our results. Correcting for a common AR(1) parameter across all industries and regions using disaggregated data also does not affect our results.

where each entry corresponds to a 16×16 matrix (for 16 years of data) and J =171 (the number of industry-region pairs).[8] Under these assumptions, the covariance between the contemporaneous error terms of any two units is constant over time, but otherwise unrestricted.[9] We use an estimate of Ω only for the purpose of correcting our standard errors; our point estimates come from ordinary least squares.[10]

We are now ready to present our empirical results. We have the following two empirical hypotheses:

1. The percent of jobs created by new establishments is negatively related to inflation, even after controlling for real-business cycle effects.
2. The percent of jobs destroyed by dying establishments is negatively related to inflation, even after controlling for real-business cycle effects.

The top panel of Table 2 shows estimates of the determinants of the percent of total manufacturing jobs created by new establishments. Note first that job creation by births is negatively correlated with inflation when inflation is the only explanatory variable. This relationship is statistically significant and large in magnitude. Note further that including the percent of jobs created by existing establishments and including the percent change in real GDP, which at least partially control for real-business cycle effects, does not weaken the inflation coefficient.

The bottom panel of Table 2 shows, with similar results, analogous estimates for job destruction by dying establishments. When inflation is included as the only independent variable,

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[8] The data are sorted by industry-region pair, then by time.

[9] To be conservative, we normalize our standard errors by n-k (k is the number of parameters estimated) rather than by n. Green (1997) notes that neither generates unbiased variance estimation.

[10] Feasible Generalized Least Squares (FGLS) requires $\hat{\Omega}$ to be inverted, which is impossible when the number of cross-sectional units is larger than the number of time periods. FGLS is therefore impossible for our data. See Beck and Katz (1995) for details, including monte carlo simulations of the small-sample properties of the standard errors.

its coefficient is negative, statistically significant, and large in magnitude. Again, including controls for the real-business cycle does not weaken the inflation coefficient.

Figure 7 plots actual and predicted values from the model in which the percent of jobs created by births is regressed on inflation, the percent change in real GDP, and the percent of jobs created by existing establishments. The model appears well specified throughout our sample period. Figure 8 plots actual and predicted values from the analogous death equation; again the model appears well specified throughout the time period.

Although results for the manufacturing sector as a whole are interesting, much more can be learned from disaggregated data. Table 3 uses data from 19 manufacturing industries and 9 regions from 1973-88 to re-estimate birth and death equations of the form estimated in Table 2, adding fixed industry and fixed region effects as additional controls. Note that, for both the birth models and death models, the inflation coefficients are quite similar to those reported in Table 2. Specifically, the inflation coefficients are negative, large, statistically significant, and not weakened by real-business-cycle controls.

Figure 9 is the analog of Figure 7; it is generated from the birth equation in Table 3 that includes both jobs created by existing establishments and real GDP growth as controls. In particular, Figure 9 plots yearly averages of predicted and actual values for the percent of jobs created by new establishments. Figure 9 shows that the birth model estimated on disaggregated data does not fit particularly well for the latter half of our time period. Figure 10 presents the analogous death-equation plots, and shows that the death model also fits the data better in the first half of our sample.

In order to control further for real-business cycle effects in our birth models, we use one- and two-year lags of jobs created by existing establishments as additional controls. We do not include lags of real GDP because we are reluctant to add more variables without cross-sectional variability. We present these results in the top panel of Table 4, which shows that the lags do not have much explanatory power and do not have much of an impact on the inflation coefficient.[11]

Similarly, we use one- and two-year lags of jobs destroyed by continuing establishments as additional controls for our death models, and present these estimates in the bottom panel of Table 4. Lags of job destruction by continuing establishments do have significant explanatory power in the death equation, but they do not have much of an impact on the inflation coefficient.

Figure 11 plots yearly averages of actual and predicted values from the birth equation in Table 4 that includes real GDP growth and current through two-year lags of jobs created by existing establishments as controls. The fit seems somewhat better than the fit presented in Figure 9, particularly for the later years. Figure 12 plots yearly averages of actual and predicted values from the analogous death equation, and also shows an improvement in fit compared to Figure 10. Most importantly, our results on the effects of inflation on establishment births and deaths remain strong after adding additional real-business-cycle controls.

Overall, we believe Tables 2-4, along with Figures 1-12 offer strong evidence that both jobs created by new establishments and jobs destroyed by dying establishments are negatively related to inflation, and that these relationships are not driven by the real-business cycle. Although these results are consistent with both the financial-markets and nominal-wage rigidities explanations we offered earlier, we note that we are not directly testing either model.

6. Specification Checks

We consider the following four possible criticisms of the results presented in section 4:

1. Inflation proxies for the effect of oil-price shocks.

[11] A test that current through two-year lags of job creation by existing establishments all have no effect on births yields a p-value of 0.08.

2. Our results are not robust throughout our sample period.
3. Inflation proxies for the effects of monetary policy.
4. Our results are not robust across industries and regions.

Oil-price shocks and robustness over time

We follow Hamilton (1999) and use the producer price index for crude petroleum as our oil-price measure, although we normalize the measure by dividing by the producer price index for all commodities. More specifically, our oil-price measure is the percent change, from March of the previous year to March of the current year, in the producer price index for crude petroleum divided by the producer price index for all commodities.

Figure 13 plots the percent change in the consumer price index and our oil-price measure from 1975 through 1988. Not surprisingly, the two measures are highly correlated; the correlation coefficient between the two series is 0.78. It is therefore quite difficult for us to separate the effects of inflation from the effects of oil prices, although we believe oil-price shocks are unlikely candidates to explain our results.

The top panel of Table 5 shows the results from birth equations estimated on disaggregated data, including real GDP growth and current through two-year lags of job creation in existing establishments as real-business cycle controls. Note that both inflation and oil-price shocks have negative and statistically significant coefficients when entered individually. When entered together, neither coefficient is significant at the 0.05 level.

The bottom panel of Table 5 shows the results from the analogous death equations. Once again, both inflation and oil-price shocks have negative and statistically significant coefficients when entered individually. When entered together, the inflation coefficient becomes statistically insignificant while the oil-price coefficient remains negative and strong.

How should we interpret these results? We believe the only sensible interpretation of the birth results is that the data cannot distinguish between the effects of inflation and oil prices. The death results imply that inflation does not affect deaths, and merely proxies for oil-price shocks. We believe, however, that this negative coefficient for oil-prices is extremely counterintuitive; why would oil-price increases lead to fewer deaths? We therefore believe that the strength of the oil prices in the death equation is more likely to reflect functional form than a true oil-price effect.

Previous studies on the effects of oil prices might help us distinguish between the effects of inflation and oil-price shocks. Numerous studies have found that oil-price shocks have asymmetric effects; oil-price increases have important macroeconomic effects, but oil-price decreases may not.[12] Davis and Haltiwanger (1996) and (1999) also found a non-linear relationship using job creation and destruction data where births are aggregated with expansions and deaths are aggregated with contractions.

Returning to Figure 13, we see that oil-prices fell six out of seven years from 1982-1988. If inflation has no impact on births and deaths, and merely proxies for oil-price shocks, we would not expect a strong relationship over this period of declining oil prices. We address this issue, for both a birth and death model, in Table 6 by estimating separate inflation coefficients for the 1975-81 period and for the 1982-88 period. This robustness check would be useful even if oil-price shocks were not a concern.

Looking at the birth equation in Table 6, we see the inflation coefficient is estimated to be stronger during the period of declining oil prices, although the difference is statistically insignificant. The death equation yields a slightly weaker inflation coefficient during the period of declining oil prices; once again this difference is statistically insignificant. Overall, we view the robustness of our results during a period of declining oil prices as evidence that inflation is more than a proxy for oil-price shocks.

Monetary policy

We use the real federal funds rate from March 13 of the previous year through March 12 of the current year to investigate the effects of monetary policy.[13] Figure 14 plots inflation and the real federal funds rate from 1975-1988. This figure reveals two important features: monetary policy is not highly correlated with inflation over this period (the correlation coefficient is 0.46), and monetary policy was tightened severely in the early 1980s.

The top panel of Table 7 shows the results from birth equations estimated on disaggregated data, including real GDP growth and current through two-year lags of job creation in existing establishments as real-business cycle controls. Note that the real federal funds rate does not have a significant impact on births whether inflation is included in the model or not.

The bottom panel of Table 7 presents the analogous death estimates. Note that the coefficient for the real federal funds rate is statistically significant when inflation is left out of the model. When inflation is included, the federal-funds-rate coefficient loses statistical significance. The inflation coefficient, however, remains strong when the real federal funds rate is included as a control.

Based on both the birth and death results from Table 7, we do not believe our inflation results reflect changes in monetary policy. The federal-funds-rate coefficient is not statistically significant in either the birth or the death model when inflation is included. The inflation coefficients, however, remain strong when the federal funds rate is included.

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[12] See, for instance, Mork (1989) and Hamilton (1999).

[13] The CPI-UX1 is used to convert nominal returns into real returns.

Heterogeneity across industries and regions

Figures 9-12 show that, for both our birth and death equations, yearly averages of predicted and actual averages match up reasonably well. This fact is particularly true in Figures 11 and 12, which are based on models where lags of job creation or job destruction variables are included as additional controls. Since the R^2 values from the models estimated on disaggregated data are not particularly high, Figures 9-12 might mask considerable heterogeneity across industries or regions. We will show below that, despite this heterogeneity, our results appear robust across industries and regions.

Table 8 presents estimates of a birth and death equation. Each model contains the percent change in CPI and our real-business cycle controls, fully interacted by industry, as well as fixed industry and fixed region effects. Although there is strong evidence from both models that the inflation coefficients differ across industries, all of these coefficients are negative and many are statistically significant.

Table 9 presents estimates of a birth and death equation analogous to those in Table 8, but where heterogeneity across regions is investigated. Once again, both models reveal statistically significant inflation-coefficient heterogeneity, but all of the inflation coefficients are negative and many are statistically significant.

In summary, although we find strong evidence of heterogeneity across industries and regions, this heterogeneity does not undermine our results. Estimating separate coefficients across industries and regions yielded no evidence to contradict our basic results.

An alternative data source

In this subsection, we use an alternative data source on business failures to further support our hypothesis regarding establishment deaths. As will be clear from our description of the data, important differences exist between the job-destruction data used earlier and the business-failures data we use here. Despite these differences between the two data sets, both data sets yield similar conclusions regarding inflation and firm or establishment turnover.

The Dun & Bradstreet Corporation keeps statistics on business failures. The Dun & Bradstreet business-failure statistics include: businesses that ceased operations following assignment or bankruptcy; ceased operations with losses to creditors after such actions as foreclosure or attachment; voluntarily withdrew leaving unpaid debts; were involved in court actions such as receivership, reorganization or arrangement; or voluntarily compromised with creditors. See Dun & Bradstreet Corporation (1998) for details.

These data allow us to look at deaths in a manner that is completely different from the job destruction statistics presented earlier. First, we use data from calendar years 1968-97, which is the period over which our inflation measure overlaps with the business-failures data. Second, these business-failure statistics are defined at the firm level rather than the establishment level. Third, these business-failure statistics are the percent of firms that failed, rather than the percent of employment in firms that failed. Unfortunately, these business-failure statistics account for only a fraction of total business closings; business that discontinued operations after paying their creditors in full are not included.

The business-failures data have an important weakness. The coverage of the sample was extended in 1984 to include the following business sectors: agriculture, forestry and fishing; finance, insurance and real estate; and the services sector in its entirety. The results presented in this section, however, are stable across the 1968-1983 and 1984-1997 periods.

In Figure 15, we plot inflation and the number of business failures per 1,000 firms listed on the Dun & Bradstreet database. Figure 15 appears similar to Figure 4; business failures are negatively correlated with inflation. It is particularly noteworthy that the business-failure rate is higher in the 1990s than in the late 1970s when the economy experienced both weak economic growth and high inflation.

In Table 10, we present regression models of the effect of inflation on the business-failure rate, including controls for real-GDP growth and a linear time trend. In addition to ordinary least-squares models, we present Prais-Winston models that account for an AR(1) error process. It is clear from the Durbin-Watson statistics and from the estimated AR(1) parameters that the business-failures data are serially correlated.

Although the inflation coefficients are unstable across specifications, the inflation coefficient is always estimated to be negative and statistically significant. Since the business-failures data are produced using a methodology that is substantially different from the methodology used for the job destruction data, we view the results in Table 10 as an important robustness check.

7. Conclusions and Directions for Future Research

Using manufacturing data from 1973-88 we provide strong evidence that both jobs created by new establishments and jobs destroyed by dying establishments are negatively related to inflation. These relationships do not appear to be driven by the real-business cycle, oil-price shocks, or monetary shocks. Moreover, these relationships appear robust across industries, across regions, and throughout our time frame. Data on business failures from 1968-1997 offer additional empirical support.

We consider two explanations for these results. We consider a financial-markets explanation in which inflation affects establishment turnover by affecting real interest rates. We then consider a nominal-wage rigidities explanation in which inflation affects establishment turnover through the labor market. Regardless of the model used to explain the facts, we provide evidence on a mechanism through which inflation may have real effects.

Even if our results could be replicated in other time periods and other sectors of the economy, several important issues would remain. First, what are the characteristics of the establishments whose births and deaths are affected by inflation? Second, can our financial-markets hypothesis, our nominal-wage rigidities hypothesis, or any other hypothesis be tested directly? Finally, do the changes in establishment turnover that are driven by changes in inflation have significant impacts on aggregate productivity? We leave these questions for future research.

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Table 1: Descriptive Statistics

Aggregate data for manufacturing (1973-88): N=16

Variable	Mean	Std.	Min.	Max.
Percent of total jobs destroyed by dying establishments	2.517	0.752	1.193	4.367
Percent of total jobs destroyed by continuing establishments	7.836	2.629	4.368	13.804
Percent of total jobs created by new establishments	1.441	0.496	0.611	2.306
Percent of total jobs created by existing establishments	7.774	2.052	4.745	11.919
Percent change in consumer price index (urban unadjusted)	6.309	2.806	2.256	12.011
Percent change in real (chained 1992 dollars) GDP	3.057	2.579	-1.427	6.591
Percent change in real oil prices	3.294	23.585	-40.947	50.235
Real federal funds rate	2.608	3.100	-1.181	8.932

Regional 2-digit industry data from manufacturing (9 regions, 19 industries, 1973-88): N=2736

Variable	Mean	Std.	Min.	Max.
Percent of total jobs destroyed by dying establishments	2.734	2.742	0.000	52.032
Percent of total jobs destroyed by continuing establishments	7.843	4.291	0.000	36.353
Percent of total jobs created by new establishments	1.530	1.867	0.000	51.268
Percent of total jobs created by existing establishments	8.073	3.840	0.000	46.210
Percent change in consumer price index (urban unadjusted)	6.309	2.717	2.256	12.011
Percent change in real (chained 1992 dollars) GDP	3.057	2.497	-1.427	6.591
Percent change in real oil prices	3.294	22.841	-40.947	50.235
Real federal funds rate	2.608	3.003	-1.181	8.932

Note: See text for more precise definitions of all variables.

Table 2: The Effect of Inflation on Establishment Births and Deaths (aggregate manufacturing data, 1973-88)

Dependent Variable: Percent of Jobs Created By New Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
intercept	2.166	2.482	2.478	2.269
	(0.247)	(0.295)	(0.479)	(0.472)
% change in CPI	-0.115	-0.133	-0.117	-0.137
	(0.036)	(0.035)	(0.037)	(0.037)
% change in real GDP		-0.066		-0.090
		(0.038)		(0.057)
% jobs created by existing estabs			-0.038	0.040
			(0.050)	(0.069)
Durbin-Watson statistic	1.800	1.725	1.656	1.906
R-squared	0.422	0.529	0.447	0.543

Dependent Variable: Percent of Jobs Destroyed By Dying Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
intercept	3.493	4.394	2.181	2.908
	(0.402)	(0.350)	(0.373)	(0.888)
% change in CPI	-0.155	-0.206	-0.181	-0.192
	(0.059)	(0.042)	(0.037)	(0.039)
% change in real GDP		-0.188		-0.070
		(0.046)		(0.078)
% jobs destr by continuing estabs			0.189	0.133
			(0.040)	(0.074)
Durbin-Watson statistic	1.617	2.038	2.097	2.103
R-squared	0.333	0.712	0.757	0.773

Notes: 16 observations. See text for details.

Table 3: The Effect of Inflation on Establishment Births and Deaths
(2-digit manufacturing industries by region, 1973-88)

Dependent Variable: Percent of Jobs Created By New Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.116	-0.132	-0.116	-0.136
	(0.040)	(0.039)	(0.041)	(0.039)
% change in real GDP		-0.057		-0.075
		(0.044)		(0.043)
% jobs created by existing estabs			0.009	0.030
			(0.023)	(0.021)
R-squared	0.131	0.136	0.131	0.139

Dependent Variable: Percent of Jobs Destroyed By Dying Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.162	-0.217	-0.171	-0.214
	(0.064)	(0.048)	(0.052)	(0.047)
% change in real GDP		-0.199		-0.181
		(0.052)		(0.056)
% jobs destr by continuing estabs			0.074	0.022
			(0.023)	(0.023)
R-squared	0.180	0.210	0.192	0.211

Notes: 2736 observations from 19 manufacturing industries, 9 regions, and 16 years. All standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details.

Table 4: The Effect of Inflation on Establishment Births and Deaths
(2-digit manufacturing industries by region, 1975-88)

Dependent Variable: Percent of Jobs Created By New Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.123 (0.046)	-0.143 (0.045)	-0.132 (0.046)	-0.164 (0.044)
% change in real GDP		-0.068 (0.050)		-0.101 (0.049)
% jobs created by existing estabs			0.010 (0.027)	0.033 (0.023)
% jobs created by existing estabs (one-year lag)			0.006 (0.027)	0.028 (0.024)
% jobs created by existing estabs (two-year lag)			0.023 (0.027)	0.017 (0.024)
R-squared	0.119	0.126	0.122	0.133

Dependent Variable: Percent of Jobs Destroyed By Dying Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.177 (0.068)	-0.234 (0.053)	-0.145 (0.057)	-0.190 (0.052)
% change in real GDP		-0.199 (0.059)		-0.173 (0.062)
% jobs destr by continuing estabs			0.057 (0.024)	0.017 (0.023)
% jobs destr by continuing estabs (one-year lag)			0.081 (0.024)	0.056 (0.022)
% jobs destr by continuing estabs (two-year lag)			0.027 (0.025)	0.044 (0.024)
R-squared	0.184	0.211	0.207	0.221

Notes: 2394 observations from 19 manufacturing industries, 9 regions, and 14 years. All standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details.

Table 5: The Effect of Inflation and Oil Prices on Establishment Births and Deaths (2-digit manufacturing industries by region, 1975-88)

Dependent Variable: Percent of Jobs Created By New Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.164		-0.121
	(0.044)		(0.065)
% change in real oil prices		-0.019	-0.007
		(0.006)	(0.009)
% change in real GDP	-0.101	-0.089	-0.106
	(0.049)	(0.051)	(0.048)
% jobs created by existing estabs	0.033	0.033	0.035
	(0.023)	(0.024)	(0.022)
% jobs created by existing estabs (one-year lag)	0.028 (0.024)	0.020 (0.025)	0.029 (0.023)
% jobs created by existing estabs (two-year lag)	0.017 (0.024)	-0.004 (0.026)	0.011 (0.024)
R-squared	0.133	0.125	0.135

Dependent Variable: Percent of Jobs Destroyed By Dying Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.190		-0.052
	(0.052)		(0.064)
% change in real oil prices		-0.029	-0.024
		(0.006)	(0.008)
% change in real GDP	-0.173	-0.193	-0.197
	(0.062)	(0.052)	(0.051)
% jobs destr by continuing estabs	0.017	0.001	0.002
	(0.023)	(0.021)	(0.021)
% jobs destr by continuing estabs (one-year lag)	0.056 (0.022)	0.059 (0.019)	0.055 (0.019)
% jobs destr by continuing estabs (two-year lag)	0.044 (0.024)	0.063 (0.021)	0.057 (0.020)
R-squared	0.221	0.231	0.232

Notes: 2394 observations from 19 manufacturing industries, 9 regions, and 14 years. All standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details.

Table 6: Testing for Changes in the Inflation Coefficients Over Time
(2-digit manufacturing industries by region, 1975-88)

	Birth Equation		Death Equation	
Variable	Estimate	Std. Error	Estimate	Std. Error
% change in CPI (1975-1981)	-0.198	0.052	-0.169	0.064
% change in CPI (1982-1988)	-0.274	0.102	-0.125	0.123
Test for equality of inflation coefficients for the two periods	t=1.23		t=0.60	
% change in real GDP	-0.107	0.048	-0.169	0.062
% jobs created by existing estabs	0.028	0.022		
one-year lag	0.025	0.023		
two-year lag	0.007	0.024		
% jobs destr by continuing estabs			0.014	0.023
one-year lag			0.056	0.022
two-year lag			0.041	0.024
R-squared	0.137		0.222	

Notes: 2394 observations from 19 manufacturing industries, 9 regions, and 14 years. Standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details.

Birth equation: Dependent variable is the percent of the industry's regional employment created by new establishments.

Death equation: Dependent variable is the percent of the industry's regional employment destroyed by dying establishments.

Table 7: The Effect of Inflation and Monetary Policy on Establishment Births and Deaths (2-digit manufacturing industries by region, 1975-88)

Dependent Variable: Percent of Jobs Created By New Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.164 (0.044)		-0.204 (0.050)
real federal funds rate		0.026 (0.051)	-0.066 (0.043)
% change in real GDP	-0.101 (0.049)	-0.024 (0.063)	-0.124 (0.050)
% jobs created by existing estabs	0.033 (0.023)	0.024 (0.027)	0.021 (0.022)
% jobs created by existing estabs (one-year lag)	0.028 (0.024)	-0.002 (0.031)	0.029 (0.023)
% jobs created by existing estabs (two-year lag)	0.017 (0.024)	0.002 (0.031)	0.014 (0.023)
R-squared	0.133	0.092	0.139

Dependent Variable: Percent of Jobs Destroyed By Dying Establishments

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
% change in CPI	-0.190 (0.052)		-0.148 (0.060)
real federal funds rate		0.134 0.051	0.066 (0.052)
% change in real GDP	-0.173 (0.062)	-0.085 0.068	-0.150 (0.064)
% jobs destr by continuing estabs	0.017 (0.023)	0.002 0.024	0.007 (0.022)
% jobs destr by continuing estabs (one-year lag)	0.056 (0.022)	0.078 0.023	0.058 (0.021)
% jobs destr by continuing estabs (two-year lag)	0.044 (0.024)	0.055 0.025	0.043 (0.023)
R-squared	0.221	0.213	0.225

Notes: 2394 observations from 19 manufacturing industries, 9 regions, and 14 years. All standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details.

Table 8: Inflation-Coefficient Heterogeneity Across Industries
(2-digit manufacturing industries by region, 1975-88)

	Birth Equation		Death Equation	
Variable	Estimate	Std. Error	Estimate	Std. Error
% Δ CPI for Food & Tobacco	-0.131	0.046	-0.138	0.067
% Δ CPI for Textile	-0.377	0.118	-0.057	0.197
% Δ CPI for Apparel	-0.110	0.076	-0.099	0.189
% Δ CPI for Lumber	-0.180	0.089	-0.162	0.121
% Δ CPI for Furniture	-0.161	0.091	-0.014	0.088
% Δ CPI for Paper	-0.060	0.042	-0.032	0.040
% Δ CPI for Printing	-0.064	0.077	-0.187	0.072
% Δ CPI for Chemicals	-0.096	0.070	-0.180	0.136
% Δ CPI for Petroleum	-0.065	0.032	-0.420	0.099
% Δ CPI for Rubber	-0.314	0.079	-0.176	0.049
% Δ CPI for Leather	-0.143	0.086	-0.246	0.114
% Δ CPI for Stone, Clay, & Glass	-0.169	0.062	-0.161	0.065
% Δ CPI for Primary Metals	-0.096	0.044	-0.315	0.063
% Δ CPI for Fabricated Metals	-0.121	0.049	-0.150	0.039
% Δ CPI for Non-electric Machinery	-0.276	0.066	-0.303	0.055
% Δ CPI for Electric Machinery	-0.214	0.046	-0.218	0.035
% Δ CPI for Transportation	-0.107	0.054	-0.143	0.044
% Δ CPI for Instruments	-0.221	0.101	-0.116	0.112
% Δ CPI for Miscellaneous	-0.271	0.100	-0.416	0.147
R-squared	0.176		0.269	
Wald Test for equality of inflation coefficients	$\chi^2(18)=94$, p-val<0.01		$\chi^2(18)=83$, p-val<0.01	

Notes: 2394 observations from 19 manufacturing industries, 9 regions, and 14 years. Standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details. Census disclosure rules require that data for food (SIC=20) be aggregated with tobacco (SIC=21).

Birth equation: Dependent variable is the percent of the industry's regional employment created by new establishments. The control variables are the percent change in real GDP (current only) and the percent of the industry's regional employment created by existing establishments (current, one-year lag, and two-year lag). All controls are fully interacted by industry.

Death equation: Dependent variable is the percent of the industry's regional employment destroyed by dying establishments. The control variables are the percent change in real GDP (current only) and the percent of the industry's regional employment destroyed by continuing establishments (current, one-year lag, and two-year lag). All controls are fully interacted by industry.

Table 9: Inflation-Coefficient Heterogeneity Across Regions
(2-digit manufacturing industries by region, 1975-88)

	Birth Equation		Death Equation	
Variable	Estimate	Std. Error	Estimate	Std. Error
% Δ CPI for New England	-0.126	0.041	-0.237	0.070
% Δ in CPI for Middle Atlantic	-0.050	0.040	-0.107	0.052
% Δ in CPI for East North Central	-0.144	0.036	-0.172	0.047
% Δ in CPI for West North Central	-0.276	0.094	-0.281	0.119
% Δ in CPI for South Atlantic	-0.197	0.039	-0.244	0.046
% Δ in CPI for East South Central	-0.137	0.040	-0.155	0.049
% Δ in CPI for West South Central	-0.150	0.071	-0.234	0.061
% Δ in CPI for Mountain	-0.206	0.087	-0.044	0.130
% Δ in CPI for Pacific	-0.166	0.070	-0.280	0.073
R-squared	0.157		0.254	
Wald Test for equality of inflation coefficients	$\chi^2(8)=73$, p-val<0.01		$\chi^2(8)=17$, p-val=0.03	

Notes: 2394 observations from 19 manufacturing industries, 9 regions, and 14 years. Standard errors are robust to contemporaneous correlation of the error terms across industry-region pairs. Fixed industry and fixed region effects included but not shown. See text for details.

Birth equation: Dependent variable is the percent of the industry's regional employment created by new establishments. The control variables are the percent change in real GDP (current only) and the percent of the industry's regional employment created by existing establishments (current, one-year lag, and two-year lag). All controls are fully interacted by region.

Death equation: Dependent variable is the percent of the industry's regional employment destroyed by dying establishments. The control variables are the percent change in real GDP (current only) and the percent of the industry's regional employment destroyed by continuing establishments (current, one-year lag, and two-year lag). All controls are fully interacted by region.

Table 10: The Effect of Inflation on Business Failures
(annual Dun & Bradstreet data, 1968-97)

Dependent Variable: Business Failures per 1,000 firms

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
intercept	10.836	12.096	6.089	7.051
	(1.003)	(1.274)	(1.320)	(1.575)
% change in CPI	-0.772	-0.835	-0.464	-0.516
	(0.176)	(0.176)	(1.153)	(0.159)
% change in real GDP		-0.330		-0.190
		(0.213)		(1.172)
linear trend			0.206	0.195
			(0.046)	(0.047)
Durbin-Watson statistic	0.387	0.438	0.437	0.428
R-squared	0.408	0.457	0.658	0.674

Dependent Variable: Business Failures per 1,000 firms (Prais-Winston Regressions)

Variable	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)	Estimate (Std. Error)
intercept	8.054	8.631	5.317	6.000
	(1.708)	(1.761)	(1.959)	(2.018)
% change in CPI	-0.314	-0.347	-0.304	-0.337
	(0.115)	(0.113)	(0.115)	(0.114)
% change in real GDP		-0.135		-0.133
		(0.083)		(0.084)
linear trend			0.183	0.175
			(0.096)	(0.097)
AR(1) parameter	0.891	0.897	0.823	0.834
R-squared (transformed model)	0.181	0.255	0.269	0.328

Notes: 30 observations. See text for details.

Figure 1: Inflation and Percent of Manufacturing Jobs Created by New Establishments

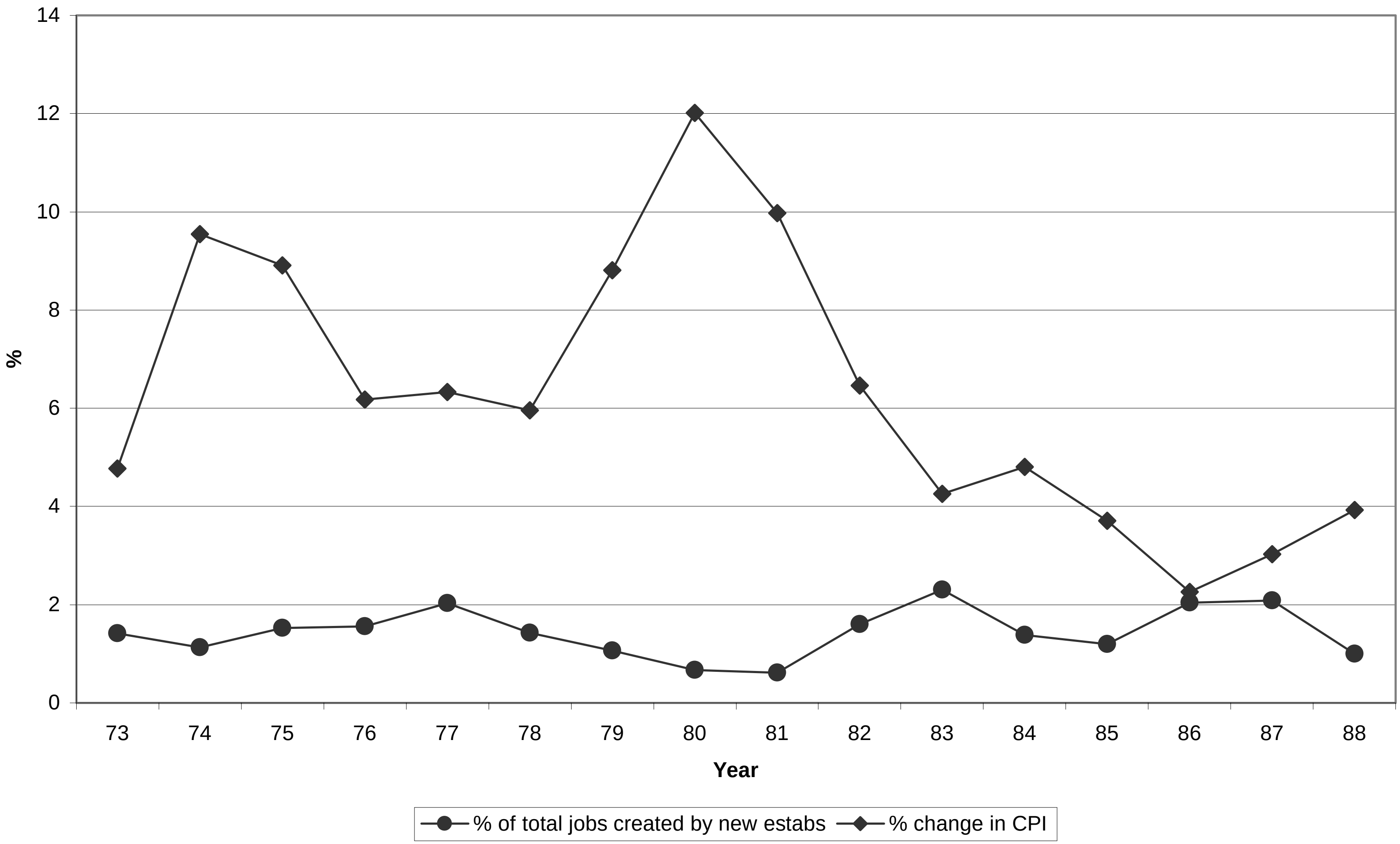

Figure 2: Inflation and Percent of Manufacturing Jobs Created by Existing Establishments

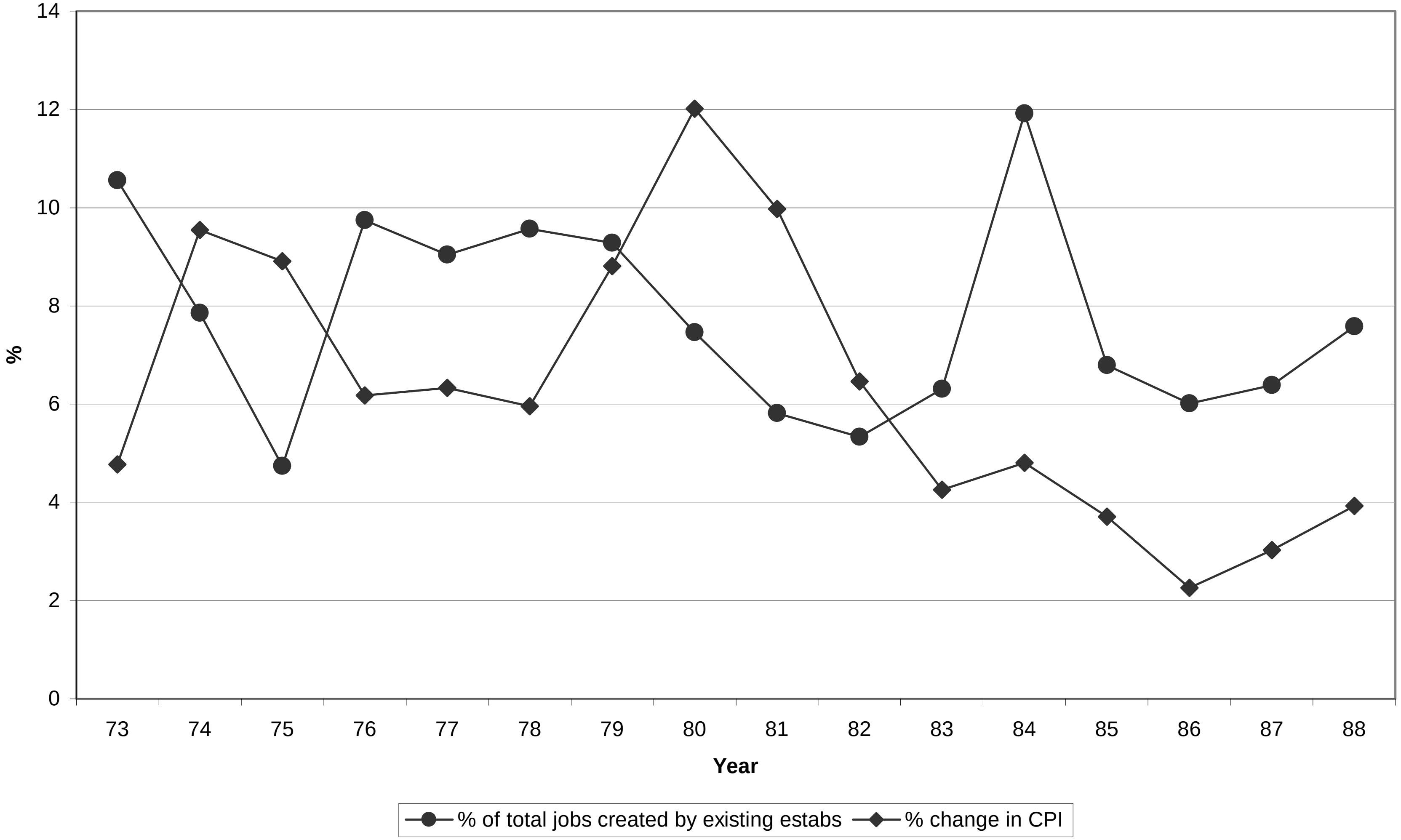

Figure 3: Real GDP and Percent of Manufacturing Jobs Created by Existing Establishments

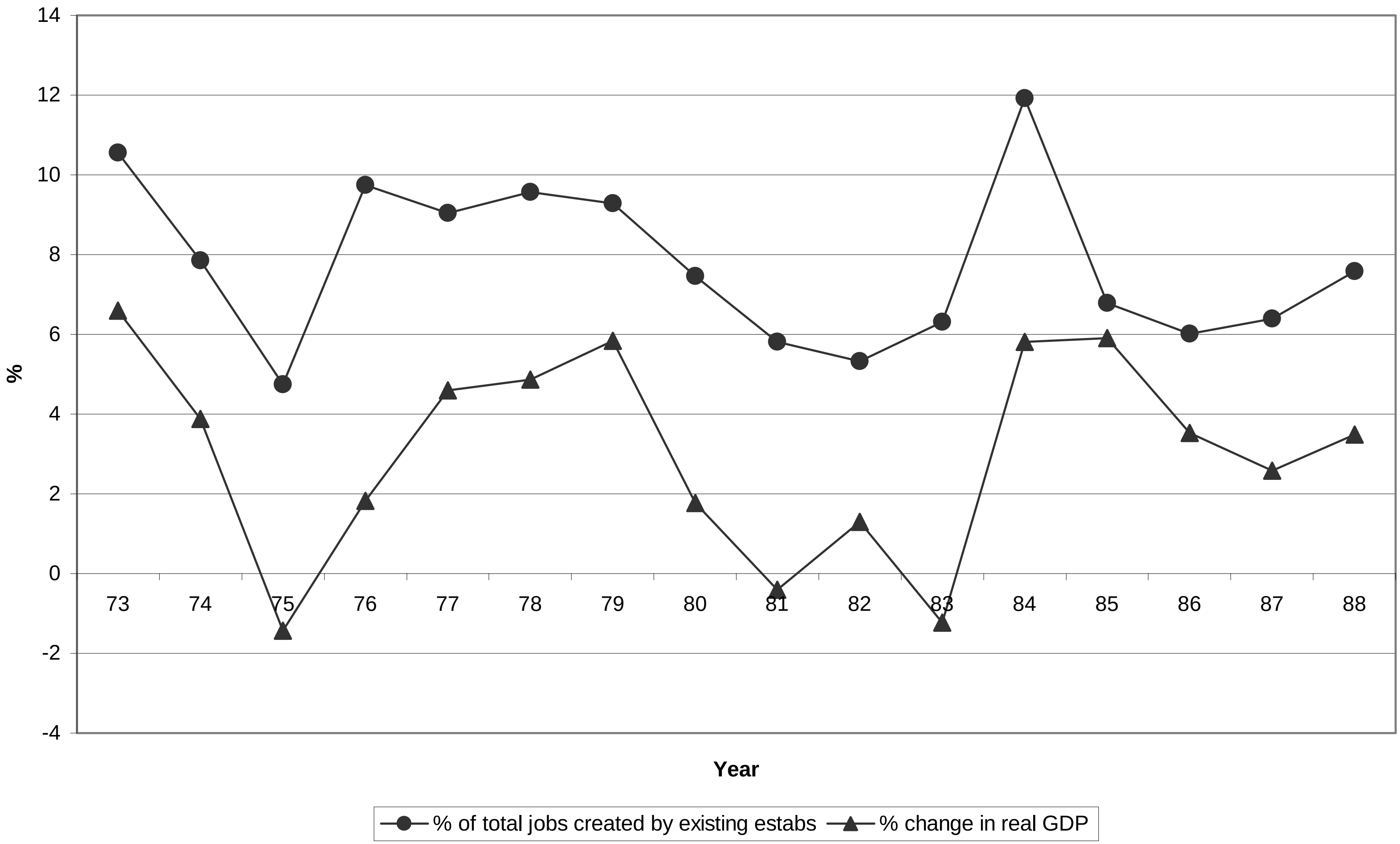

Figure 4: Inflation and Percent of Manufacturing Jobs Destroyed by Dying Establishments

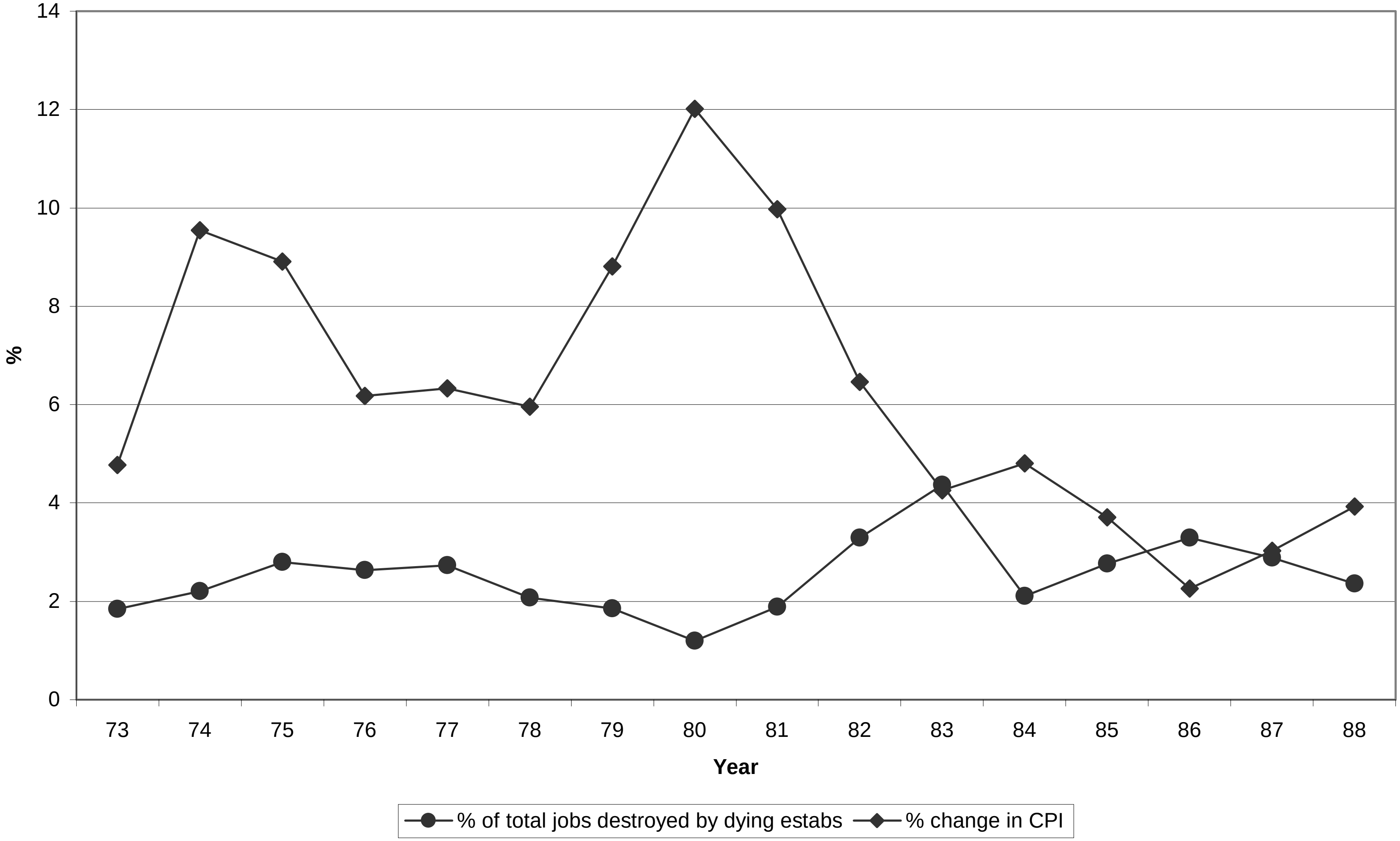

Figure 5: Inflation and Percent of Manufacturing Jobs Destroyed by Continuing Establishments

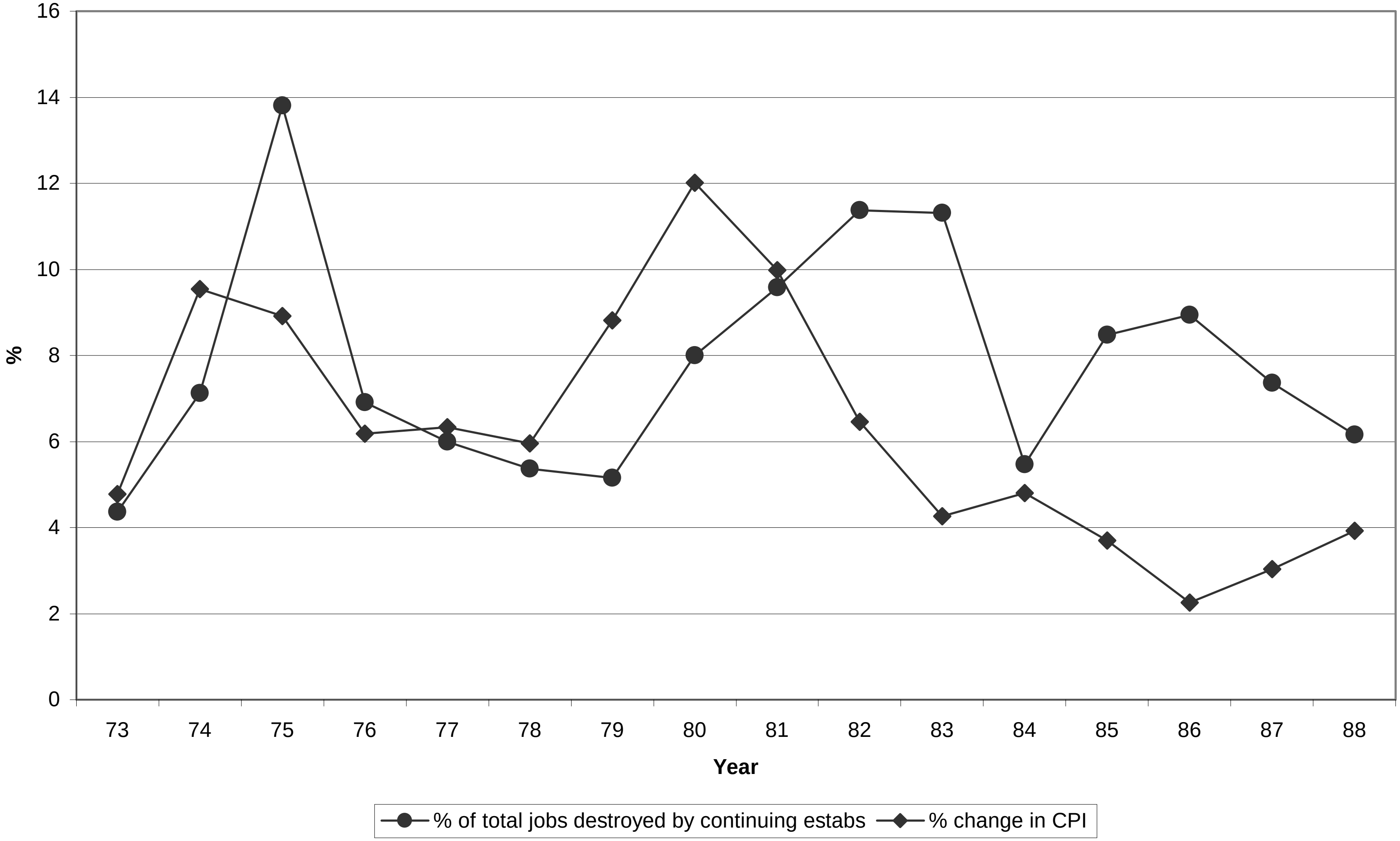

Figure 6: Real GDP and Percent of Manufacturing Jobs Destroyed by Continuing Establishments

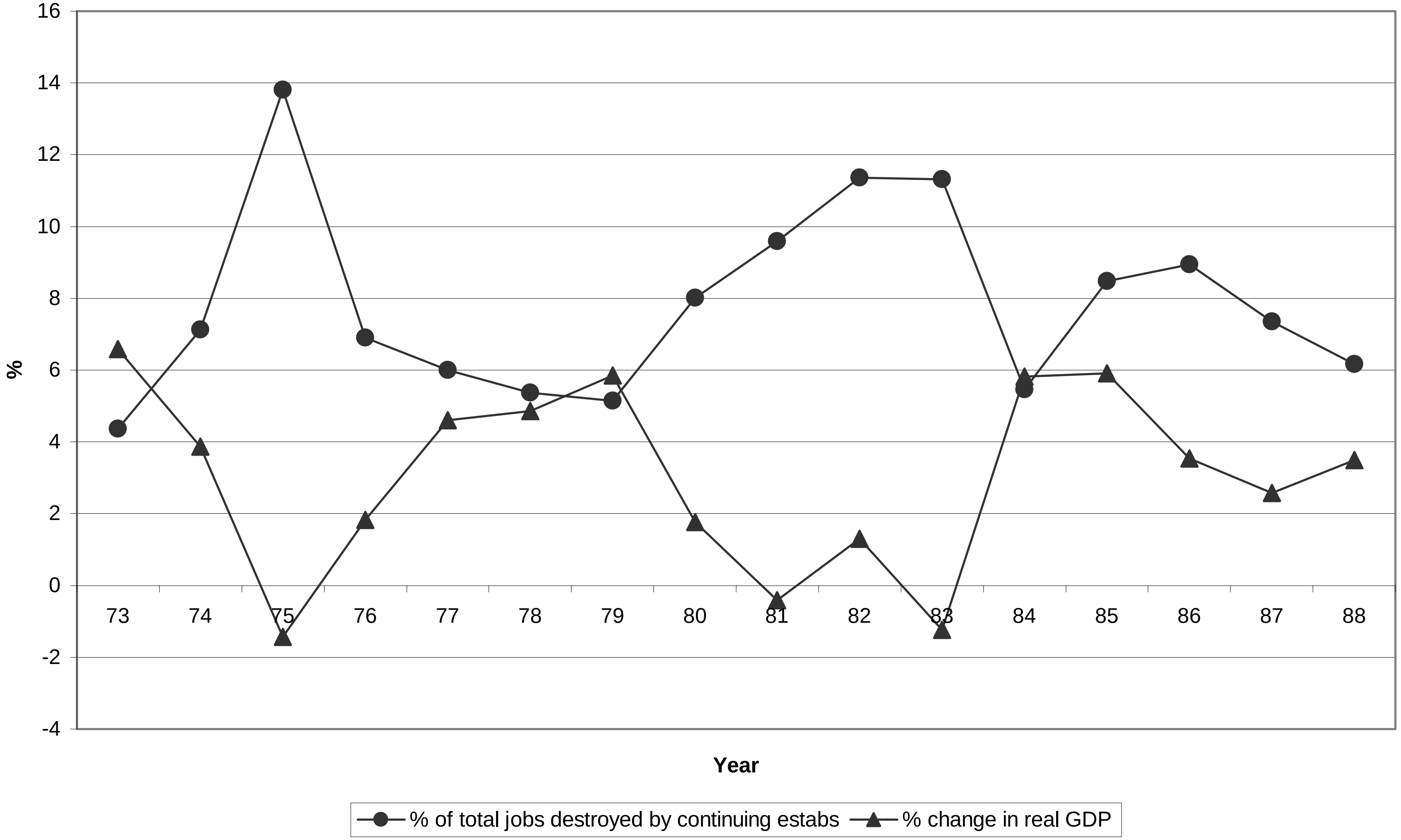

Figure 7: Percent of Manufacturing Jobs Created by New Establishments
Predicted vs Actual Values
(model controls for % jobs created by existing estabs and real GDP growth)

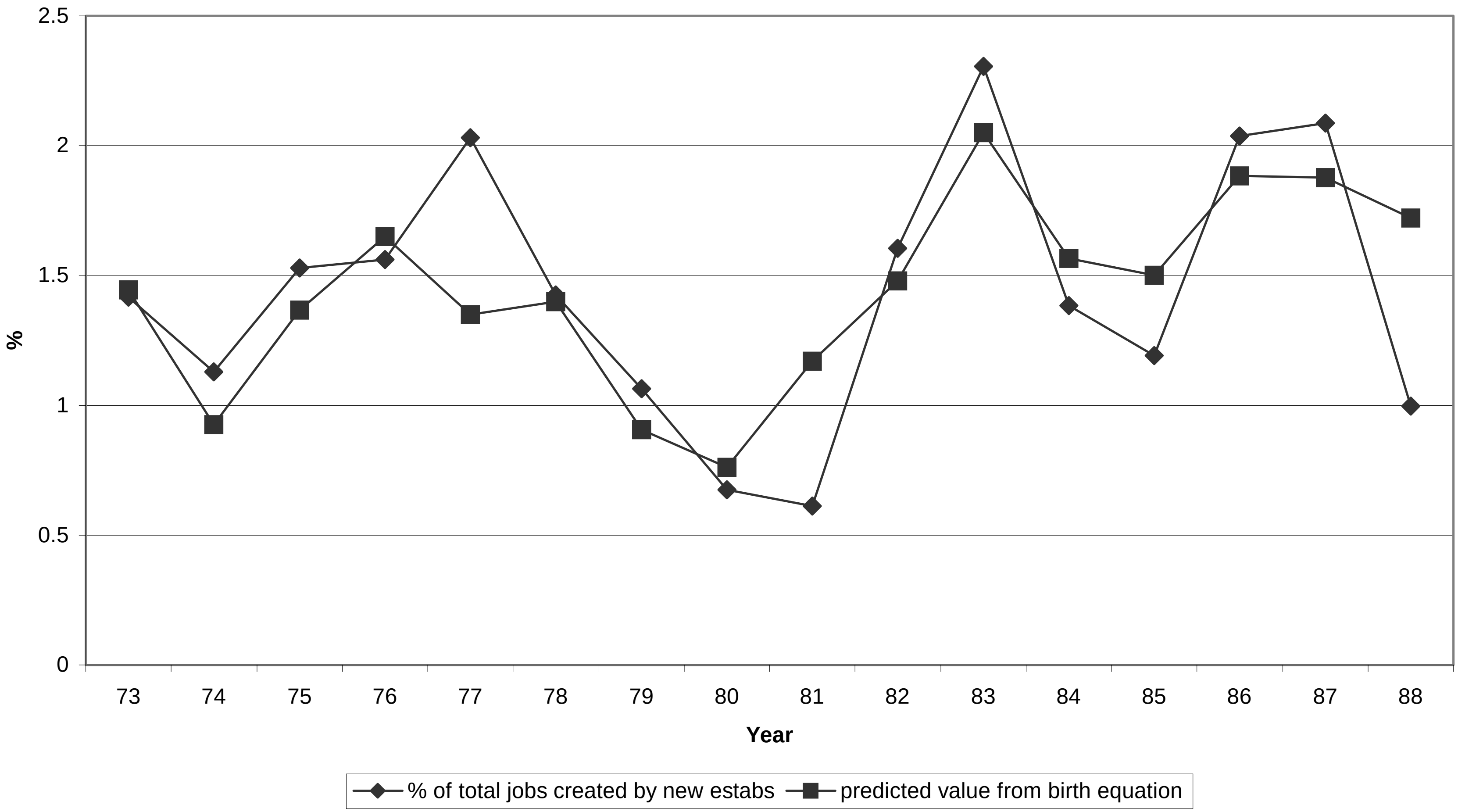

Figure 8: Percent of Manufacturing Jobs Destroyed by Dying Establishments
Predicted vs Actual Values
(model controls for % jobs destroyed by continuing estabs and real GDP growth)

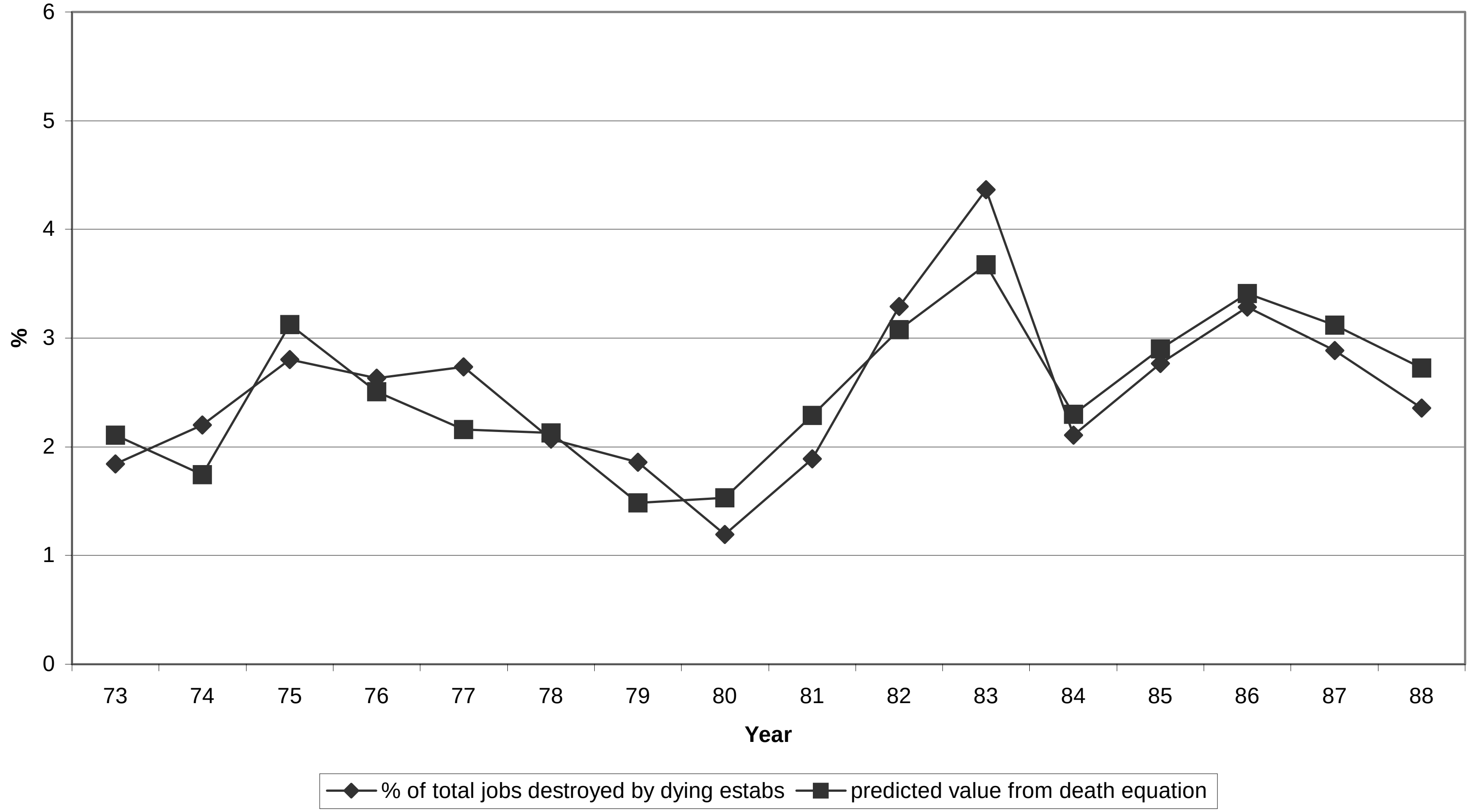

Figure 9: Averages of Predicted and Actual Percent of Jobs Created by Births (model controls for % jobs created by existing estabs, real GDP growth, fixed industry effects, and fixed region effects)

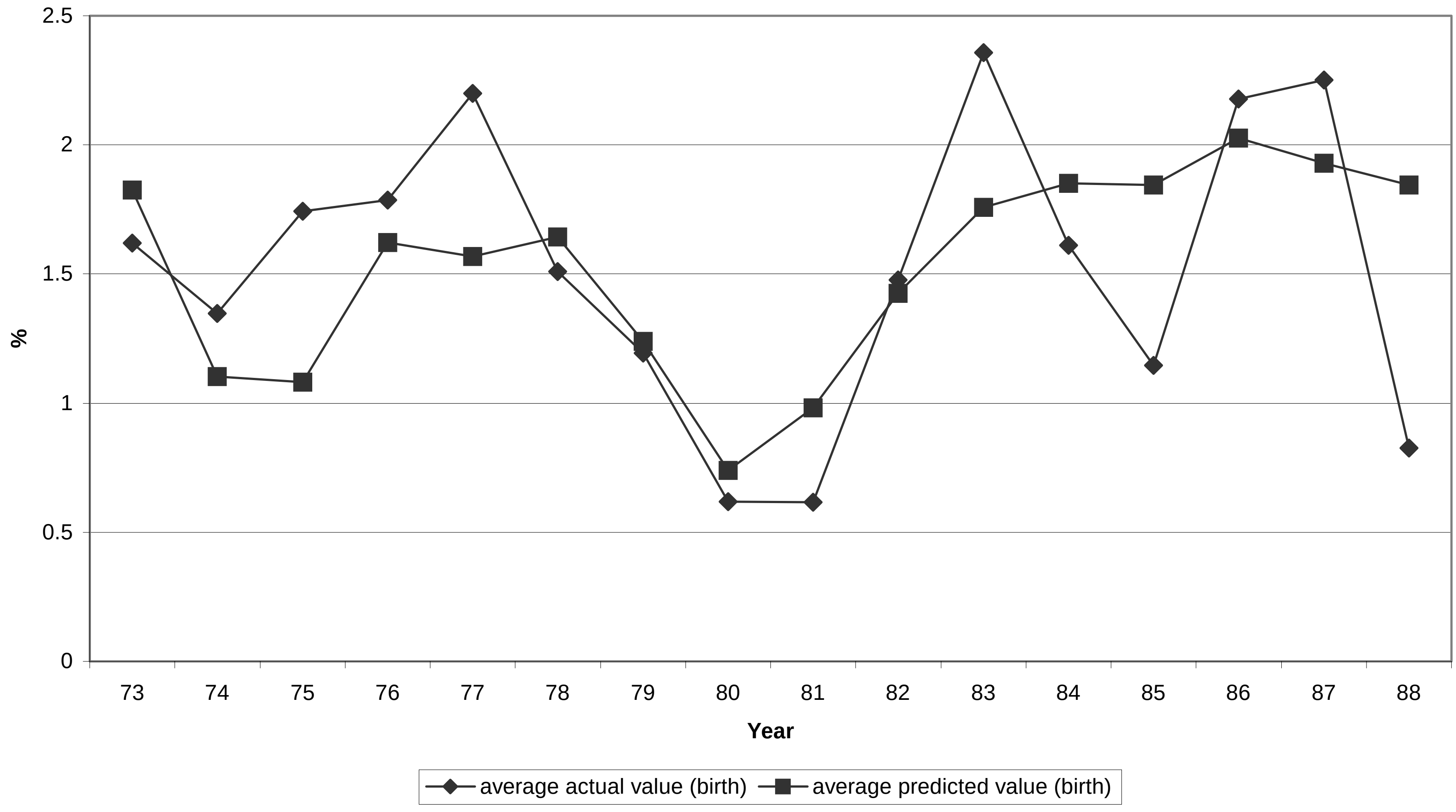

Figure 10: Averages of Predicted and Actual Percent of Jobs Destroyed by Deaths (model controls for % jobs destroyed by continuing estabs, real GDP growth, fixed industry effects, and fixed region effects)

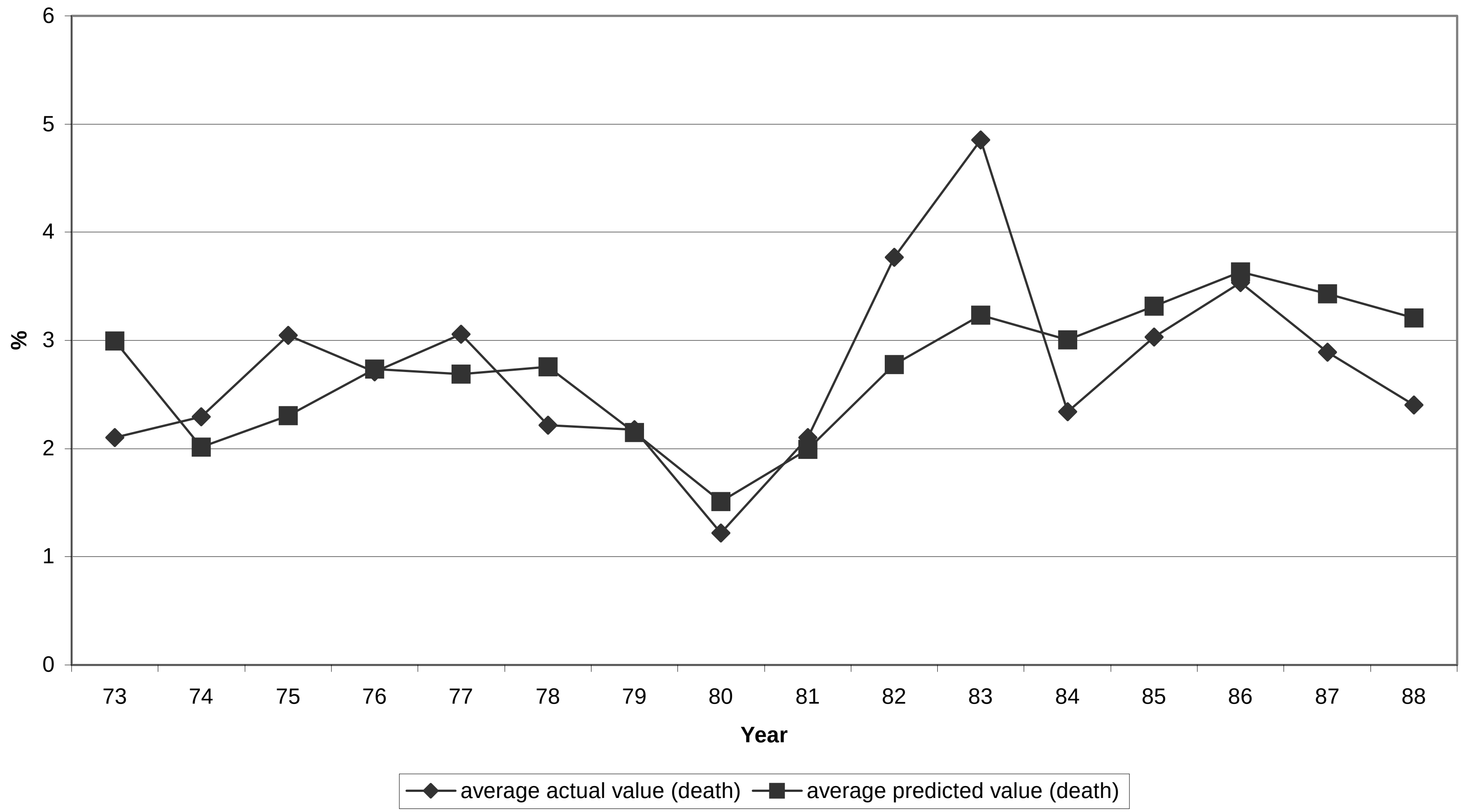

Figure 11: Averages of Predicted and Actual Percent of Jobs Created by Births (model controls for inflation, GDP growth, current through two-year lags of jobs created by existing estabs, fixed industry effects, and fixed region effects)

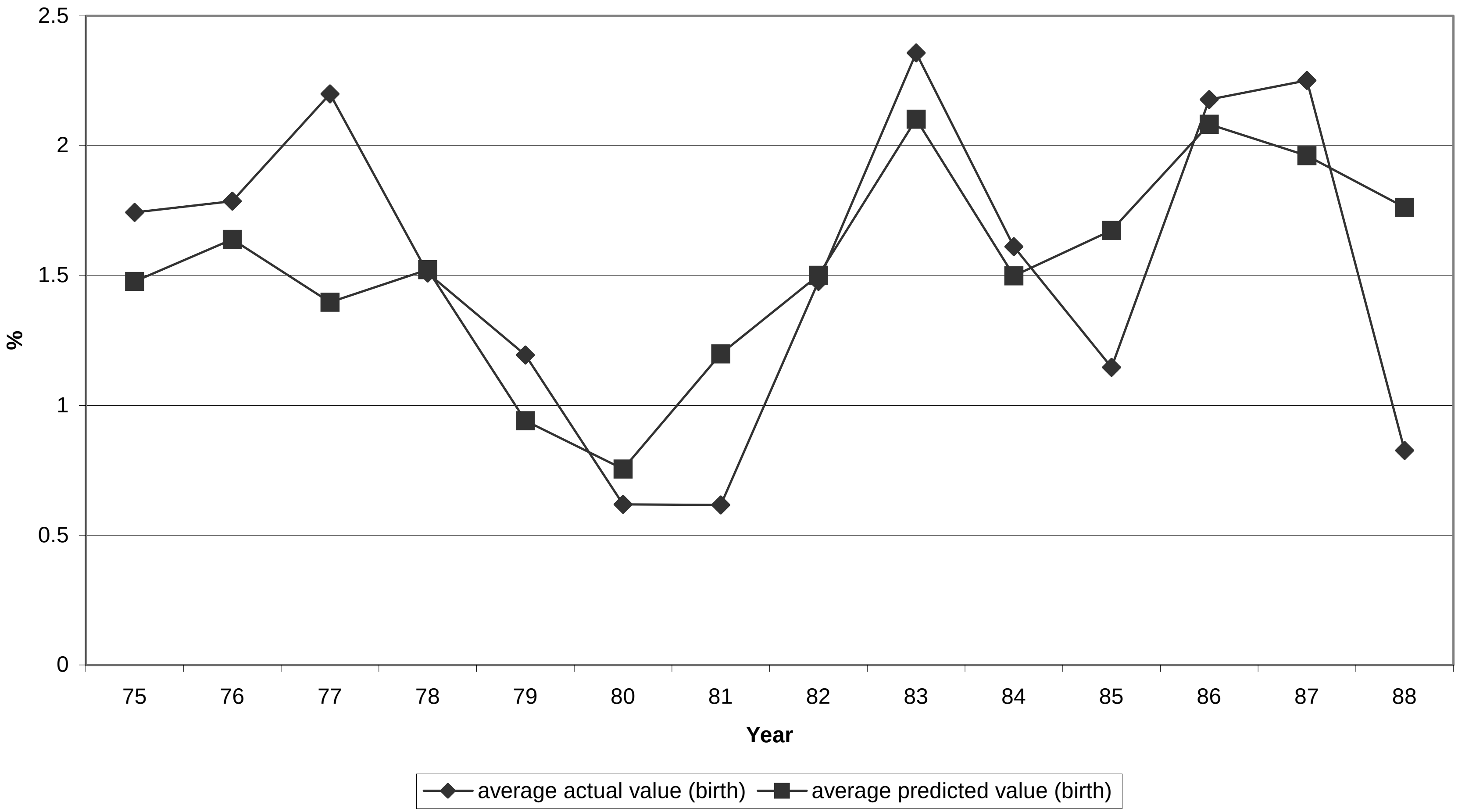

Figure 12: Averages of Predicted and Actual Percent of Jobs Destroyed by Deaths (model controls for inflation, GDP growth, current through two-year lags of jobs destroyed by continuing estabs, fixed industry effects, and fixed region effects)

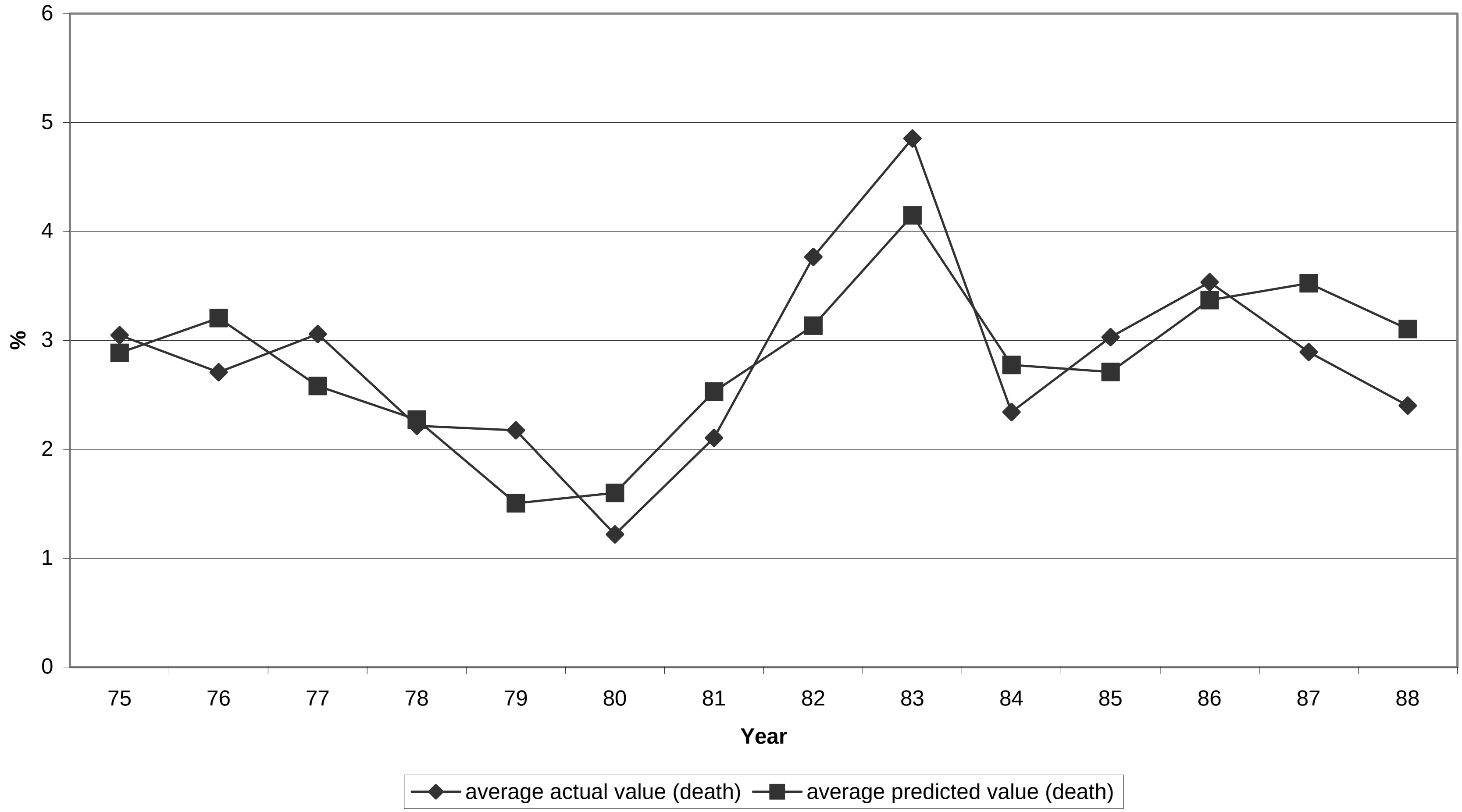

Figure 13: Inflation and Oil Prices

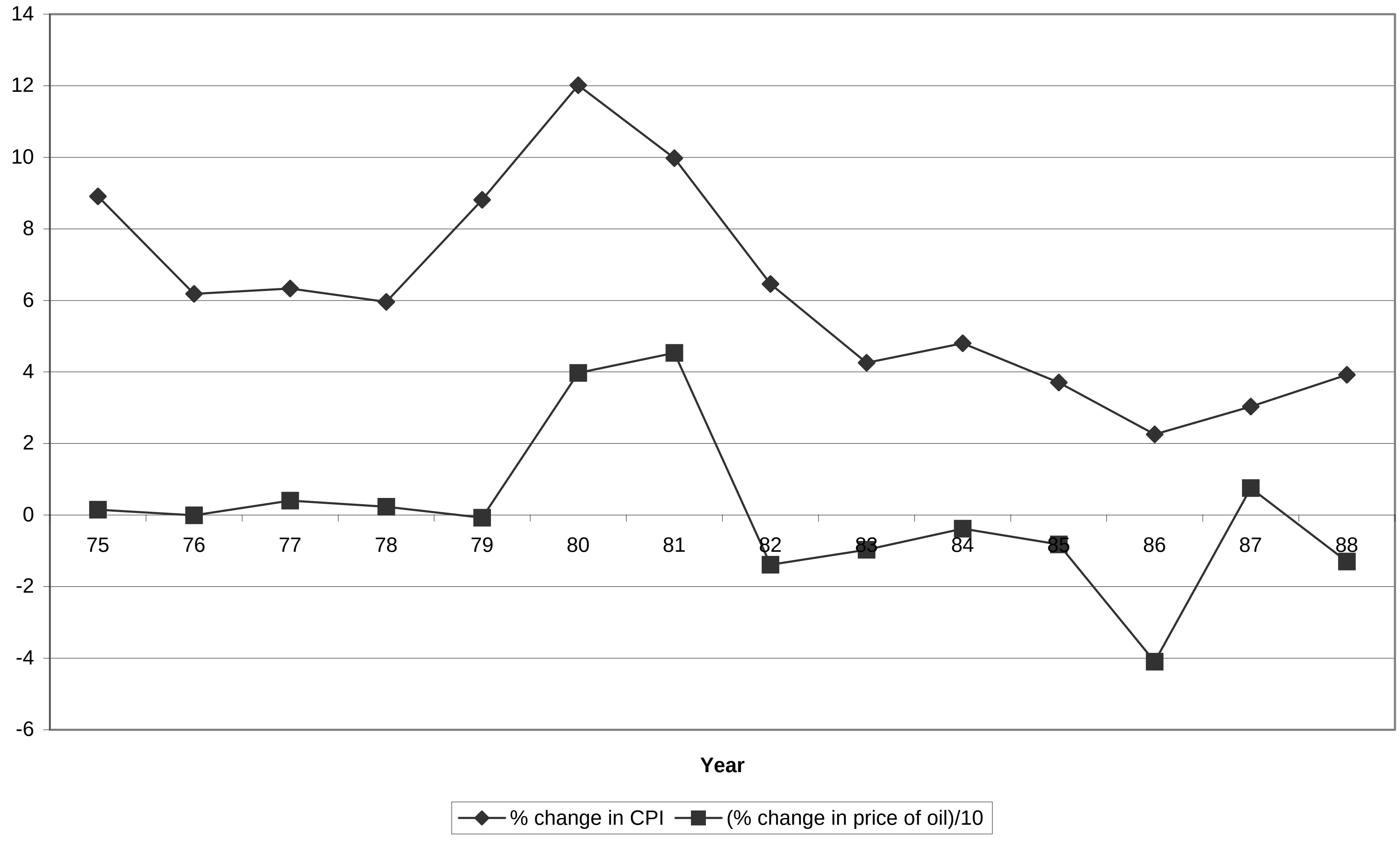

Figure 14: Inflation and Real Federal Funds Rate

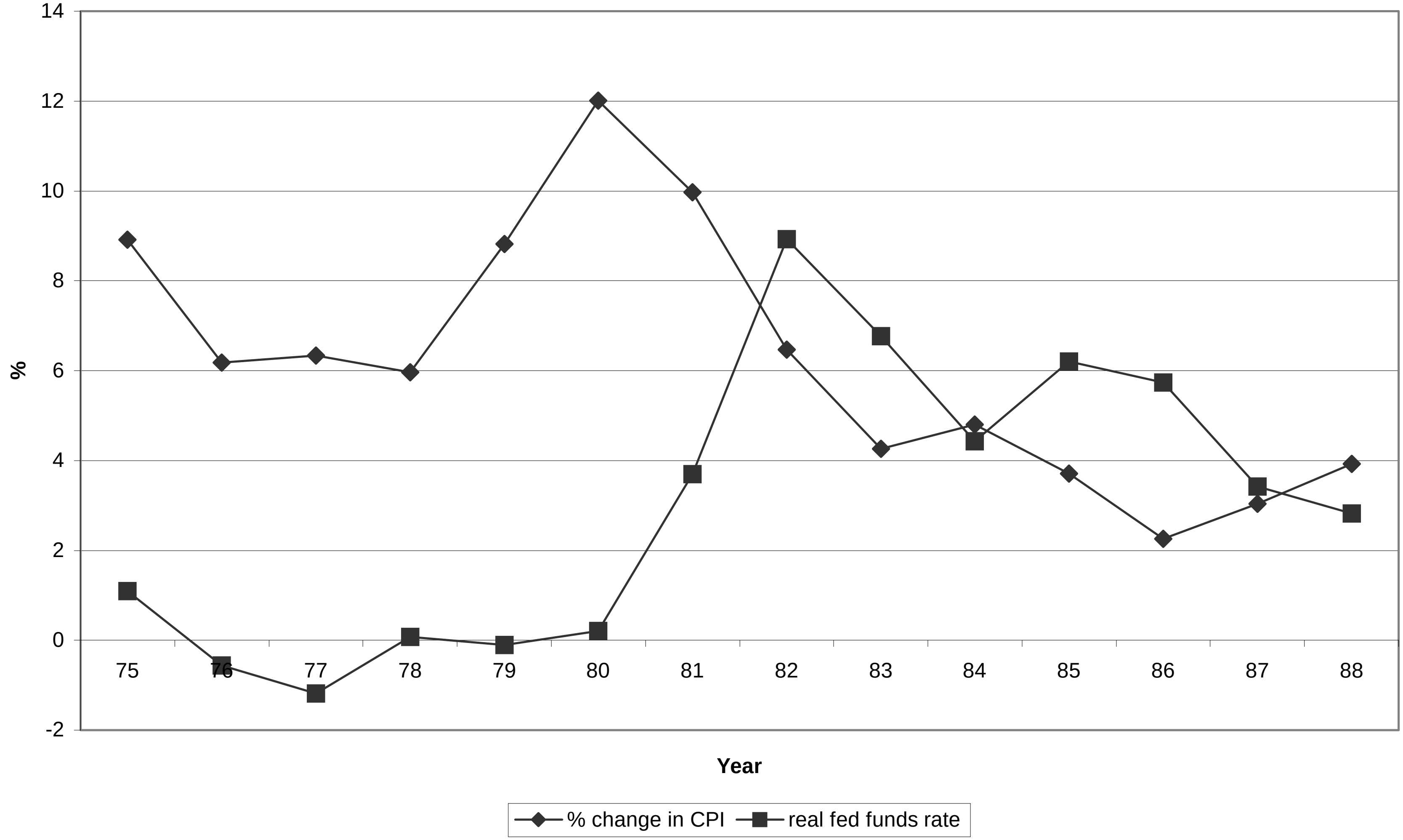

Figure 15: Inflation and Business Failures