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Sticky Prices and Monetary Policy: Evidence from Disaggregated U.S. Data*

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Abstract

This paper uses factor-augmented vector autoregressions (FAVAR) estimated using a large data set to disentangle fluctuations in disaggregated consumer and producer prices which are due to macroeconomic factors from those due to sectorial conditions. This allows us to provide consistent estimates of the effects of US monetary policy on disaggregated prices. While sectorial prices respond quickly to sector-specific shocks, we find that for a large number of price series, there is a significant delay in the response of prices to monetary policy shocks. In addition, price responses display little evidence of a "price puzzle," contrary to existing studies based on traditional VARs. The observed dispersion in the reaction of producer prices is relatively well explained by the degree of market power, as predicted by models with monopolistic competition.

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1 Introduction

In this paper, we document the effects of macroeconomic fluctuations on disaggregated prices. Whether prices are generally flexible or sticky has been for a long time the subject of considerable controversy in macroeconomics. A proper assessment of the speed of price adjustment is crucial to understand the sources of business cycle fluctuations, as well as the effects of monetary policy on the economy.

Numerous studies focusing on specific wholesale or retail items have found evidence of prices maintained fixed for several months, in the U.S.[1] Surveys of firms also suggest that a large fraction of prices remain constant for many months (Blinder, Canetti, Lebow, and Rudd, 1998). In addition, studies involving vector autoregressions (VAR) usually provide evidence of stickiness of the aggregate price level. For instance, under a wide range of identifying assumptions, following an unexpected monetary policy tightening, aggregate price indices are commonly found to remain unchanged for about a year and a half, and start declining thereafter (see, e.g., Christiano, Eichenbaum and Evans, 1999). Largely motivated by this evidence, a broad class of macroeconomic models including models used for policy analysis rests on the assumption that prices are sticky. Such models, sometimes augmented with mechanisms to increase the persistence in inflation, have been argued to replicate many features of aggregate data (e.g., Rotemberg and Woodford, 1997; Christiano, Eichenbaum and Evans, 2005; Smets and Wouters 2004), and in particular the delayed and persistent effects of monetary policy shocks on prices.

However, recent evidence on disaggregated prices series has cast doubts on the validity of existing models with price rigidities. For instance, Bils and Klenow (2004) find that disaggregated consumer prices are much more volatile than conventionally assumed in studies based on aggregate data. In fact, looking at 350 categories of consumer goods and services

[1] See for instance Carlton (1986), Cecchetti (1986), Kashyap (1995), Levy, Bergen, Dutta and Venable (1997), MacDonald and Aaronson (2001), and Kackmeister (2001).

that cover about 70% of U.S. consumer expenditure, Bils and Klenow (2004) estimate that the median time between price changes is 4.3 months.[2] The duration between price changes varies however considerably across sectors.[3] Bils and Klenow (2004) argue that sectorial inflation rates are much more volatile and short-lived than implied by simple sticky-price models. Klenow and Kryvtsov (2004) document that when prices change, they change by more than 13% on average, or by 8.5% when adjusting for temporary sales. Golosov and Lucas (2003), in turn, calibrate a menu-cost model with both aggregate and idiosyncratic shocks to match these facts, and find that monetary policy shocks have large and rapid effects on aggregate prices but only very little effect on economic activity.

The evidence about relatively flexible individual prices thus contrasts sharply with the evidence obtained from aggregate price indices. While simple sticky-price models designed to explain aggregate price behavior appear to explain poorly the behavior of more disaggregated price series, models with relatively flexible sectorial prices do not seem to explain the empirical evidence obtained from aggregate series.

How then, can the facts just laid out be reconciled? One possibility is that studies based on aggregate series mistakenly assume that prices are sticky in the face of macroeconomic fluctuations, when in fact prices adjust more frequently to changes in economic conditions. In such a case, sectorial prices would be expected to respond on average rapidly to macroeconomic disturbances such as monetary policy shocks. And they would be expected to respond more rapidly in sectors that adjust prices more frequently. Another possibility is that prices respond differently to sectorial and macroeconomic shocks. In that case, individual prices may respond rapidly and strongly to shocks specific to the particular price categories, but may be more slow to adjust to aggregate macroeconomic factors.

[2]The median duration remains below 5 months when they account for temporary sales.

[3]It ranges from less than a month (for gasoline prices) to more than 80 months (coin-operated apparel laundry and dry-cleaning). Disaggregated prices reveal similar characteristics in the Euro area, though with a lower frequency of price adjustments (see, e.g., Dhyne et al., 2005, and several other studies which are part of the Eurosystem Inflation Persistence Network).

In addition, while aggregate inflation is often argued to be persistent over long samples,[4] disaggregated series appear much more transient. Several authors have argued that the apparent persistence of aggregate inflation may reflect an aggregation bias or a structural break in the mean inflation during the sample.[5] Yet, as another possible explanation, the differences in inflation persistence at the aggregate and disaggregate level may also be due to different responses to macroeconomic and sector-specific shocks.

One limitation of the existing evidence such as that of Bils and Klenow (2004), Klenow and Kryvtsov (2004) is that while they provide a careful description of individual prices movements, they do not distinguish between sector-specific and aggregate sources of fluctuations. It thus not possible to infer from these studies whether sectorial prices respond rapidly or slowly, strongly or moderately to macroeconomic shocks. Such distinctions would however provide crucial insights on the determination of prices, hence guidance for the development of appropriate macroeconomic models.

In this paper, we disentangle the fluctuations in disaggregated U.S. consumer and producer prices which are due to aggregate macroeconomic factors from those due to sectorial conditions. We do so by estimating factor-augmented vector autoregressions (FAVAR) that relate a large panel of economic indicators and individual price series to a relatively small number of estimated common factors. This framework allows us to assess the relative importance of macroeconomic and sectorial disturbances in determining disaggregate price fluctuations. It also permits a decomposition of the persistence in inflation in terms of macroeconomic and sector-specific factors.

We then estimate the effects of U.S. monetary policy on disaggregated prices, after iden-

[4]See, e.g., Fuhrer and Moore (1995), Gali and Gertler (1999), Cogley and Sargent (2001, 2003), Sims (2001), Stock (2001), Pivetta and Reis (2003), Levin and Piger (2003), Clark (2003).

[5]Pesaran and Smith (1995) and Imbs, Mumtaz, Ravn and Rey (2005) argue that heterogeneity — across categories — in the persistence individual series may result in a large estimated persistence of the aggregate even if individual series display on average little persistence. Cogley and Sargent (2001, 2003), Levin and Piger (2003) and Clark (2003) find that inflation persistence drops when they allow for changes in mean inflation over time.

tifying monetary policy shocks using all of the information available. We study in particular the magnitude of the prices responses to monetary policy shocks, and whether monetary policy has delayed effects on prices. While extensive research has attempted to characterize the effects of monetary policy on macroeconomic indicators, little research has analyzed its effects on disaggregated prices. Two exceptions are Bils, Klenow and Kryvtsov (2003), and Balke and Wynne (2003). In these papers, the authors estimate the response of individual prices to monetary policy shock by appending individual price series to a separately-estimated VAR. They however find that individual price responses display a considerable "price puzzle", i.e., a price increase following an unexpected monetary policy tightening, which stands in sharp contrast to predictions of conventional models. As argued in Sims (1992) and Bernanke, Boivin and Eliasz (2005), such evidence of price puzzle may be indicative of VAR misspecification due, e.g., to the lack of information considered in the VAR estimation. In the context of our data-rich FAVAR, this risk of misspecification is considerably reduced, as we use all of the available information in the estimation. Consistency of our estimates is furthermore guaranteed by the fact that we estimate within the same framework the parameters describing the dynamics of the common factors and the parameters that relate the individual price series to common factors.

After documenting the responses of prices to a monetary policy shock, we attempt to provide an explanation for the cross-sectional dispersion of price responses. To this end, we collect data on industry characteristics that are related to various theories of price stickiness. In general, models that allow for imperfect competition and variable speed of price adjustment predict that firms in very competitive industries will react quickly to changes in the economic environment (see Barro, 1972). The standard workhorse monetary model with Calvo pricing assumes a fixed degree of price stickiness as measured by the probability of re-optimizing prices, so that industry characteristics do not affect this probability. Extensions of this model allow differences in probabilities of re-optimizing prices across sectors (see,

e.g., Aoki, 2003; Benigno, 2003; Woodford, 2003, Chap. 3), but these models do not explain why such differences might emerge as part of the optimizing behavior of firms. Nevertheless, in these New Keynesian models, one industry characteristic — the degree of competition — affects directly the degree of strategic complementarity (or "real rigidity" as in Ball and Romer, 1990) in price setting, and therefore the *magnitude* of price adjustments.

By referring to the costs of processing information, a relatively new literature attempts to explain why firms might keep their prices fixed for an extended period of time by (see Sims, 2003; Mankiw and Reis, 2002; Reis, 2006; Maćkowiak and Wiederholt, 2006). In particular, Reis (2006) presents a model of inattentive producers and derives some interesting implications of this class of models: (i) stickiness is higher in industries with low price elasticity of demand; (ii) costs of processing information are positively related with inattentiveness; (iii) volatility of shocks requires more frequent updating. In addition, price adjustment will be more frequent after shocks that affect marginal costs significantly. Therefore one potential source of the cross-industry dispersion in inflation rates could be that monetary policy shocks have different implications for marginal costs across industries.

Our main findings can be summarized as follows:

First, most of the fluctuations in sectorial inflation rates are due to sector-specific factors. On average, only about 15% of inflation fluctuations are due to macroeconomic factors (17% for personal consumption expenditure prices and 12% for producer prices). Thus, the relative flexibility of sectorial prices found by Bils and Klenow (2004) is to a large extent due to sector-specific disturbances. Consistent with the evidence on disaggregated price series, we also find considerable disparities in the magnitude of price changes and in the persistence of inflation across price categories, both for consumer and producer prices. These disparities are due to a large extent to differences in the volatility of sector-specific component, and only little to different responses to macroeconomic factors.

Second, fluctuations in sectorial inflation rates are somewhat persistent, but this persis-

tence is essentially due to the very high degree of persistence in the common components, and not to sector specific disturbances. While sector-specific shocks may cause large fluctuations in the individual inflation rates, these fluctuations are short-lived on average. Aggregate macroeconomic shocks instead tend to have more persistent effects on a wide range of sectorial inflation rates.

Third, in the context of our estimated FAVAR, the responses of disaggregated prices to a monetary policy shock display very little evidence of a price puzzle, in agreement with conventional economic models, but in contrast to the results routinely obtained in VAR studies. This suggests that by exploiting a large information set in the estimation, we may obtain more accurate estimates of the effects of monetary policy.

Fourth, while individual price series reveal some heterogeneity in their responses to an unexpected monetary policy tightening, a striking feature is that most indices respond very little for several months following the shock, and start falling only later.

The picture that emerges then, is one in which many prices do in fact fluctuate considerably in response to sector-specific shocks, even though, they tend to respond only sluggishly to aggregate macroeconomic shocks such as monetary policy shocks. This difference in responses to various shocks can explain why, at the disaggregated level, individual prices are found to be adjusted relatively frequently, while estimates of the degree of price rigidity are much higher when based on aggregate data. This explains why models that assume considerable price stickiness have often been successful at replicating the effects of monetary policy shocks.

Fifth, we document that responses of producer prices to monetary policy shocks are strongly correlated with the degree of imperfect competition. In more competitive industries (i.e., those with relatively low average profit rates), we observe a relatively rapid response of prices to monetary policy.

The rest of the paper is organized as follows. Section 2 reviews the econometric frame-

work, by discussing the formulation and estimation of the FAVAR. In Section 3, we discuss various data sets that we use in our estimation. Section 4 presents our empirical results including the effects of monetary policy on a very wide range of prices. Section 5 concludes.

2 Econometric Framework: FAVAR

The empirical framework that we consider is based on the factor-augmented vector autoregression model (FAVAR) described in Bernanke, Boivin and Eliasz (2005) (BBE). One of its key features is to provide estimates of macroeconomic factors that affect the data of interest, by systematically and consistently exploiting all information from a large set of economic indicators. In our application, we estimate the empirical model by exploiting information from a large number of macroeconomic indicators, as well as from disaggregated data. This framework is particularly well suited to decompose the fluctuations of each series into a common and a series-specific component. It also allows us to characterize the response of all data series to macroeconomic disturbances, such as monetary policy shocks. As BBE argue, this framework should lead to a better identification of the policy shock than standard VARs, because it explicitly recognizes the large information set that the Federal Reserve and financial market participants exploit in practice, and also because it does not require to take a stand on the appropriate measures of prices and real activity which can simply be treated as latent common components. A natural by-product of the estimation is to obtain impulse response functions for any variables included in the data set. In particular, this allows us to document the effect of monetary policy on disaggregated prices.

We only provide here a general description of our implementation of the empirical framework and refer the interested reader to BBE for additional details. We assume that the economy is affected by a vector C_t of common components to all variables entering the data set. Since we will be interested in characterizing the effects of monetary policy, this vector of common components includes a measure of the stance of monetary policy. As in most

related VAR applications, we assume that the Federal funds rate, R_t, is the policy instrument. It will be allowed to have pervasive effect throughout the economy and will thus be considered as a common component of all variables entering the data set. The rest of the common dynamics are captured by a $K \times 1$ vector of unobserved factors F_t, where K is relatively small. These unobserved factors may reflect general economic conditions such as "economic activity," the "general level of prices," the level of "productivity," which are not easily captured by a few time series, but rather by a wide range of economic variables. We assume that the joint dynamics of F_t and R_t are given by

$$C_t = \Phi(L)C_{t-1} + v_t \tag{1}$$

where

$$C_t = \begin{bmatrix} F_t \\ R_t \end{bmatrix},$$

and $\Phi(L)$ is a conformable lag polynomial of finite order d, which may contain a priori restrictions, as in standard structural VARs. The error term v_t is i.i.d. with mean zero and covariance matrix Q.

The system (1) is a VAR in C_t. The additional difficulty, with respect to standard VARs, however, is that the factors F_t are unobservable. We assume that the factors summarize the information contained in a large number of economic variables. We denote by X_t this $N \times 1$ vector of "informational" variables, where N is assumed to be "large," i.e., $N > K + 1$. We assume furthermore that the large set of observable "informational" series X_t is related to the common factors according to

$$X_t = \Lambda C_t + e_t \tag{2}$$

where Λ is an $N \times (K + 1)$ matrix of factor loadings, and the $N \times 1$ vector e_t contains (mean-zero) sector-specific components that are uncorrelated with the common components C_t.

These sector-specific components are allowed to be serially correlated and weakly correlated across indicators. Equation (2) reflects the fact that the elements of C_t, which in general are correlated, represent pervasive forces that drive the common dynamics of X_t. Conditional on the observed Federal funds rate R_t, the variables in X_t are thus noisy measures of the underlying unobserved factors F_t. Note that it is not restrictive to assume that X_t depends only on the current values of the factors, as F_t can always capture arbitrary lags of some fundamental factors.[6]

To estimate the system (1) – (2), we follow the two-step principal component approach described in BBE. In the first step, the space spanned by the common components, C_t, is estimated using the first $K+1$ principal components of X_t. While the estimation does not exploit the fact that R_t is observed, Stock and Watson (2002) show that the principal components consistently recover the space spanned by both F_t and R_t, when N is large and the number of principal components used is at least as large as the true number of factors. In the second step, a structural VAR is estimated on these common components, after imposing that R_t is one of the common components.

This procedure has the advantages of being computationally simple and easy to implement. As discussed by Stock and Watson (2002), it also imposes few distributional assumptions and allows for some degree of cross-correlation in the idiosyncratic error term e_t. Boivin and Ng (2005) document the good forecasting performance of this estimation approach compared to some alternatives.[7]

[6] This is why Stock and Watson (1998) refer to (2) as a dynamic factor model.

[7] Note that this two-step approach implies the presence of "generated regressors" in the second step. According to the results of Bai (2002), the uncertainty in the factor estimates should be negligible when N is large relative to T. Still, the confidence intervals on the impulse response functions reported below are based on a bootstrap procedure that accounts for the uncertainty in the factor estimation.

3 Data

The data set used in the estimation of our FAVAR is a balanced panel of 653 monthly series, for the period running from 1976:1 to 2005:6. All data have been transformed to induce stationarity. The details for this data set, as well as the transformation applied to each particular series, are in Appendices A – D. The data set includes 111 updated macroeconomic indicators used by BBE, and listed in Appendix A, which involve several measures of industrial production, various price indices, interest rates, employment as well as other key macroeconomic and financial variables. These indicators have been found to collectively contain useful information about the state of the economy for the appropriate identification of monetary policy. We expanded the data set of BBE in two directions.

First, we appended disaggregated data published by the Bureau of Economic Analysis on personal consumption expenditure (PCE). Specifically, we collected 335 series on PCE prices and an equal number of series on real consumption. Among these series, 35 price series and 35 real consumption series were removed because of missing observations. In order to capture data for all expenditures reported, we removed the other series in the same categories and retained the series at the immediately higher level of aggregation. However, we removed from our data set aggregate price and real consumption series (except for overall aggregates), so as to count only once each category in the disaggregated data. We thus ended up with 191 disaggregated PCE price series and the 191 corresponding consumption series. At the level of disaggregation considered, we have for instance data on new domestic autos, bicycles, jewelry and watches, shoes, cereals, taxicabs, and so on. In addition, we also included 4 price indices and 4 consumption aggregates (overall PCE, durable goods, nondurable goods, and services). Further details on these series are provided in Appendix B.

Second, in order to obtain a more detailed picture of the characteristics of price responses, we also collected over 600 series for producer prices at the 6-digit level of NAICS codes (corresponding to 4-digit SIC codes). Because of changes in definitions and data coverage,

we managed to obtain only 154 series for a longer period starting in January 1976 and ending in June 2005. Appendix C provides a brief description of these series.

Besides the series just described, which we used to estimate the FAVAR, we also collected data on industry characteristics, which could help us validate or reject assumptions underlying models of price determination. We start first with the C4 ratio provided by the Bureau of the Census. This ratio reports the percentage of total sales attributable to the four largest firms in the industry. As yet another measure of competition we use also data on average gross profit rates from the Annual Survey of Manufacturing. This data is available on an annual basis from 1997 to 2001. The cross-sectional industry data is described in Appendix D.

4 Empirical Evidence on Disaggregated Prices

We estimated the system (1) – (2) for the period 1976:1- 2005:6, using the data just described, and assuming 5 latent factors in the vector F_t. We experimented with more factors, but none of our conclusions were affected. We used 13 lags in estimating (1). The estimated system allows us to analyze the sources of fluctuations in sectorial inflation rates. Note that for all of the price series considered (2) implies that

$$X_{it} = \lambda_i' C_t + e_{it}, \tag{3}$$

where X_{it} contains the monthly log change in the respective price series. This formulation allows us to disentangle the fluctuations in sectorial inflation rates due to the macroeconomic factors — represented here by the common components C_t which have a diffuse effect on all data series — from those due to sector specific conditions represented by the term e_{it}. It also allows us to study to what extent the persistence in sectorial inflation rates is due to macroeconomic or sectorial shocks. Note that since C_t is a vector which may contain elements

with very different dynamics and the vectors of loadings λ_i may differ across sectors, each sector-specific inflation rate may have different dynamics in response to macroeconomic disturbances. Recall also, that the sector-specific terms e_{it} are allowed to be serially correlated and weakly correlated across sectors.

4.1 Sources of fluctuations and persistence

Table 1 reports various summary statistics on the volatility and the persistence of both aggregate and disaggregated monthly inflation series. As is indicated in the first column, the standard deviation of aggregate inflation amounts to 0.24% for the overall PCE series, and ranges between 0.24% and 0.33% for the inflation rates of durable goods, nondurable goods and services. Most of the volatility in aggregate inflation is due to fluctuations in common macroeconomic factors. In fact, the R^2 statistic, which measures the fraction of the variance in inflation explained by the common component $\lambda_i' C_t$ lies above 0.5 for all of the aggregate measures.

The picture is however quite different for more disaggregated inflation series. As the lower panel of Table 1 shows, disaggregated inflation series have been on average much more volatile than aggregate series. On average (across sectors), the standard deviation of monthly inflation has been 1.15% for all price series considered (0.98% for PCE inflation and 1.36% for PPI inflation).[8] As the columns two to four reveal, most of the inflation volatility is however due to sector-specific disturbances. In fact while the mean volatility of the common component to inflation lies at 0.33%, the volatility of the sector specific component is more than three times as large. The results are roughly similar for PCE and PPI inflation rates. As a result, the R^2 statistic amounts to 0.15 on average (0.17 for PCE and 0.12 for PPI).

Table 1 also reveals a considerable amount of heterogeneity across sectors in the volatility

[8] The average volatility of disaggregated PCE inflation series, weighted with expenditure shares, is somewhat lower than the unweighted average, but the overall picture remains the same for the volatility as well as for other statistics described below.

of disaggregated inflation series. Whereas some series such inflation of tenant-occupied rent fluctuate even less than the inflation rate of the aggregate index, some such as the consumption category "insurance for other user-operated transportation" or the production category "other oilseed processing" have monthly standard deviations of close to 10%. This heterogeneity is due to a large extent to differences in the volatility of sector-specific conditions. It is due much less so to differences in the response to macroeconomic fluctuations. As the sector-specific components tend to cancel each other out, inflation in the aggregate price indices ends up being less volatile than most sector-specific inflation rates.

One interesting fact revealed by Figure 1 is that the volatility of the common and the sector-specific components to inflation are strongly positively correlated across sectors. Sectors that experience volatile inflation rates due to changes in sectorial conditions are also sectors that experience a volatile inflation rate in response to changes in aggregate conditions. Several explanations can rationalize this fact. One possible explanation is that firms which adjust their prices frequently due to large sectorial shocks, may take the opportunity of changing their price to respond also to changed macroeconomic conditions.

One characteristic of aggregate inflation often discussed is its persistence. To assess the degree of persistence, we fit for each inflation series X_{it} and each of its components, $\lambda_i' C_t$ and e_{it} an AR(p) process, of the form

$$w_t = \rho(L)\, w_{t-1} + \varepsilon_t$$

where the lag-length p is selected on the basis of BIC, and we measure the degree of persistence by the sum of the coefficients on all lags, $\rho(1)$. Not surprisingly, as we report on Table 1, fluctuations in aggregate inflation are persistent with a measure $\rho(1)$ close to 0.7 for the PCE inflation rate, and ranging between 0.44 and 0.59 for the three main components of PCE inflation. This measured persistence likely suffers from an upward bias. In fact, as argued in Pesaran and Smith (1995) and Imbs, Mumtaz, Ravn, and Rey (2006), the

estimated persistence is likely biased upward when the components of the aggregate index display heterogenous dynamics, and the persistence of the individual series and their variance are positively correlated. Another possible source of bias has to do with a possible change in mean inflation during the sample.

As Clark (2003) noted, the sectorial inflation series display much less persistence than the aggregated series over the long sample. Similarly, Altissimo, Mojon and Zaffaroni (2004) who estimated a factor model on disaggregated CPI inflation series in Europe also found that inflation rates of individual categories are on average more volatile and less persistent than the aggregate inflation rate, and display widespread heterogeneity across categories. In our data set, the persistence is 0.15 on average over all sectors (0.16 for PCE inflation and 0.14 for PPI inflation). The inflation persistence varies importantly across sectors. While it is negative for some producer and consumer prices, it gets as large as 0.8 for the "health insurance" category of "worker's compensation" and for "rental value of farm dwellings." Interestingly, while the inflation persistence is in some cases due to series-specific factors, such as in the categories just mentioned, the inflation persistence is for most series due to fluctuations in common factors in the economy. In fact, while the average persistence of the common components reaches 0.79, the individual components display on average almost no persistence. There is however considerable heterogeneity in the persistence of the sector-specific component across sectors.

Overall these results suggest that there is a much higher volatility of sectorial inflation rates than of aggregate inflation rates, and that changes in sector-specific conditions are the most important determinants of sectorial inflation rates. Fluctuations in the common components, however, are responsible for a significant fraction of the volatility of sectorial inflation rates, and generate most of the fluctuations in aggregate inflation. In addition, the persistence in sectorial inflation is essentially due to the very high degree of persistence in the common components, and not to sector specific disturbances. While sector-specific

shocks may cause large fluctuations in sectorial inflation, these fluctuations are typically short lived. Aggregate macroeconomic shocks instead tend to have more persistent effects on a wide range of sectorial inflation rates.

4.2 Effects of monetary policy shocks

Prices may change for all sorts of reasons, including changes in costs, in productivity, or changes in demand for goods. While Bils and Klenow (2004) and Klenow and Kryvtsov (2005) provide very valuable evidence that most prices are changed relatively frequently, and on average by large amounts, their study does not identify the source of these changes. It is therefore not clear from these studies whether prices which tend to change frequently and by large amounts — e.g., due to large and frequent changes in sector specific conditions — also change readily to macroeconomic shocks. Clarifying this issue is particularly relevant to understand the effects of monetary policy. If fact, if prices were adjusting rapidly to monetary shocks, monetary policy would have little and only short-lived effects on economic activity, as in the model of Golosov and Lucas (2004). Our paper thus complements Bils and Klenow's (2004) study by documenting when and by how much various prices are changed following a monetary policy shock.

Since Bernanke and Blinder (1992) and Sims (1992), it is common to use VARs to trace out the effects of monetary policy innovations on macroeconomic variables. VARs are particularly convenient for this as they merely require the identification of monetary policy shocks, leaving the rest of the macroeconomic model unrestricted. To maintain enough degrees of freedom, estimated VARs are typically low-dimensional, involving in general no more than six to eight variables.[9] The small size of traditional VARs has however been criticized. In fact estimated monetary policy innovations are likely to be biased in small-sized VARs to the extent that central banks and the private sector make decisions on the basis of information

[9] Leeper, Sims and Zha (1996), using Bayesian priors consider slightly larger VARs containing up to about 20 variables.

not considered in these VARs. A common illustration of this problem is the "price-puzzle", i.e., the finding that the price level tends to increase slightly after a contractionary money policy shock, which contradicts most standard theories (see Sims, 1992). Another problem with small-sized VARs is that they don't allow us to understand the effects of monetary policy shocks on a large number of variables of interest.

Fortunately, as argued in BBE, the FAVAR described above allow us to address both of these shortcomings of traditional VAR. BBE provide a characterization of the effects of monetary policy on about twenty macroeconomic variables using estimated factors. In this paper, we focus on the effects of monetary policy on our large panel of prices, in order to understand their response to monetary shocks.

4.2.1 Identification of monetary policy shocks

To identify the monetary policy shock, we follow the strategy described in BBE. The assumption is that none of the latent common components of the economy responds within a month to unanticipated changes in monetary policy. This is the FAVAR extension of the standard recursive identification of monetary policy shock in standard VARs. To implement it in a FAVAR, we need to account for the added difficulty that the principal components are not associated with any particular economic concepts. However, when the number of data series N is large, the principal components estimated from the entire data set, $\hat{C}(F_t, R_t)$, have the property that they should consistently recover $K+1$ independent, but arbitrary, linear combinations of the latent factors F_t and the observed common factor, i.e., the Federal funds rate R_t. Since R_t is not explicitly imposed as a common component in the first step, any of the linear combinations underlying $\hat{C}(F_t, R_t)$ could involve the Fed's policy instrument, R_t. It would thus not be valid to simply estimate a VAR in $\hat{C}(F_t, R_t)$ and R_t, and identify the policy shock recursively. Instead, the direct dependence of $\hat{C}(F_t, R_t)$ on R_t must first be removed, which is achieved by exploiting a subset of the variables — prices and real-activity

measures, but not financial variables — that are assumed not to respond within the month to changes in monetary policy. We refer the reader to BBE for the precise details on the implementation of the identification.

4.2.2 Empirical results

We proceed with a description of the response of our data series to a monetary policy shocks, i.e., an unexpected increase (of one standard deviation) of the Federal funds rate. Figure 2a shows the response of the Federal funds rate, the index of industrial production — as an aggregate measure of economic activity —, and an aggregate price index (PCE deflator). The solid line shows the responses generated by our FAVAR and the dashed lines show the responses obtained from a standard VAR that include these three variables only.[10] Figure 2b shows similar impulse responses except that the VAR is estimated using the consumer price index (CPI) instead of the PCE deflator.

One important feature of this figure is that the responses of the price index and industrial production are very different for the FAVAR and the VAR. The VAR displays a price puzzle and a large effect of monetary policy on industrial production after four years, which is inconsistent with long-run money neutrality. The price puzzle is especially important for the VAR using the CPI data, in Figure 2b. Instead the FAVAR displays a more conventional response of industrial production, and essentially no response of the price index for the first few months following a monetary policy shock. As discussed in BBE, since the FAVAR nests the VAR specification, this suggests that the FAVAR is able to exploit the relevant information from the data set, that Sims (1992) argued may be missing from small-sized VARs. Note that if the additional series added to the dataset were irrelevant, they should not bias the estimated response, but they should rather result in less precise estimates. As a result, the fact that the responses of the price index and the industrial production are different for both specifications suggests that the FAVAR is exploiting relevant information,

[10] The VAR includes 13 lags as is the case for the estimated equation (1) in the FAVAR.

especially for the CPI data, in Figure 2b.

We now turn to the responses of more disaggregated price series to the monetary policy shock. The FAVAR is perfectly suited for such an exercise as it allows us to compute directly the responses of all of the variables in the data set. The Figures 3a-3h show the responses of the disaggregated price indices. (For lack of space we didn't include in this figure all of the PCE price responses; we present only the responses constructed for the higher level aggregates; the responses of the most disaggregated series look similar and are all reported on the Figure 4, which we discuss below). As can be seen from the first row of plots in Figure 3a, the aggregate prices of nondurable goods and services show little response for several months following the shock, and then fall progressively. The prices of durable goods however start falling more rapidly than nondurables and services, a fact noted by Erceg and Levin (2002) and Barsky, House and Kimball (2003), and attributed to the greater interest-rate sensitivity of durable goods. These price indices do not reveal a price puzzle.

Looking at the other, more disaggregated price responses, while we observe some heterogeneity in the responses, a striking feature is that most indices respond very little for several months following the shock, and start falling only later. In addition, only very few sectors display an important price puzzle. Recall that in order to identify the monetary policy shock, we assume that individual prices do not respond within the same month to changes in the Federal funds rate. However nothing in the estimated FAVAR constrains the response of price series in all months following the monetary policy shock. We report in Figures 3c-3i the responses of PPI components to the same monetary policy shock. As for consumer prices, most components of the PPI respond only several months after the monetary policy shock.

Figure 4 summarizes the price responses. The left panels of the figure report on the same graph all of the disaggregated price responses to the monetary shock, along with the unweighted average response (thick solid line) and the response of the overall price index (thick dashed line). It is interesting to note that the average price responses to a

monetary shock and the response of the aggregate price indices are very similar. Studies such as Carvalho (2006) suggest that these responses may in principle be very different in the presence of heterogeneity across sectors. The figure makes it clear that most of the disaggregated prices move little in the 6 months following the monetary shock, and start decreasing thereafter. As reported in Table 2, the cumulative decline in prices is only 0.03% over the first 6 months, but reaches 0.28% when cumulated over the first 12 months. The drop in prices is more pronounced for producer prices with a cumulated decline of 0.56% over the first year than for consumer prices (cumulated decline of 0.05%). When they start falling following the monetary shock, prices tend to decline fairly steadily for a couple of years. This results in quite a persistent inflation rate. As reported in Table 2, the autocorrelation coefficients of inflation conditional on a monetary shock are well above 0.5 on average.

To the extent that one is interested in characterizing the behavior of the economy in response to monetary policy actions, our results provide empirical support for features such as price rigidities and inflation persistence often embedded in monetary models. Our findings, however, contrast sharply with those of Bils, Klenow, and Kryvtsov (2003) and Balke and Wynne (2003) which call for a rejection of conventional sticky-price models. These authors found the opposite conclusion mainly because they estimate an important price puzzle.

Bils, Klenow, and Kryvtsov (2003) estimate the responses of 123 components of the CPI to a Federal funds innovation, where the latter innovations are extracted from a 7-variable monthly VAR. As the VAR is estimated independently from the disaggregated price data, the responses obtained constitute only a rough estimates of the price responses. Based on frequencies of price adjustments reported in Bils and Klenow (2004), they consider two categories of price responses — the flexible price and sticky price categories — and they report the responses of the prices in both categories as well as their ratio. They argue that the movements in relative prices are inconsistent with a popular sticky-price model. Following an expansionary monetary policy shock, their estimated relative price (of flexible

prices relative to sticky prices) declines initially and then increases, while in the model, the relative price increases temporarily before reverting back to zero. However, the main reason for their finding of an unconventional relative price response in the data, is related to the fact that their estimate of flexible-price responses display a price puzzle: the flexible prices fall initially, in response a monetary policy expansion, and increase only later. In contrast, sticky prices do not show significant dynamics in the first 20 months.

Balke and Wynne (2003), instead, focus on components of the producer price index. After estimating a small-sized VAR and the response of components of the PPI to an identified monetary policy shock, they also find a substantial price puzzle in individual series, and thus conclude similarly to Bils, Klenow and Kryvtsov (2003) that the implied estimated evolution of relative prices in inconsistent with that predicted by sticky price models.

These studies make two key assumptions about the behavior of the macro-economy: i) that the macroeconomic dynamics can be properly uncovered from a small set of macroeconomic indicators, and ii) that macroeconomic dynamics can be modeled separately from the disaggregated prices. Based on the results of BBE, and as argued above, the first assumption does not seem to be empirically valid and could be responsible for finding a price puzzle. The second assumption implies that disaggregated prices only have an effect on the macroeconomy through an observed aggregate index. The FAVAR framework that we consider in this paper relaxes these two assumptions as it allows us to incorporate more information in the estimation of the macroeconomic dynamics, and to model the disaggregated dynamics in a more flexible fashion. Interestingly, in contrast to these studies, we don't find any evidence of price puzzle in our estimated FAVAR. This implies that the ratio of flexible to sticky prices behaves as predicted by sticky price models.

While disaggregated prices appear to respond with a long lag to monetary policy shocks, and then decline steadily for a while, these prices respond sharply and very promptly to sector-specific disturbances, and tend to reach their new equilibrium level shortly after the

shock. This can be seen from the two right panels of Figure 4 which report the (log) price level responses to an adverse sector-specific shock, i.e., a drop in e_{it} by one standard deviation. Inflation rates in response to the sector-specific shock show no persistence, in contrast to the response to monetary shocks. In fact, most prices reach their new level rapidly, following a sector specific shock. Our analysis does not allow us to uncover the structural disturbances that affect sectorial prices, so that we cannot disentangle to what extent the differences in responses to monetary shocks and sector specific shocks are attributable to the shocks themselves and to the price responses to these shocks. These results do however suggest that prices respond differently to macroeconomic shocks (such as monetary policy shocks) and to sector specific shocks.

4.3 Sectorial Results

This section is organized in the following way: First we summarize the cross-sectional results from the FAVAR both for PCE deflators and for PPI. We emphasize several important results. Then we report the regression of PPI impulse responses on various industry characteristics, including some of those derived from the FAVAR.

4.3.1 Correlation matrices from FAVAR

In Tables 3, 4, and 5 we report the correlation matrices for key statistics from the FAVAR analysis. In the first table we calculate correlations by using both PCE deflators and PPI data, and the next two focus on PCE and PPI data separately.

Volatility of common and sectorial components. Not surprisingly, the volatility of inflation is correlated both with the volatility of sectorial inflation shocks and with the volatility of the common components. As we documented in Figure 1, there is also a very high correlation between the volatility of idiosyncratic shocks (*Sd(ei)*) and the volatility of

the common component (*Sd(com)*). This correlation is high both for PCE deflators (0.70) and for PPI data (0.76). From a statistical point of view, there is no reason to expect that the portion of inflation volatility explained by the regression (common component) and the portion of inflation volatility explained by the error terms should be correlated across industries (or samples). Therefore, Figure 1 presents an interesting result that requires structural interpretation. It might be useful to note that the inflation variance explained by the macroeconomic factors depends on the loadings represented by the matrix Λ. One interpretation is that these loadings reflect the price setting behavior of firms in various industries. Under this interpretation, Figure 1 reveals that firms in industries with volatile idiosyncratic shocks do also respond strongly to macroeconomic shocks. As we mentioned, this is the case if frequent price adjustments necessitated by idiosyncratic volatility are also used as an opportunity to adjust to changes in the macroeconomic environment. An alternative interpretation might be that industries with significant inherent volatility are riskier so that the degree of asymmetric information between firms and lenders is more acute (since it is more difficult for lenders to determine the state of the world). In this case, more idiosyncratic volatility should make firms more vulnerable to changes in monetary policy, which is known to affect the wedge between internal and external financing (e.g. Bernanke and Gertler, 1995). In any case, the correlation is too strong to be ignored. Furthermore, it is suggestive of what price-setting assumptions might be more consistent with the data.

Persistence and volatility. As Bils and Klenow (2004) emphasize, one of the predictions of the sticky-price models such as the Calvo model is that a higher degree of price stickiness reduces the impact of exogenous shocks on current inflation, but that it increases the persistence inflation. Thus everything else equal, in sectors with high price stickiness, the inflation rate should display a relatively low volatility and a relatively high persistence. Bils and Klenow (2004) argue that models such as the Calvo model are importantly rejected by the data as they predict a strong negative correlation across sectors between the frequency of

price adjustment and the persistence in sectorial inflation, while this correlation is positive in their data covering 123 consumer goods over the period 1995-2000, and only mildly negative in their longer data set.

While we do not have estimates of the frequency of price adjustment, as in Bils and Klenow (2004), we can nevertheless look at the correlations of inflation volatility and inflation persistence across sectors in our data set. Similarly to Bils and Klenow, we find only a weak negative correlation of -0.10 between the standard deviation of sectorial inflation and its persistence. As Table 3 indicates, the fact that this correlation is only weakly negative is due to a positive correlation between volatility and persistence in the sector-specific component of inflation. Once we look at the common component of inflation, however, the persistence and the volatility of inflation are much more negatively correlated. This suggests that sticky-price models such as the Calvo model may have a chance at replicating broadly the volatility and persistence of inflation fluctuations generated by macroeconomic disturbances. Such models however, do not seem to be able to replicate these statistics for inflation fluctuations generated by sector-specific shocks.

Cumulated impulse responses and volatility of sectorial shocks. Another set of interesting correlations pertains to the cumulative sum of the impulse responses to a monetary shocks over the first 6 months (*sum6*) and over the first 12 months (*sum12*). Not surprisingly the two series are highly correlated with each other. In part this is due to the fact that *sum6* is part of *sum12*, but we will see below that the correlation holds also between the first six and the next six months. Two striking results are the correlations of the cumulative sums (in the last two columns) with the volatility (*Sd(ei)*) and persistence of idiosyncratic shocks (*rho(idio)*). To interpret these correlations, we should point out that the sums of impulse responses are calculated for a contractionary monetary policy and therefore more negative numbers imply more price flexibility, i.e. faster price adjustment.

Starting with the volatility of the idiosyncratic shock, we note from Table 3 that there

is a significantly negative correlation between the cumulated price response over the first 6 months and the volatility of the idiosyncratic shock. This is further illustrated Figure 5a: in sectors with small enough sectorial shocks there is almost no price response to monetary shocks over the first 6 months. However the larger the sector-specific volatility the higher the price responses to monetary policy shocks. This result confirms the interpretation of Figure 1, that industries with high inherent volatility adjust faster to macroeconomic disturbances.

Although there is still negative relationship between the volatility of sector-specific shocks and the cumulated price responses after the first six months, this correlation is dampened. This is revealed clearly by Figures 5b and 5c which show regression lines with intercepts that are significantly negative, but with the slopes that are not significantly different from zero.

Similarly, we note that from Tables 3 – 5 that the persistence of the idiosyncratic shocks is again negatively related to the responses of prices to monetary policy shocks. One possible interpretation is that in industries where we observe more persistence of the idiosyncratic component, firms adjust immediately to *any* shock because both common and idiosyncratic components are persistent. Those firms that experience rather transient idiosyncratic shocks wait to see if the current shock is persistent (macroeconomic) or not (idiosyncratic) and adjust only with a delay. Of course, these are raw correlations and it is not clear whether any of these relationships will remain significant after controlling for example for the degree of competition in the industry. Accordingly, we turn now to regression analysis.

4.3.2 Cross-sectional variation in the producer price indices

For the producer price series we have collected data on industry characteristics by NAICS codes. We can match now the responses of prices to these characteristics. Our goal is to provide evidence on the main explanatory factors for the dispersion in price responses observed in Figure 4. To address this question we start with the following specification of

the cross-industry price responses:

$$IRFCU_{i,h} = \alpha + \beta_1 comp_i + \beta_2 U_i + \beta_3 D_i + \beta_4 sig(e)_i + \beta_5 rho(idio)_i + \epsilon_i \qquad (4)$$

where $IRFCU_{i,h}$ is the cumulative deviation of the price level in industry i after a monetary policy shock, h periods after the shock. We present results for the deviation of prices 6 and 12 months after the shock. $comp_i$ denotes the degree of competition. Here we have obtained two measures: *C4* is the market share of the 4 largest companies in the industry and the *Gross Profit* rate is the average profit rate in the industry for the period 1997-2001. U_i is a measure of capital utilization rate. Christiano, Eichenbaum and Evans (2005) argue that variable utilization rate is necessary to generate impulse responses that resemble the ones in the data. In particular, their model is capable of generating a moderate price puzzle if variable capital utilization is assumed, and the puzzle disappears if utilization is constant. The simplest measure to use is the variance of capital utilization. We use *Capacity utilization* as reported in G17 of the Fed's bulletin. D_i is a measure of dependence on bank loans. The data comes from the Quarterly Financial Reports. As suggested in the previous section, we also use two variables from the factor analysis: $sig(e)_i$ is a measure of the volatility of the idiosyncratic component and $rho(idio)_i$ is the persistence of this component. To check robustness we will also add other controls and deterministic components like dummy variables.

Since the cross-sectional data for capacity utilization and dependence on bank loans is still under construction, we report now results only for the other regressors. We start in Table 6 by using as a dependent variable the cumulative sum of price responses over the first six months. Column (1) reports that profit rates are strongly and positively correlated with price responses. Since our price variable is on average negative and higher flexibility implies more negative cumulative deviation, the result implies that more competitive industries (lower profit rates) have higher price flexibility. This is consistent with the standard models using

Calvo pricing (see Woodford, 2003), as well as with theories based on rational inattention (Reis, 2006). In column (5), we include three dummy variables to control for potentially different average price dynamics. We use three broad categories – food and textiles (NAICS codes starting with 31; dummy is coded as *d1*); paper, wood, chemicals (codes with 32; dummy is denoted by *d2*); and metallurgy, electronics and machinery (codes with 33; dummy is denoted by *d3*). In all three cases the intercepts are negative signifying the absence on average of a price puzzle. Notably the extra flexibility of the model improves the fit, but does not alter the coefficient on profit rates. In column (6), by including an interaction term we test whether the relationship between market power and price flexibility differs across major industry categories. Indeed in the heavy industries (coded as 33), price flexibility varies substantially across sectors. The mean profit rate is about 25% and a movement from the mean to the maximum of 40% implies 0.15 percentage points smaller price change after a policy shock. This positive relationship between price stickiness and competition within each sector contrast with Bils and Klenow's finding (2004) that their preferred measure of market power — the C4 ratio — becomes insignificant once they control for prices of raw material goods. As in Bils and Klenow, we also find that the C4 ratio is not a robust predictor of price dynamics. We use the inverse of the ratio as a measure of elasticity of demand, and we report in column (2) that the inverse of the C4 ratio is not significantly related to price dynamics. However, our results based on mean profit rates imply that for producer prices, market power is robustly related to price dynamics in response to monetary shocks.

Columns (3) and (4) confirm the correlation from the correlation matrix – both idiosyncratic volatility and persistence are negatively related to price impulse responses. This implies that firms in industries with persistent and volatile idiosyncratic shocks adjust rapidly to changes in the macroeconomic environment. Interestingly, the result survives once we include as controls profit rates (column (7)) and the three dummy variables defined above (not shown in this table).

As a robustness check, we turn now to the results based on the cumulative response over the first 12 months. The results confirm the importance of market power as measured by profit rates and also confirm the importance of the persistence measure (rho_idio_i). The C4 ratio now has a p-value of slightly above 5% so it is only marginally insignificant, but as mentioned before there is no strong relationship between this measure of market power and price dynamics. Most notably, the significance of idiosyncratic volatility disappears (columns 3 and 7).

In order to understand better this result we construct yet another measure of price responses, which is the difference between the sum over the first 12 months and the sum over the first 6 months. Effectively, these are the price impulse responses from the 7th to the 12th month after the shock. We summarize the results in Table 8. The table reconfirms the importance of market power (columns 1, 2, 5, 6, 7 and 8) but also finds another interesting regularity. In column (7) we find that the volatility of the idiosyncratic component has a positive coefficient for the impulse response. Together with the results from Table 6, this finding implies, that industries with high idiosyncratic volatility adjust so rapidly to monetary shocks that after the sixth month, they are on the "sluggish" side of the distribution. For example, the industry with the most volatile idiosyncratic component (*Other Oilseed Processing*) will continue its price adjustment downwards, but now price changes will be less than 1/3 of the price change in the initial six months. In column (8) we include also the sum of the impulse responses in the initial 6 months. The coefficient is highly significant and positive. Its value of 1.26 implies that a larger portion of the price adjustment occurs in this second 6-month period.

Since the positive coefficient on the volatility of idiosyncratic shocks is somewhat surprising, we decided to check whether it is not driven by outliers. On Figure 6 we report the partial correlation between the dependent variable (price change in the second six months after the shock) and idiosyncratic volatility after partialing out the effects of profit rates,

persistence and price adjustment in the first six months. The scatterplot does not indicate the presence of any observations, which could be solely responsible for the result.

To sum up, our sectorial analysis indicates that consistent with models based on monopolistic competition, prices adjust sluggishly in industries where market power is higher. In addition we uncover two other critical explanatory variables. First, idiosyncratic volatility matters and second, the persistence of industry-specific shocks also matters.

5 Conclusion

In this paper, we disentangle the fluctuations in disaggregated U.S. consumer and producer prices which are due to aggregate macroeconomic shocks from those due to shocks to individual price series. We do so by estimating factor-augmented VAR that relate a large panel of economic indicators and of individual price series to a relatively small number of estimated common factors. After identifying monetary policy shocks using all of the information available, we estimate consistently the effects of U.S. monetary policy on disaggregated prices. This is important not only to get a better understanding of the nature of the fluctuations in disaggregated prices, and of how prices react to macroeconomic shocks, but also to assess the impact of monetary policy on prices in various sectors.

We obtain several empirical results that can be summarized as follows:

First, at the level of disaggregation considered, most of the sectorial prices fluctuations appear to be due to sector-specific factors, and only about 15% of individual sectorial price fluctuations, on average, are due to aggregate macroeconomic factors.

Second, individual price fluctuations are relatively persistent, but this persistence is essentially due to the very high degree of persistence in the components driven by common or macroeconomic shocks, and not to sector-specific disturbances. While sector-specific shocks may cause large fluctuations in the individual prices, these fluctuations are typically short lived. Aggregate macroeconomic shocks instead tend to have more persistent effects on a

wide range of sectorial prices.

Third, in the context of our estimated FAVAR, the responses of disaggregated prices to a monetary policy shock display almost no evidence of a price puzzle, in agreement with conventional economic models, but in contrast to the results routinely obtained in VAR studies. This suggests that by exploiting a large information set in the estimation, we may obtain more accurate estimates of the effects of monetary policy.

Fourth, while individual price series reveal some heterogeneity in their responses to an unexpected monetary policy tightening, a striking feature is that most indices respond very little for several months following the shock, and start falling only later.

Finally, we document that price responses are strongly correlated with the degree of imperfect competition. In industries with low average profit rates, we observe a rapid response of prices to monetary policy.

This paper has attempted to present stylized facts on the response of disaggregated U.S. prices to various shocks for the period 1976-2005. In the future, we intend to check the robustness of our results over various subsamples, given that some research has provided evidence of instability in macroeconomic series. An evaluation of various models on the basis of stylized facts provided here is beyond the scope of this paper. We hope however that these stylized facts will help researchers develop improved models of price determination. Some of the findings suggest that sectorial prices respond differently to macroeconomic and sector-specific shocks. This may explain why sticky-price models such as the Calvo model have been so popular in characterizing the effects of monetary policy actions on aggregate variables, while they have been sharply criticized at the same time by authors focused on disaggregate price series. Clearly, it would be desirable in the future to have models that can account for the responses of aggregate and disaggregated prices to both macroeconomic and sector-specific disturbances. Recent models on rational inattention such as those proposed by Reis (2006) and Maćkowiak and Wiederholt (2006) may be promising in that respect.

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Table 1: Volatility and persistence of inflation series

		Standard deviation				Persistence		
		Inflation	Common comp.	Sector-specific	R2	Inflation	Common comp.	Sector-specific
Aggregated series								
PCE	Total	0.24	0.21	0.11	0.79	0.69	0.93	0.17
	Durables	0.33	0.25	0.21	0.60	0.59	0.91	0.09
	Nondurables	0.42	0.30	0.29	0.52	0.44	0.88	0.25
	Services	0.24	0.19	0.14	0.63	0.58	0.95	0.00
Disaggregated series								
All	Average	1.15	0.33	1.09	0.15	0.15	0.79	0.03
	Median	0.75	0.26	0.70	0.11	0.13	0.84	0.00
	Minimum	0.23	0.08	0.13	0.01	-0.73	-0.12	-0.74
	Maximum	11.67	1.84	11.59	0.70	0.82	0.97	0.82
	Std	1.14	0.23	1.13	0.13	0.24	0.16	0.21
PCE	Average	0.98	0.29	0.92	0.17	0.16	0.81	0.03
	Average (weighted)	0.88	0.32	0.80	0.27	0.28	0.84	0.06
	Median	0.65	0.24	0.60	0.12	0.13	0.86	0.00
	Minimum	0.23	0.08	0.13	0.01	-0.73	-0.12	-0.74
	Maximum	11.67	1.84	11.59	0.70	0.82	0.97	0.82
	Std	1.10	0.23	1.09	0.15	0.27	0.16	0.23
PPI	Average	1.36	0.37	1.29	0.12	0.14	0.78	0.03
	Median	0.92	0.30	0.86	0.11	0.13	0.83	0.01
	Minimum	0.35	0.09	0.29	0.01	-0.45	0.05	-0.47
	Maximum	7.73	1.27	7.63	0.38	0.61	0.94	0.55
	Std	1.15	0.22	1.15	0.08	0.19	0.16	0.18

Note: Weighted average of statistics for disaggregated PCE series is obtained using expenditure shares in year 2005 as weights.

Table 2: Responses of price series to a monetary policy shock

		Autocorrelation of π_{it} conditional on shock				Cumul. price responses	
		1st-order	3rd-order	6th-order	12th-order	6 mths	12 mths
Aggregated series							
PCE	Total	0.97	0.92	0.84	0.66	-0.07	-0.75
	Durables	0.97	0.91	0.83	0.64	-0.23	-0.69
	Nondurables	0.98	0.93	0.86	0.69	-0.06	-1.03
	Services	0.97	0.89	0.78	0.57	0.02	-0.05
Disaggregated series							
All	Average	0.97	0.91	0.81	0.60	-0.03	-0.28
	Median	0.97	0.92	0.83	0.64	-0.02	-0.23
	Minimum	0.93	0.78	0.39	-0.14	-0.68	-2.34
	Maximum	1.00	0.98	0.93	0.79	0.73	1.66
	Std	0.01	0.03	0.07	0.13	0.21	0.60
PCE	Average	0.97	0.90	0.79	0.56	0.03	-0.05
	Average (weighted)	0.97	0.90	0.79	0.56	0.04	-0.05
	Median	0.97	0.90	0.80	0.60	0.02	-0.06
	Minimum	0.93	0.78	0.39	-0.14	-0.68	-1.51
	Maximum	1.00	0.98	0.93	0.79	0.73	1.66
	Std	0.01	0.03	0.07	0.14	0.19	0.53
PPI	Average	0.98	0.92	0.84	0.65	-0.11	-0.56
	Median	0.98	0.93	0.85	0.67	-0.09	-0.52
	Minimum	0.95	0.79	0.51	0.16	-0.68	-2.34
	Maximum	0.99	0.97	0.91	0.77	0.36	0.80
	Std	0.01	0.03	0.06	0.11	0.20	0.57

Note: Weighted average of statistics for disaggregated PCE series is obtained using expenditure shares in year 2005 as weights.

Table 3. Cross-sectional correlations of various statistics (PCE & PPI)

	Sd(π_it)	Sd(Com)	Sd(idio)	R2	rho(π_it)	rho(Com)	rho(idio)	AC1	AC3	AC6	AC12	sum6	sum12
Sd(π_it)	1	0.76	1.00	-0.41	-0.10	-0.47	0.13	0.23	0.16	0.10	0.06	-0.21	-0.11
Sd(Com)	0.76	1	0.74	-0.10	0.14	-0.26	0.27	0.26	0.19	0.13	0.11	-0.25	-0.29
Sd(ei)	1.00	0.74	1	-0.43	-0.11	-0.48	0.12	0.22	0.16	0.10	0.06	-0.21	-0.10
R2	-0.41	-0.10	-0.43	1	0.57	0.45	0.15	-0.16	-0.11	-0.07	-0.05	0.12	-0.05
rho(π_it)	-0.10	0.14	-0.11	0.57	1	0.34	0.88	0.19	0.18	0.17	0.15	-0.20	-0.27
rho(Com)	-0.47	-0.26	-0.48	0.45	0.34	1	0.10	-0.12	-0.05	0.03	0.04	0.13	0.01
rho(idio)	0.13	0.27	0.12	0.15	0.88	0.10	1	0.31	0.26	0.22	0.18	-0.30	-0.30
AC1	0.23	0.26	0.22	-0.16	0.19	-0.12	0.31	1	0.97	0.88	0.78	-0.46	-0.53
AC3	0.16	0.19	0.16	-0.11	0.18	-0.05	0.26	0.97	1	0.97	0.90	-0.47	-0.58
AC6	0.10	0.13	0.10	-0.07	0.17	0.03	0.22	0.88	0.97	1	0.97	-0.48	-0.62
AC12	0.06	0.11	0.06	-0.05	0.15	0.04	0.18	0.78	0.90	0.97	1	-0.53	-0.68
sum6	-0.21	-0.25	-0.21	0.12	-0.20	0.13	-0.30	-0.46	-0.47	-0.48	-0.53	1	0.89
sum12	-0.11	-0.29	-0.10	-0.05	-0.27	0.01	-0.30	-0.53	-0.58	-0.62	-0.68	0.89	1

Sd(π_it)	Standard deviation of π_it
Sd(Com)	Standard deviation of common component of π_it
Sd(ei)	Standard deviation of idio component of π_it
R2	R2 of the common component π_it
rho(π_it)	Persistence of π_it
rho(Com)	Persistence of common component of π_it
rho(idio)	Persistence of idio component of π_it
AC1	First-order autocorrelation of π_it conditional on a monetary policy shock
AC3	Third-order autocorrelation of π_it conditional on a monetary policy shock
AC6	Sixth-order autocorrelation of π_it conditional on a monetary policy shock
AC12	Twelveth-order autocorrelation of π_it conditional on a monetary policy shock
sum6	Cummulative sum of IRF of p_it over first 6 periods
sum12	Cummulative sum of IRF of p_it over first 12 periods

Table 4. Cross-sectional correlations of various statistics (PCE)

	Sd(π_it)	Sd(Com)	Sd(idio)	R2	rho(π_it)	rho(Com)	rho(idio)	AC1	AC3	AC6	AC12	sum6	sum12
Sd(π_it)	1	0.73	1.00	-0.37	-0.16	-0.57	0.05	0.19	0.16	0.12	0.08	-0.14	-0.11
Sd(Com)	0.73	1	0.70	-0.07	0.04	-0.32	0.16	0.16	0.12	0.07	0.05	-0.11	-0.18
Sd(ei)	1.00	0.70	1	-0.39	-0.18	-0.58	0.04	0.19	0.16	0.12	0.08	-0.14	-0.10
R2	-0.37	-0.07	-0.39	1	0.60	0.45	0.17	-0.14	-0.10	-0.06	-0.04	0.08	-0.09
rho(π_it)	-0.16	0.04	-0.18	0.60	1	0.39	0.87	0.13	0.14	0.15	0.13	-0.15	-0.22
rho(Com)	-0.57	-0.32	-0.58	0.45	0.39	1	0.16	-0.16	-0.08	0.00	0.01	0.15	0.05
rho(idio)	0.05	0.16	0.04	0.17	0.87	0.16	1	0.25	0.23	0.21	0.16	-0.24	-0.23
AC1	0.19	0.16	0.19	-0.14	0.13	-0.16	0.25	1	0.97	0.88	0.75	-0.24	-0.31
AC3	0.16	0.12	0.16	-0.10	0.14	-0.08	0.23	0.97	1	0.96	0.87	-0.31	-0.41
AC6	0.12	0.07	0.12	-0.06	0.15	0.00	0.21	0.88	0.96	1	0.96	-0.37	-0.51
AC12	0.08	0.05	0.08	-0.04	0.13	0.01	0.16	0.75	0.87	0.96	1	-0.47	-0.64
sum6	-0.14	-0.11	-0.14	0.08	-0.15	0.15	-0.24	-0.24	-0.31	-0.37	-0.47	1	0.89
sum12	-0.11	-0.18	-0.10	-0.09	-0.22	0.05	-0.23	-0.31	-0.41	-0.51	-0.64	0.89	1

Sd(π_it)	Standard deviation of π_it
Sd(Com)	Standard deviation of common component of π_it
Sd(ei)	Standard deviation of idio component of π_it
R2	R2 of the common component π_it
rho(π_it)	Persistence of π_it
rho(Com)	Persistence of common component of π_it
rho(idio)	Persistence of idio component of π_it
AC1	First-order autocorrelation of π_it conditional on a monetary policy shock
AC3	Third-order autocorrelation of π_it conditional on a monetary policy shock
AC6	Sixth-order autocorrelation of π_it conditional on a monetary policy shock
AC12	Twelveth-order autocorrelation of π_it conditional on a monetary policy shock
sum6	Cummulative sum of IRF of p_it over first 6 periods
sum12	Cummulative sum of IRF of p_it over first 12 periods

Table 5. Cross-sectional correlations of various statistics (PPI)

	Sd(π_it)	Sd(Com)	Sd(idio)	R2	rho(π_it)	rho(Com)	rho(idio)	AC1	AC3	AC6	AC12	sum6	sum12
Sd(π_it)	1	0.79	1.00	-0.49	0.02	-0.34	0.25	0.18	0.04	-0.06	-0.11	-0.21	0.01
Sd(Com)	0.79	1	0.76	-0.07	0.37	-0.14	0.47	0.30	0.17	0.08	0.05	-0.34	-0.30
Sd(ei)	1.00	0.76	1	-0.51	0.00	-0.35	0.24	0.18	0.04	-0.06	-0.11	-0.20	0.03
R2	-0.49	-0.07	-0.51	1	0.49	0.46	0.12	-0.01	0.08	0.14	0.18	0.03	-0.28
rho(π_it)	0.02	0.37	0.00	0.49	1	0.25	0.91	0.42	0.34	0.29	0.29	-0.38	-0.51
rho(Com)	-0.34	-0.14	-0.35	0.46	0.25	1	0.02	0.01	0.10	0.16	0.19	0.05	-0.13
rho(idio)	0.25	0.47	0.24	0.12	0.91	0.02	1	0.47	0.35	0.26	0.24	-0.44	-0.46
AC1	0.18	0.30	0.18	-0.01	0.42	0.01	0.47	1	0.95	0.85	0.77	-0.64	-0.70
AC3	0.04	0.17	0.04	0.08	0.34	0.10	0.35	0.95	1	0.97	0.91	-0.57	-0.69
AC6	-0.06	0.08	-0.06	0.14	0.29	0.16	0.26	0.85	0.97	1	0.97	-0.50	-0.65
AC12	-0.11	0.05	-0.11	0.18	0.29	0.19	0.24	0.77	0.91	0.97	1	-0.51	-0.66
sum6	-0.21	-0.34	-0.20	0.03	-0.38	0.05	-0.44	-0.64	-0.57	-0.50	-0.51	1	0.88
sum12	0.01	-0.30	0.03	-0.28	-0.51	-0.13	-0.46	-0.70	-0.69	-0.65	-0.66	0.88	1

Sd(π_it)	Standard deviation of π_it
Sd(Com)	Standard deviation of common component of π_it
Sd(ei)	Standard deviation of idio component of π_it
R2	R2 of the common component π_it
rho(π_it)	Persistence of π_it
rho(Com)	Persistence of common component of π_it
rho(idio)	Persistence of idio component of π_it
AC1	First-order autocorrelation of π_it conditional on a monetary policy shock
AC3	Third-order autocorrelation of π_it conditional on a monetary policy shock
AC6	Sixth-order autocorrelation of π_it conditional on a monetary policy shock
AC12	Twelveth-order autocorrelation of π_it conditional on a monetary policy shock
sum6	Cummulative sum of IRF of p_it over first 6 periods
sum12	Cummulative sum of IRF of p_it over first 12 periods

Table 6: Cross-sectional dispersion in price responses for first 6 months after the shock.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-0.183	-0.045	0.013	-0.054			-0.074
	(0.040)**	(0.034)	(0.024)	(0.016)**			(0.044)
Gross Profit	0.495				0.510		0.287
	(0.138)**				(0.140)**		(0.142)*
Invc4		-0.391					
		(0.941)					
Sig(e)			-5.808				-4.160
			(1.318)**				(1.216)**
Rho-idio				-0.399			-0.248
				(0.087)**			(0.093)**
d1					-0.212	-0.174	
					(0.049)**	(0.047)**	
d2					-0.192	-0.183	
					(0.056)**	(0.107)	
d3					-0.173	-0.254	
					(0.043)**	(0.099)*	
d1*profit						0.366	
						(0.116)**	
d2*profit						0.476	
						(0.364)	
d3*profit						0.841	
						(0.391)*	
Observations	149	149	151	151	149	149	149
R-squared	0.05	0.00	0.10	0.10	0.12	0.13	0.16

Robust standard errors in parentheses. (*) denotes significant at 5%; (**) denotes significant at 1%

Table 7: Cross-sectional dispersion in price responses for first 12 months after the shock.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	-0.865	-0.321	-0.397	-0.432			-0.739
	(0.104)**	(0.080)**	(0.059)**	(0.040)**			(0.107)**
Gross Profit	1.657				1.652		1.148
	(0.337)**				(0.343)**		(0.319)**
Invc4		-4.209					
		(2.134)					
Sig(e)			-4.315				1.235
			(3.126)				(2.861)
Rho-idio				-1.094			-0.825
				(0.226)**			(0.232)**
d1					-0.798	-0.652	
					(0.119)**	(0.112)**	
d2					-0.916	-0.806	
					(0.130)**	(0.248)**	
d3					-0.872	-1.237	
					(0.113)**	(0.248)**	
d1*profit						1.099	
						(0.283)**	
d2*profit						1.240	
						(0.887)	
d3*profit						3.139	
						(0.946)**	
Obs.	149	149	151	151	149	149	149
R-squared	0.10	0.02	0.01	0.13	0.47	0.49	0.16

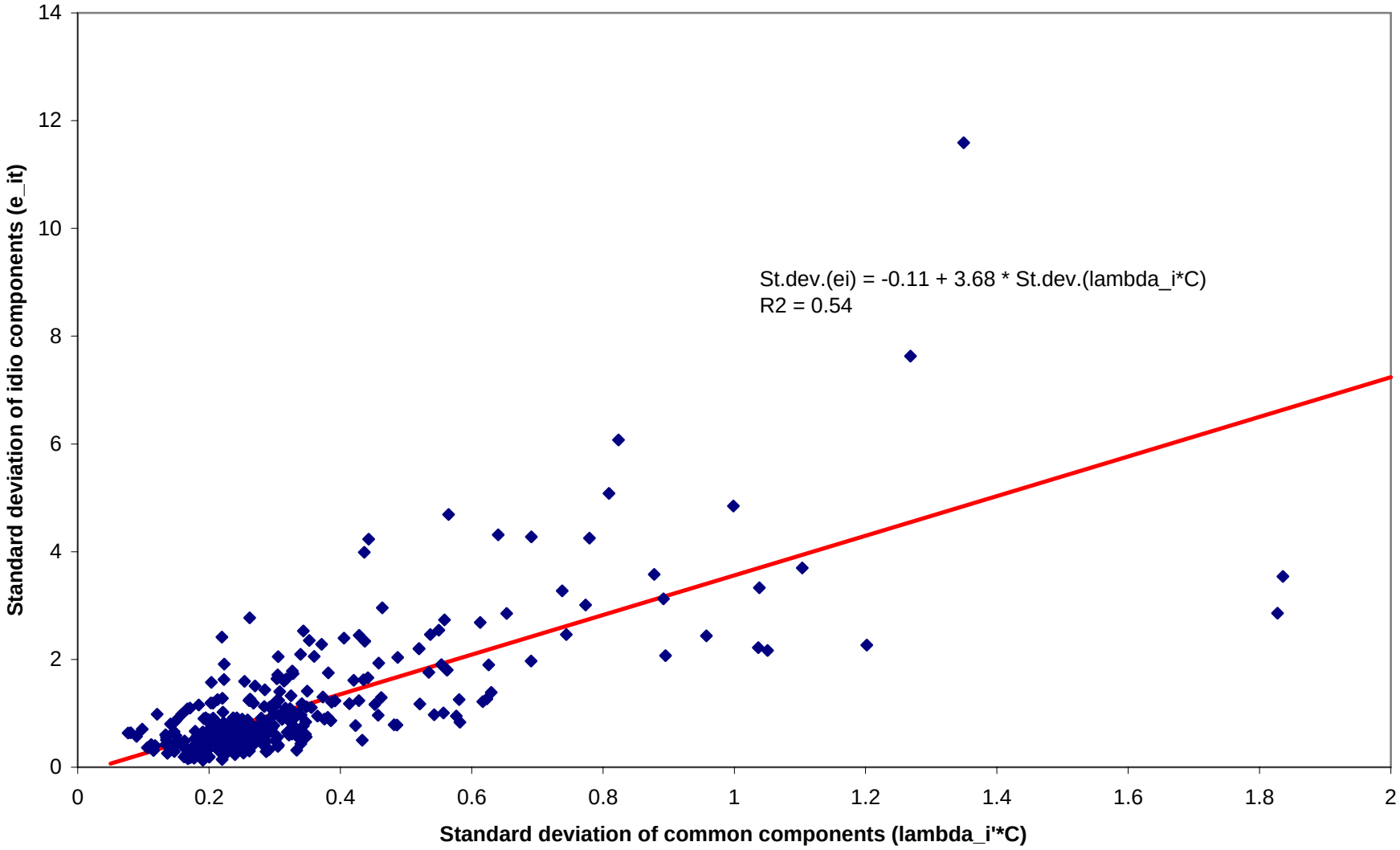
Robust standard errors in parentheses. (*) denotes significant at 5%; (**) denotes significant at 1%

Table 8: Cross-sectional dispersion in price responses for months 7 to 12 after the shock.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.682	-0.276	-0.410	-0.379			-0.664	-0.571
	(0.073)**	(0.052)**	(0.038)**	(0.026)**			(0.070)**	(0.046)**
Gross Profit	1.161				1.142		0.861	0.500
	(0.231)**				(0.238)**		(0.203)**	(0.154)**
Invc4		-3.818						
		(1.368)**						
Sig(e)			1.493				5.395	10.635
			(1.996)				(1.886)**	(1.443)**
Rho-idio				-0.695			-0.577	-0.265
				(0.165)**			(0.161)**	(0.126)*
Sum6								1.260
								(0.088)**
d1					-0.586	-0.478		
					(0.083)**	(0.082)**		
d2					-0.724	-0.623		
					(0.092)**	(0.192)**		
d3					-0.699	-0.983		
					(0.077)**	(0.158)**		
d1*profit						0.733		
						(0.213)**		
d2*profit						0.764		
						(0.673)		
d3*profit						2.298		
						(0.587)**		
Obs.	149	149	151	151	149	149	149	149
R-squared	0.11	0.04	0.00	0.12	0.61	0.63	0.19	0.69

Robust standard errors in parentheses. (*) denotes significant at 5%; (**) denotes significant at 1%

Figure 1: Volatility of common and sector-specific components



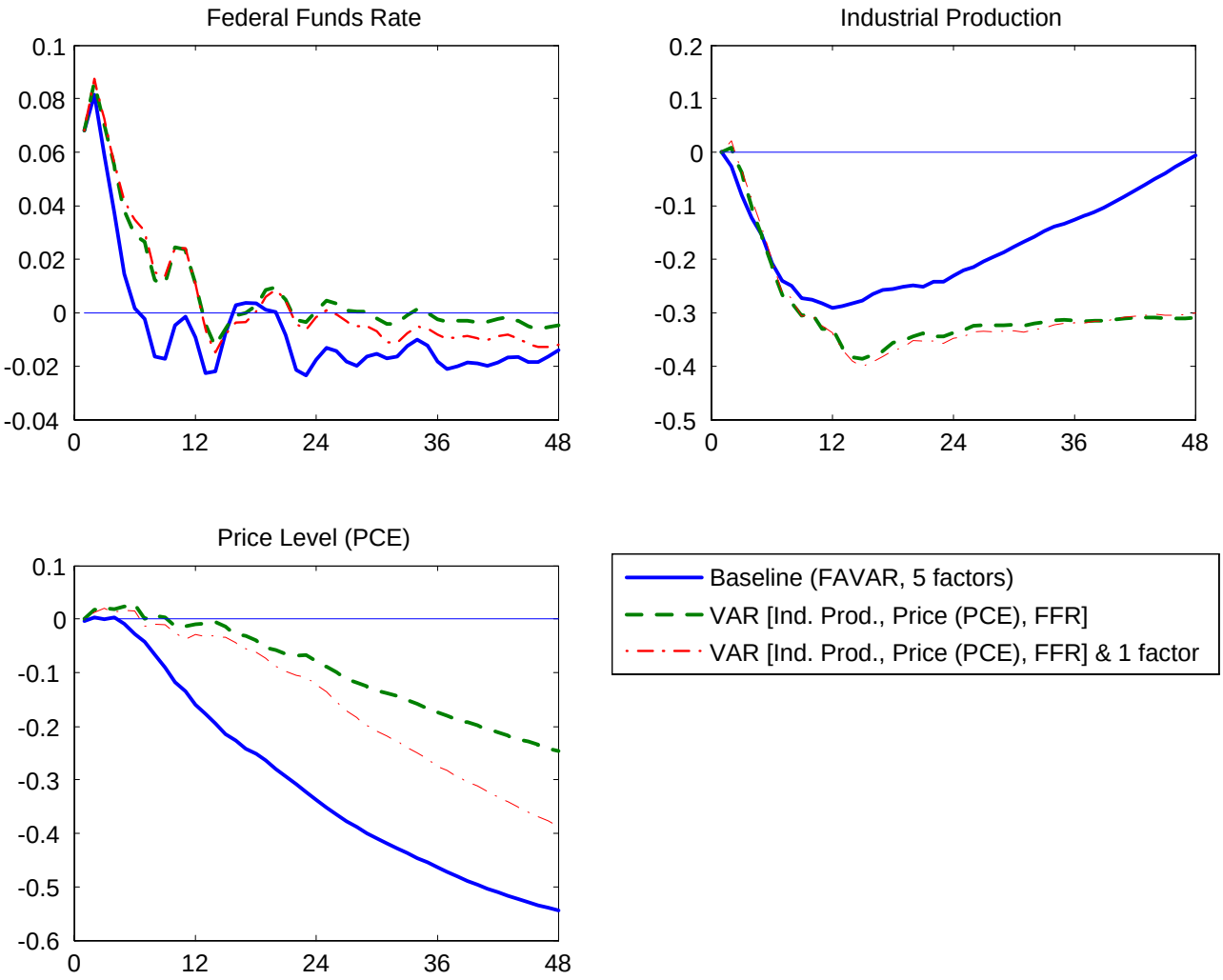


Figure 2a: Estimated impulse responses to an identified monetary policy shock

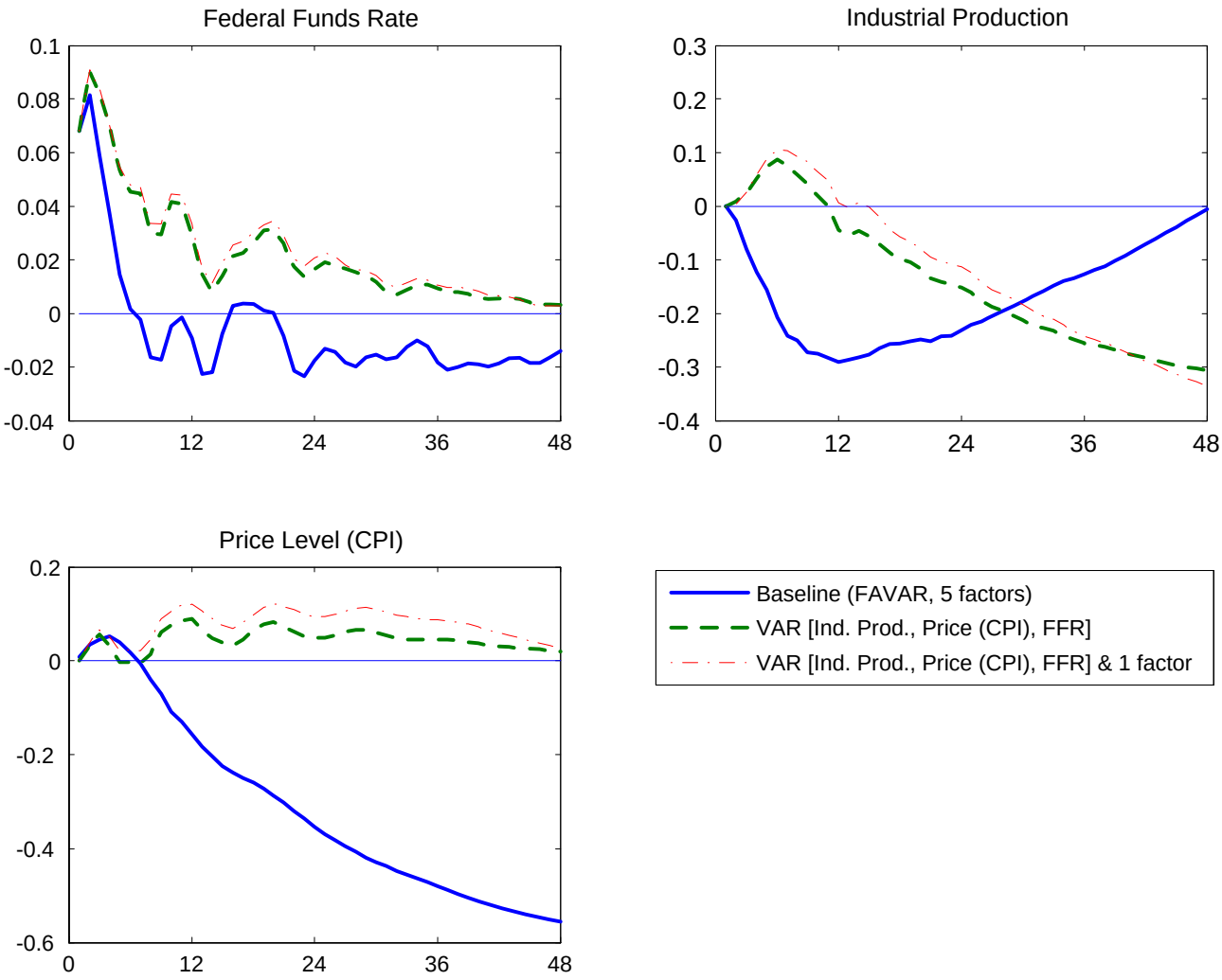


Figure 2b: Estimated impulse responses to an identified monetary policy shock (CPI)

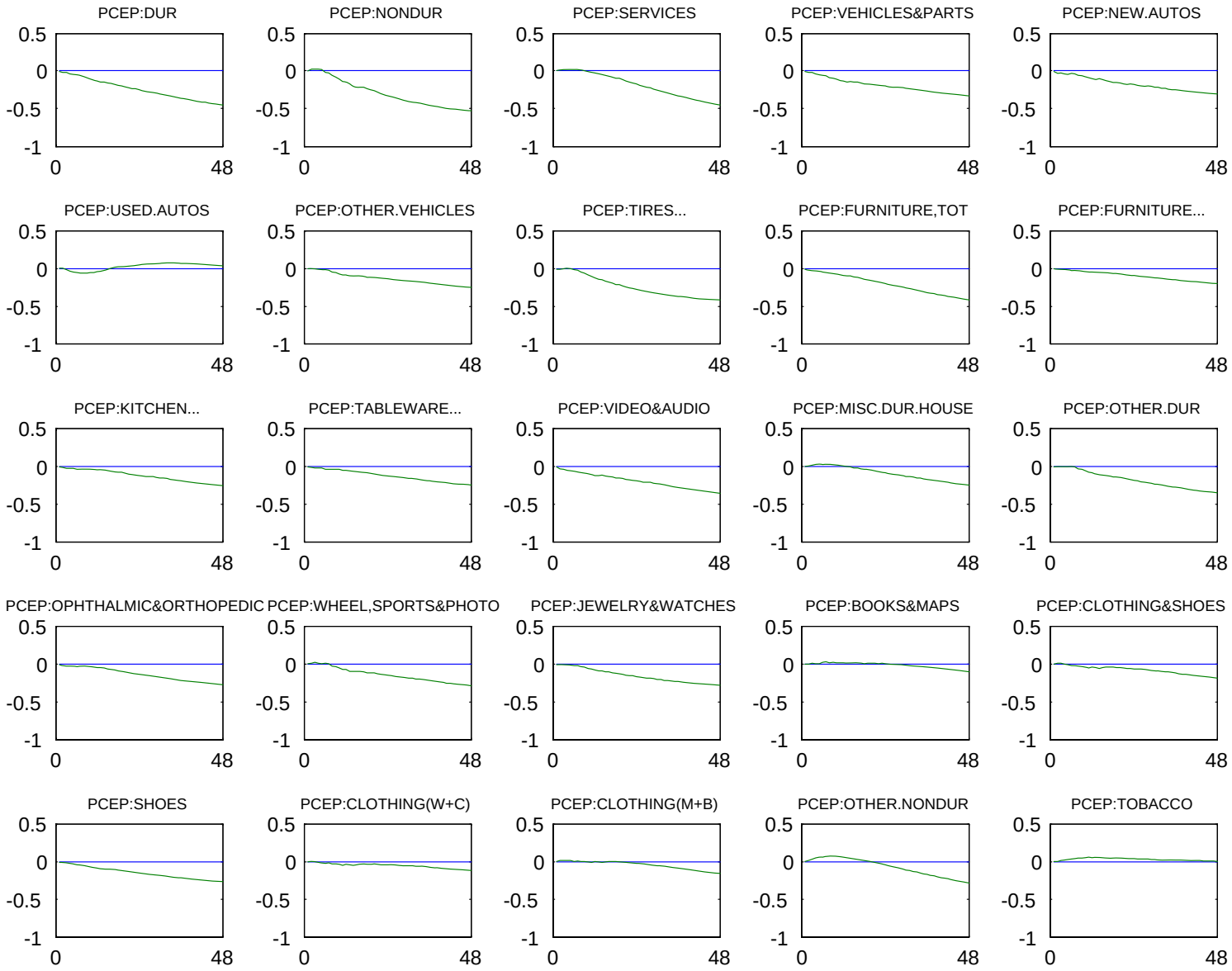


Figure 3a: Estimated impulse responses to an identified monetary policy shock

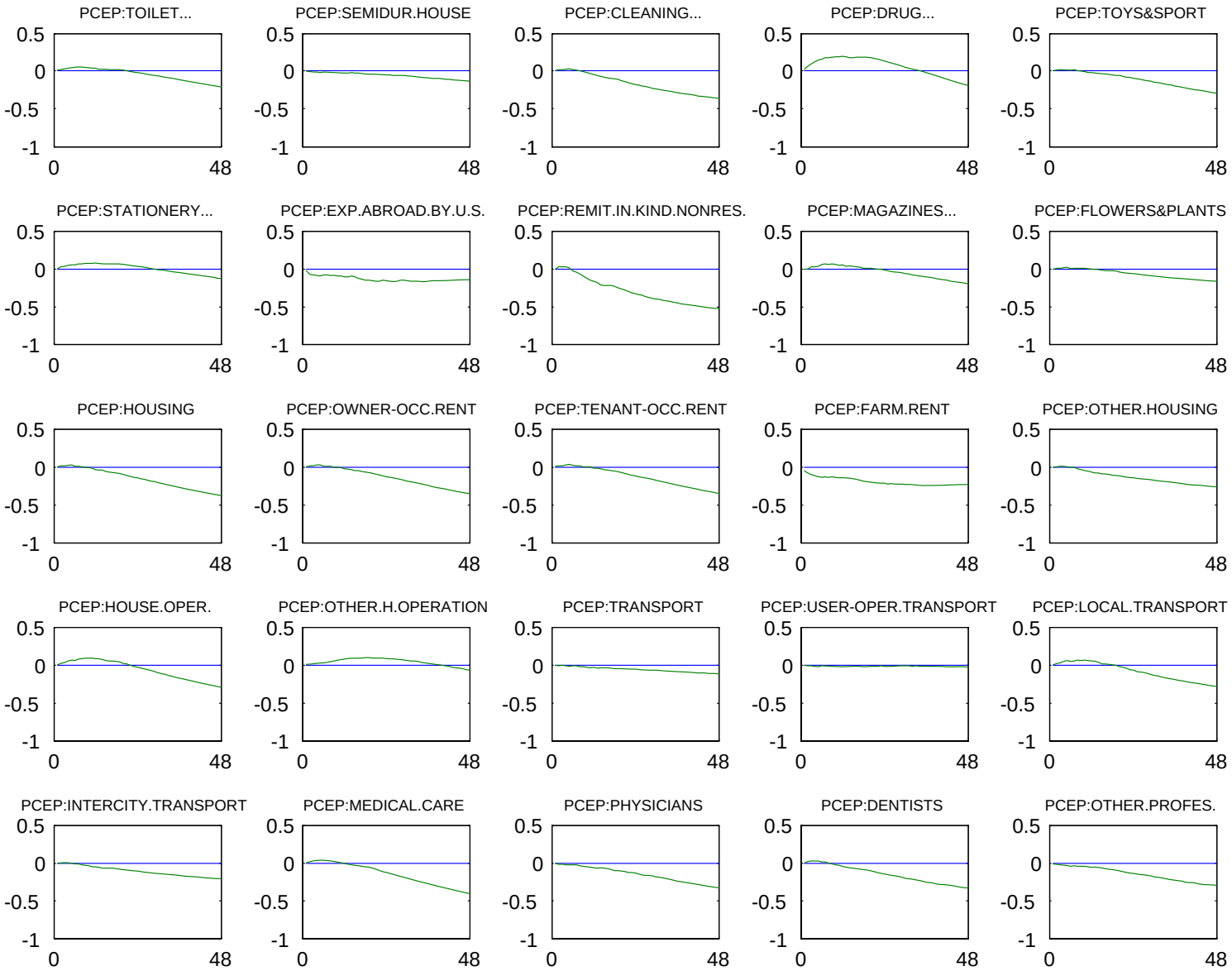


Figure 3b: Estimated impulse responses to an identified monetary policy shock

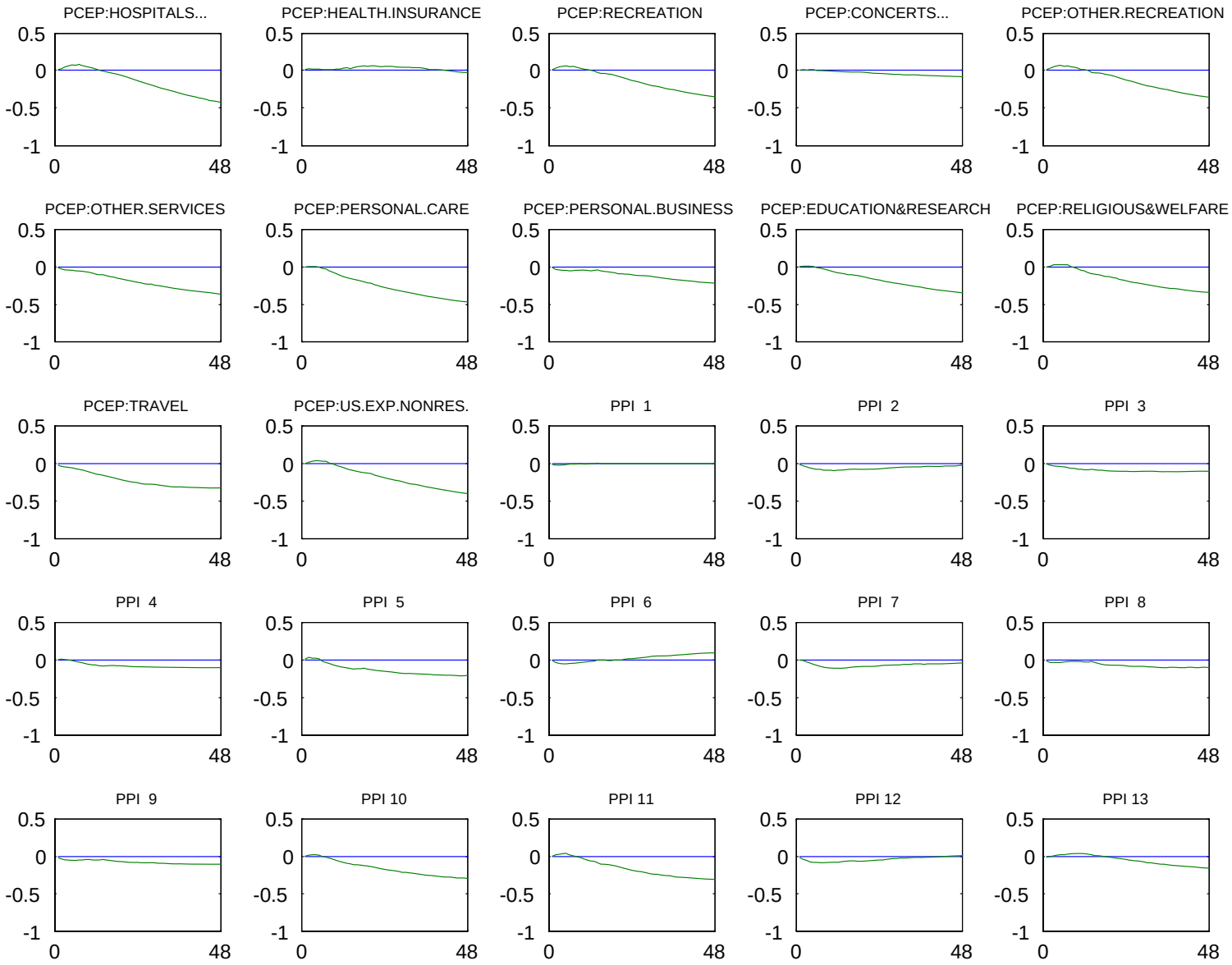


Figure 3c: Estimated impulse responses to an identified monetary policy shock

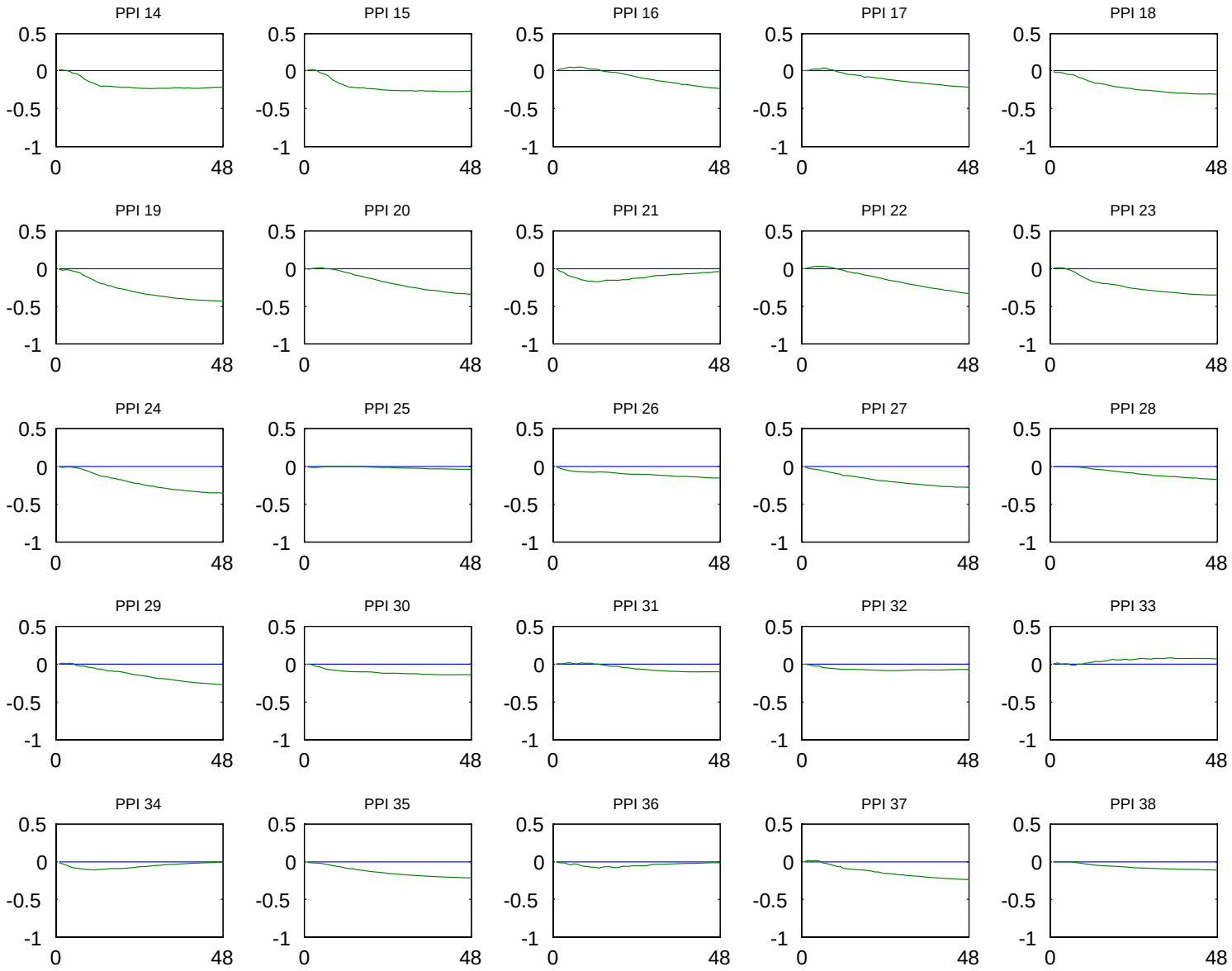


Figure 3d: Estimated impulse responses to an identified monetary policy shock

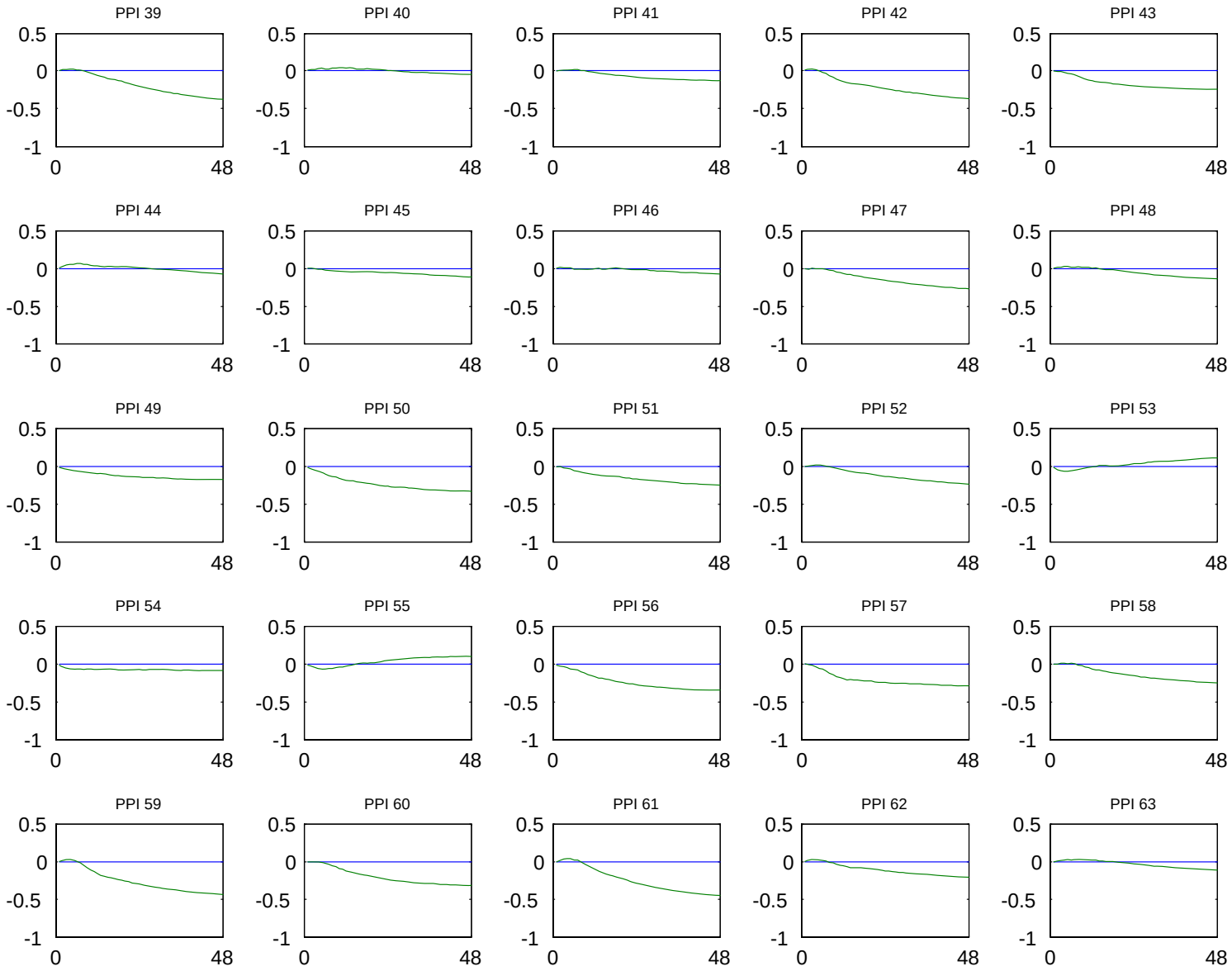


Figure 3e: Estimated impulse responses to an identified monetary policy shock

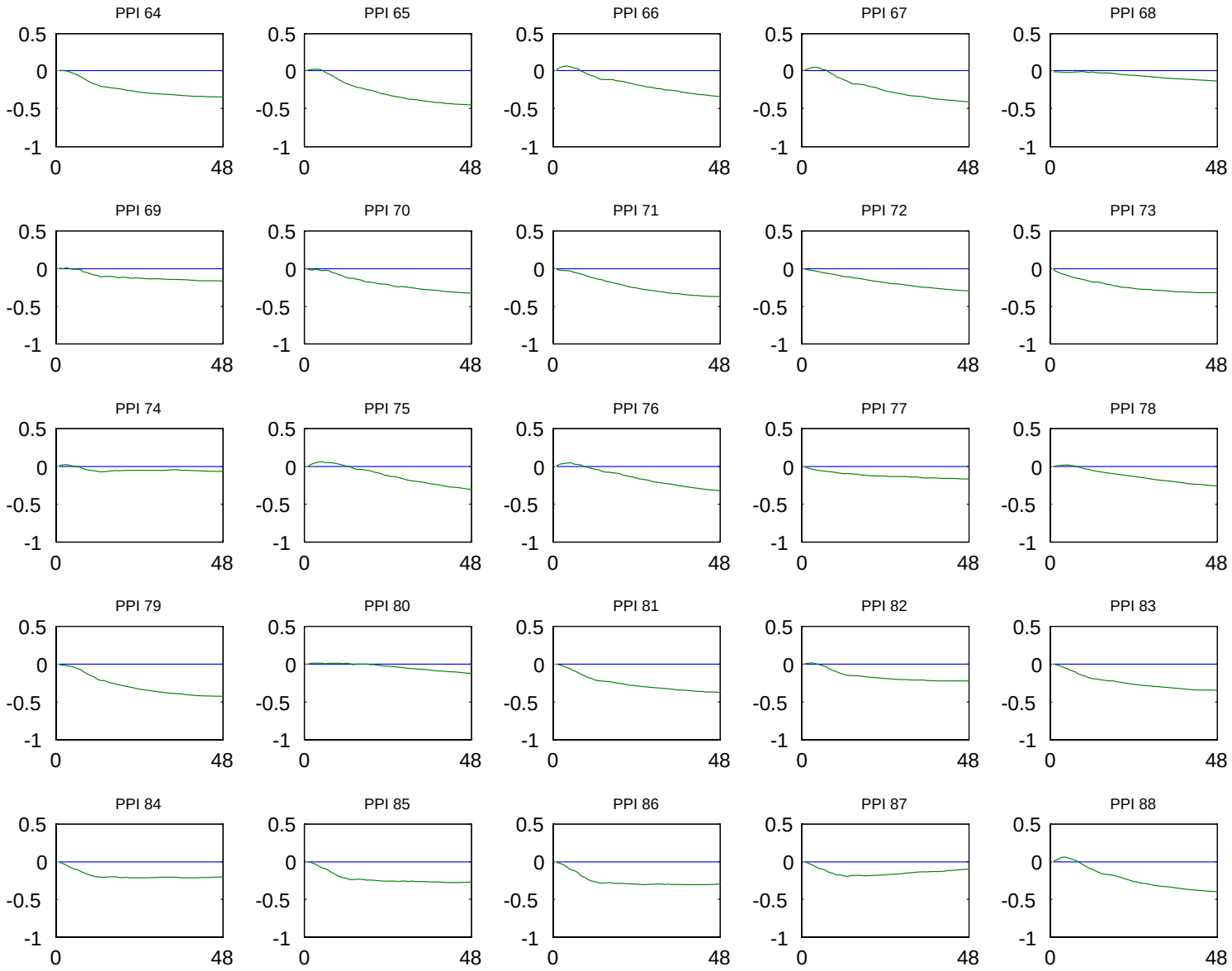


Figure 3f: Estimated impulse responses to an identified monetary policy shock

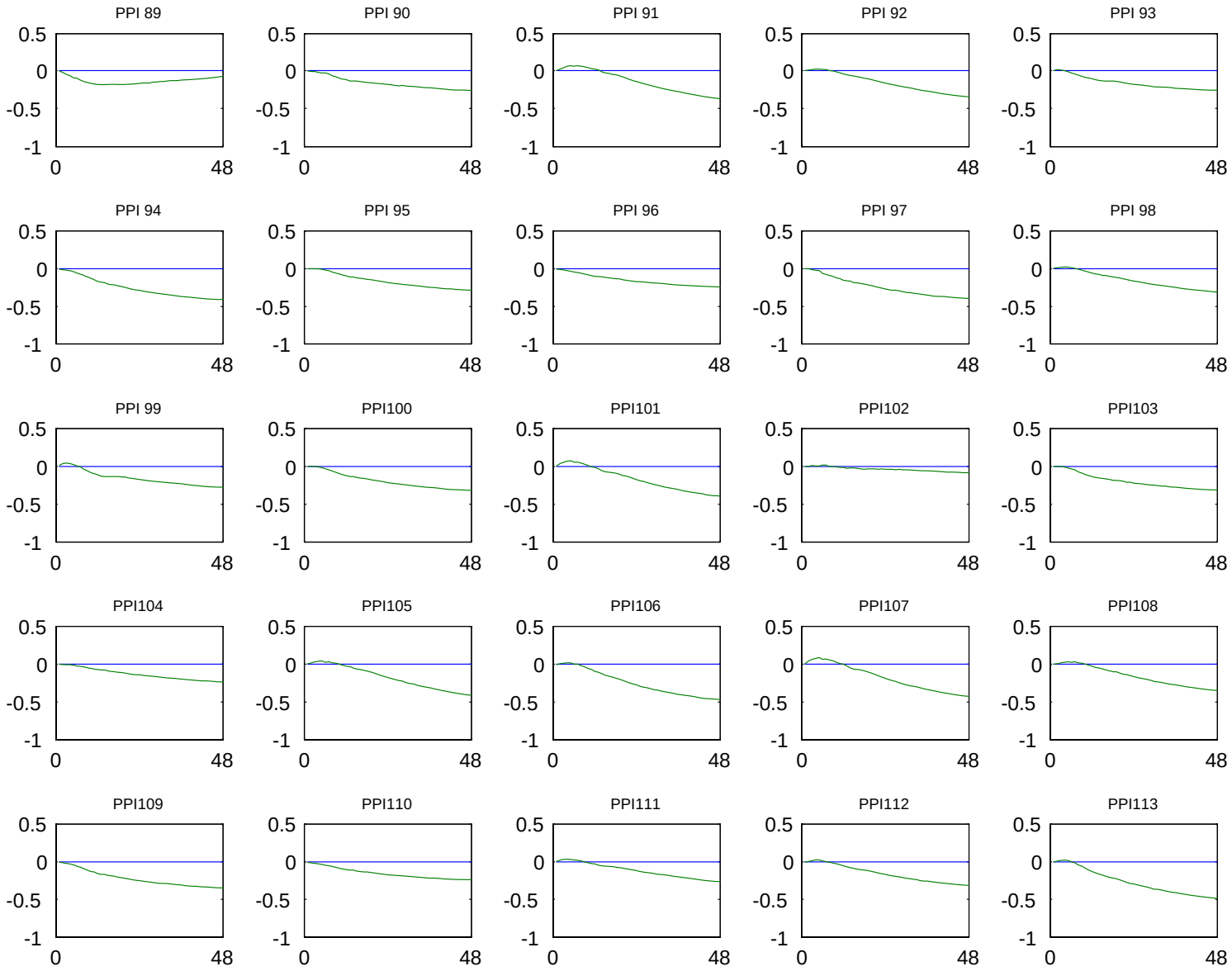


Figure 3g: Estimated impulse responses to an identified monetary policy shock

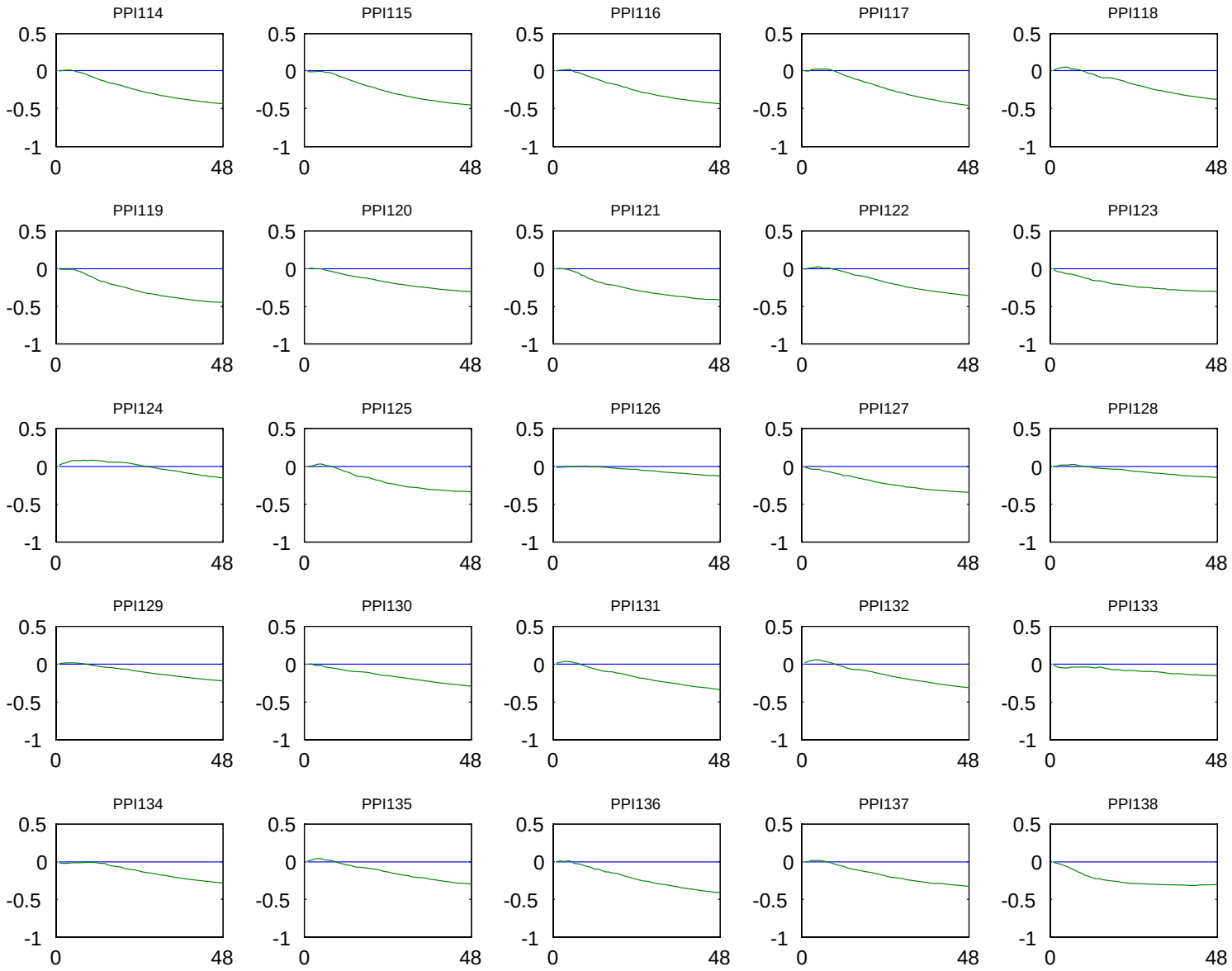


Figure 3h: Estimated impulse responses to an identified monetary policy shock

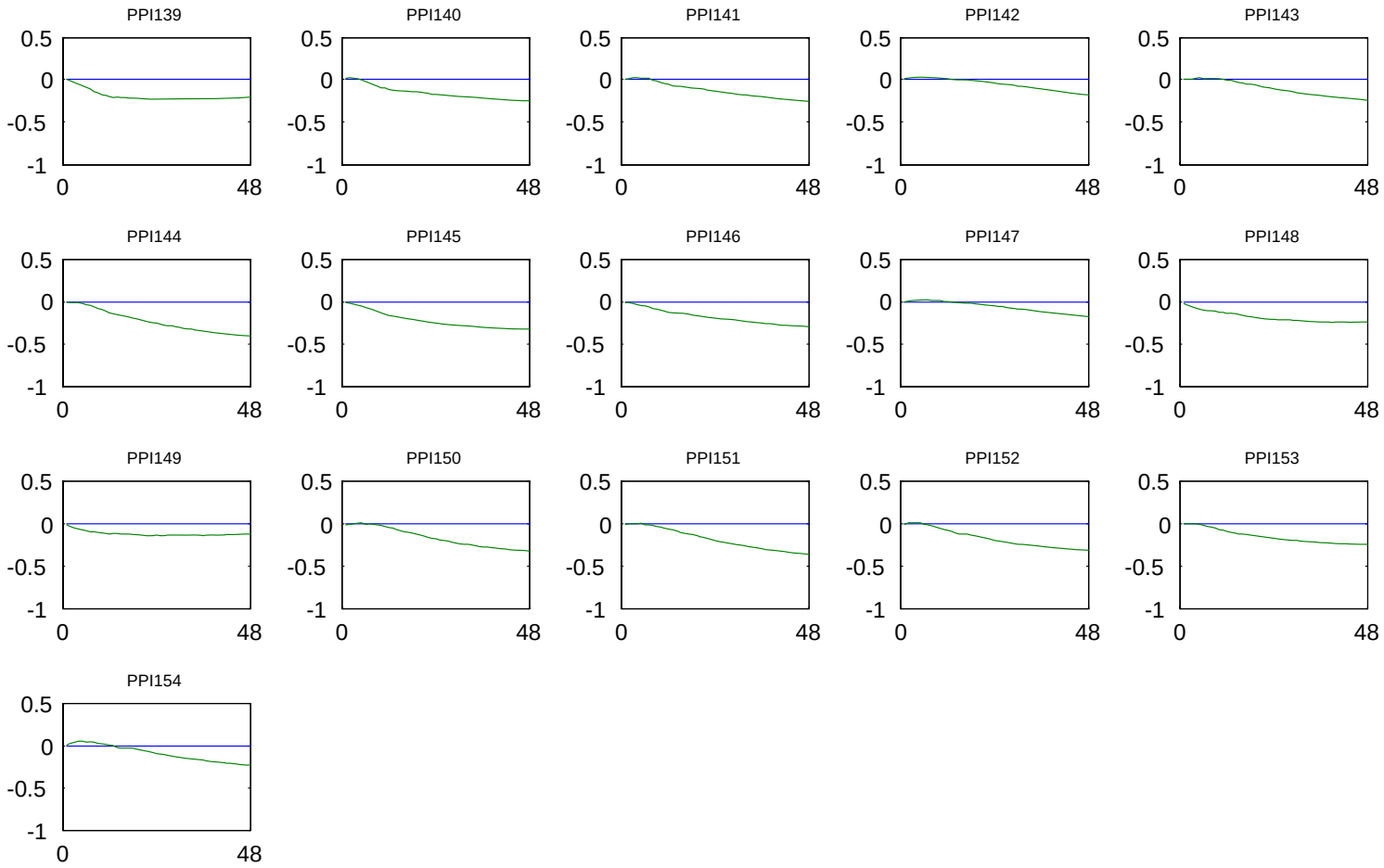


Figure 3i: Estimated impulse responses to an identified monetary policy shock

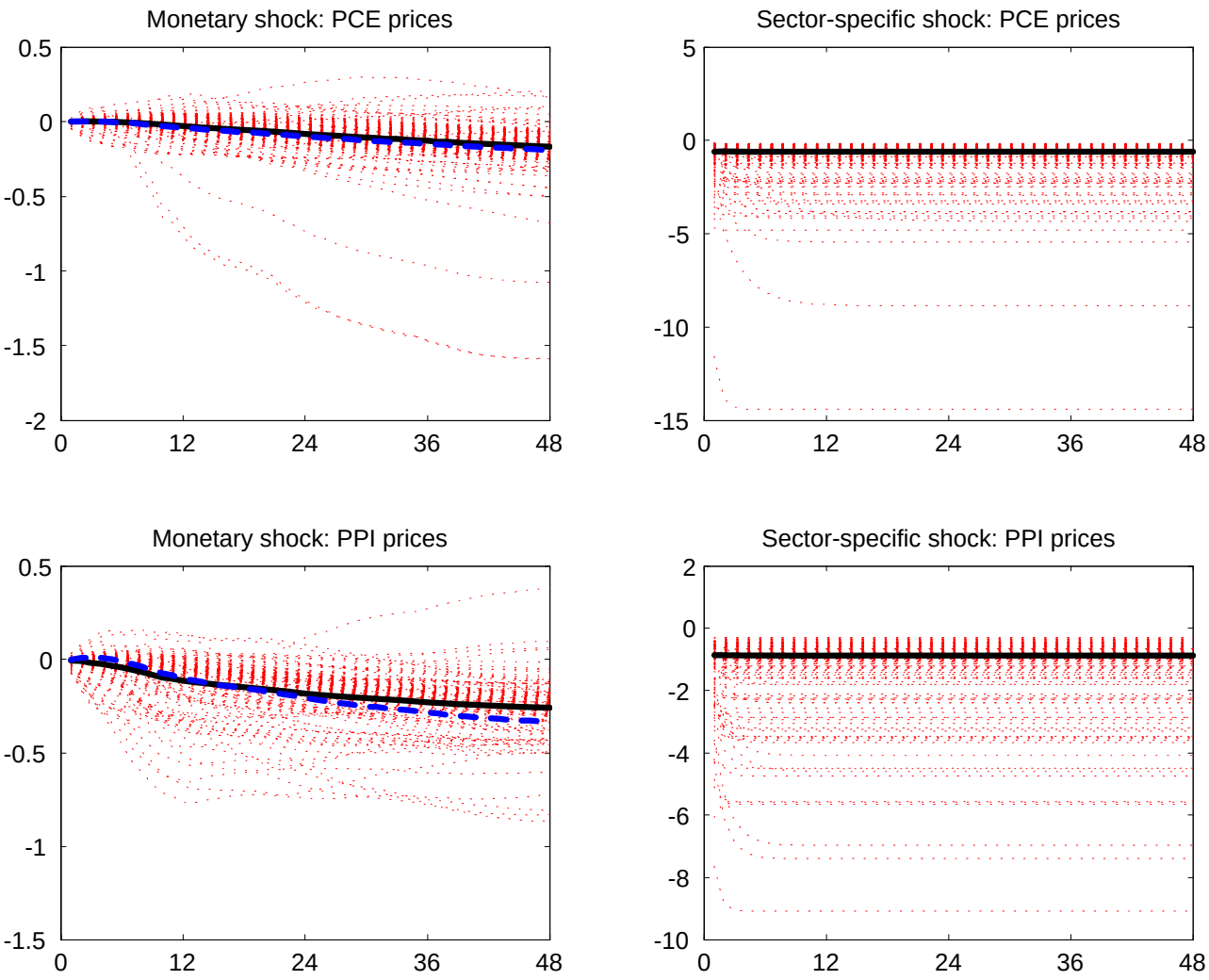


Figure 4. Estimated impulse responses of (log) sectorial prices to an identified monetary policy shock (left panels) and to a sector-specific shock (right panels). Fat lines represent unweighted average responses. Fat dashed lines represent the response of the aggregate PCE and PPI (finished) price indices to a monetary policy shock.

Figure 5a: Impulse responses to monetary shock and volatility of sector-specific components

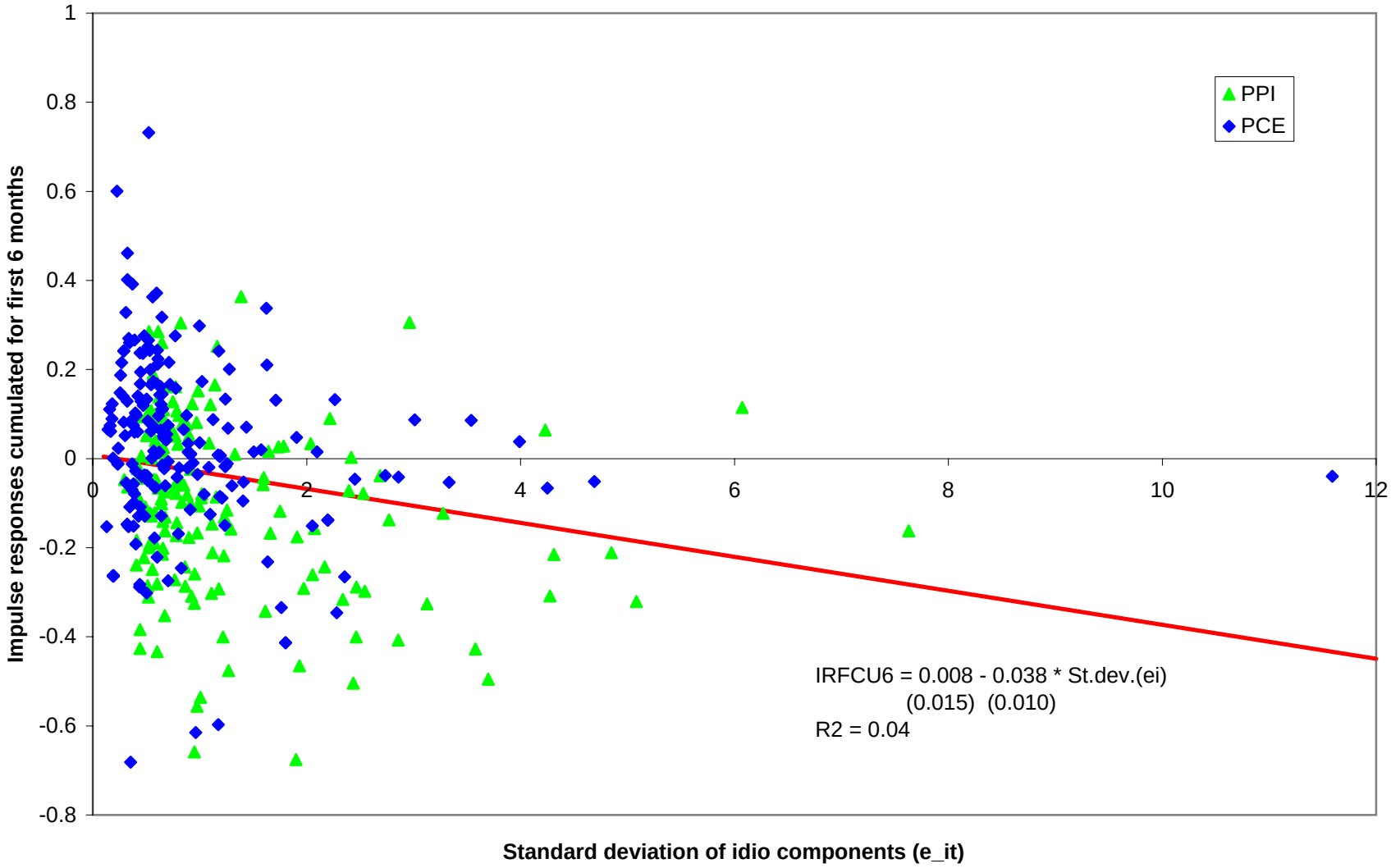


Figure 5b: Impulse responses to monetary shock and volatility of sector-specific components

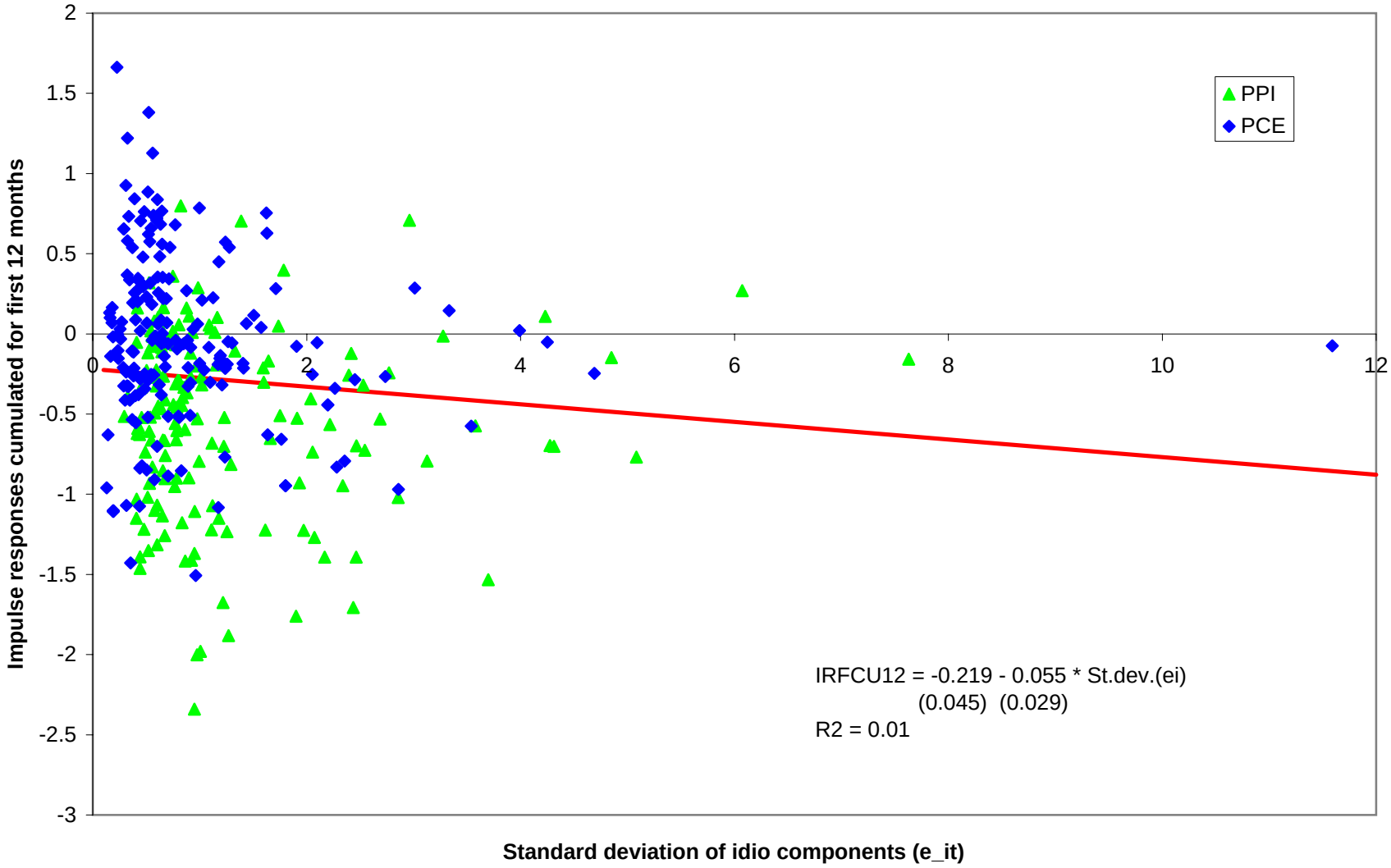


Figure 5c: Impulse responses to monetary shock and volatility of sector-specific components

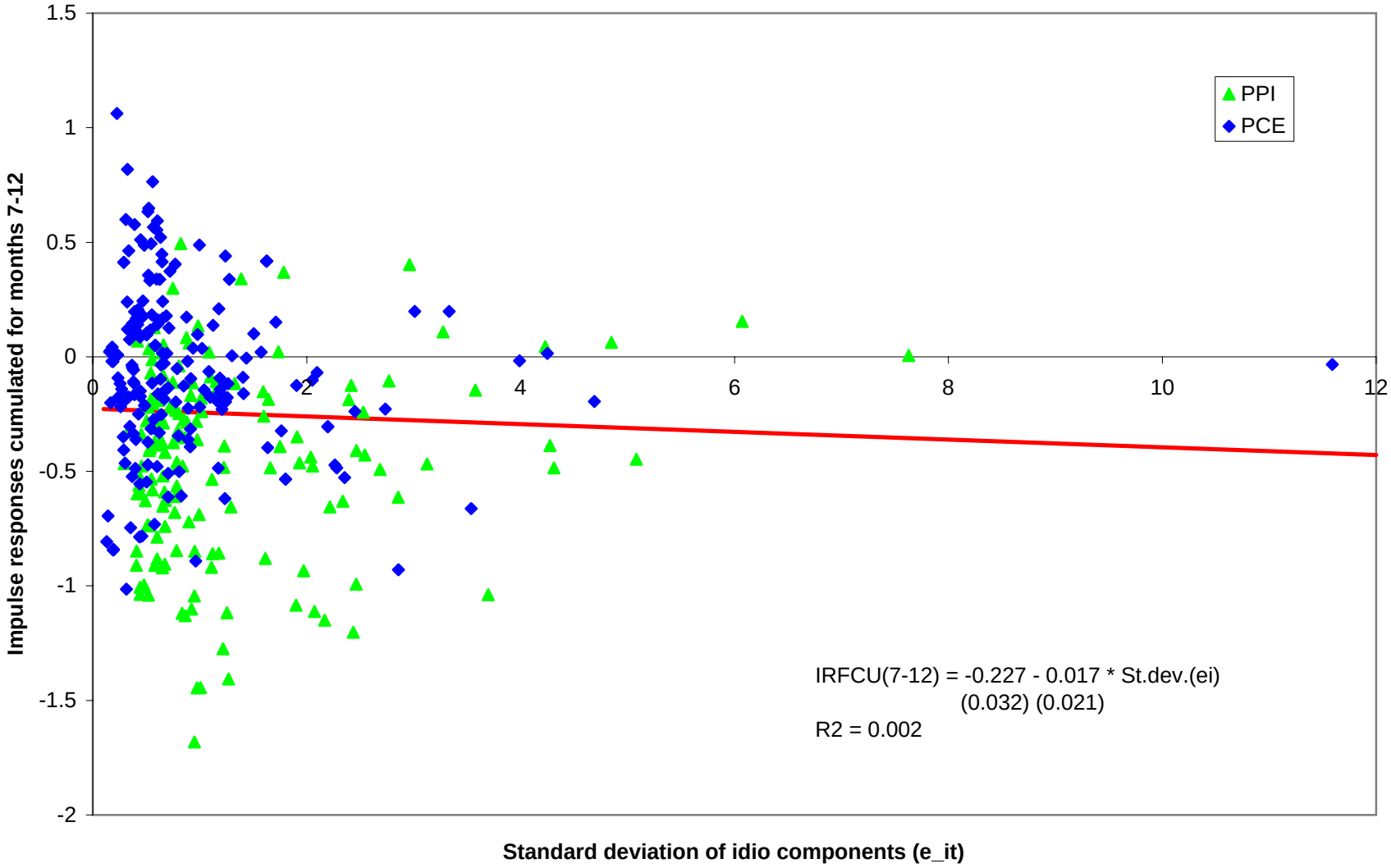
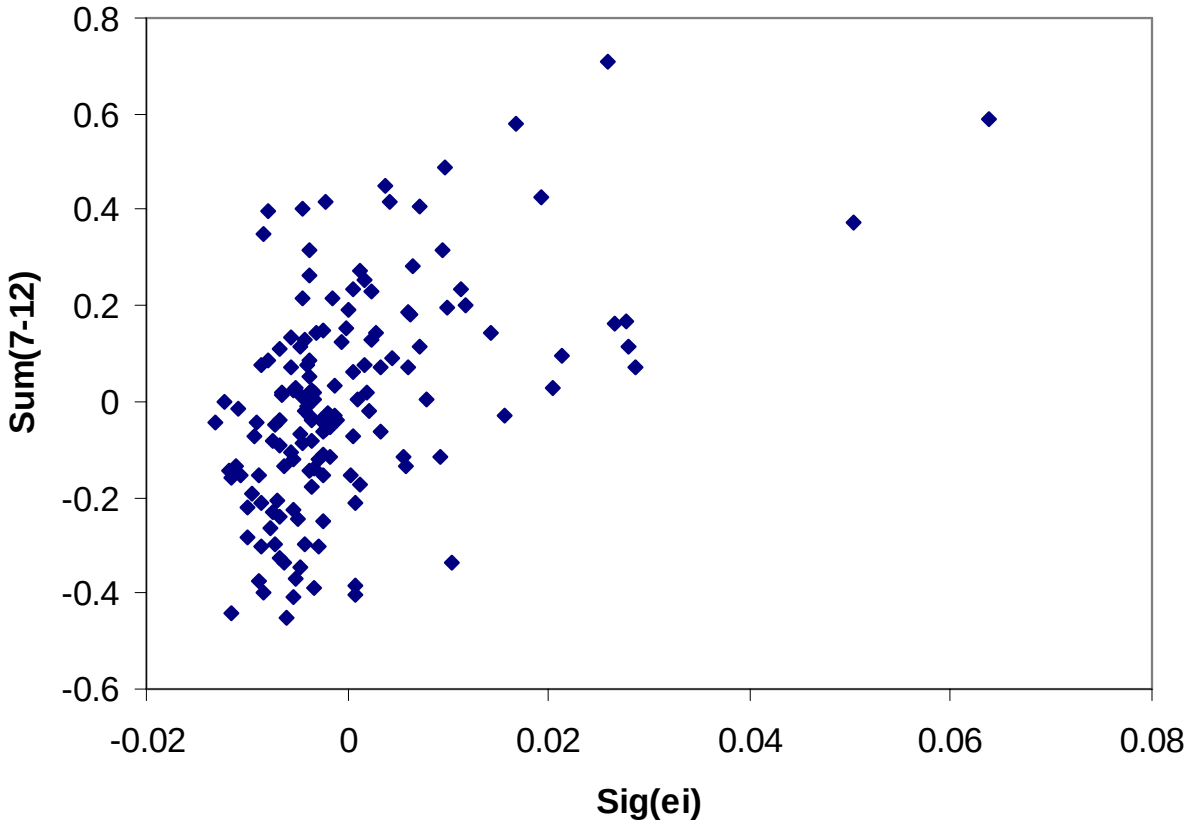


Figure 6: Partial Correlation between volatility of industry shocks (sig(ei)) and the cumulative sum of impulse responses from the 7th to the 12th months.



APPENDIX A – Main Data Set

Format is as in Stock and Watson (2002) paper: series number; series mnemonic; data span; transformation code and series description as appears in the database. The transformation codes are: 1 – no transformation; 2 – first difference; 4 – logarithm; 5 – first difference of logarithm. Second differencing of logarithms was not used. Our main data set contains 230 monthly series with no missing observations. Series were directly taken from DRI/McGraw Hill Basic Economics Database.

	OUT ---------- real output and income			
1	IPS11	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - PRODUCTS, TOTAL
2	IPS299	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - FINAL PRODUCTS
3	IPS12	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - CONSUMER GOODS
4	IPS13	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - DURABLE CONSUMER GOODS
5	IPS18	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - NONDURABLE CONSUMER GOODS
6	IPS25	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - BUSINESS EQUIPMENT
7	IPS32	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - MATERIALS
8	IPS34	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - DURABLE GOODS MATERIALS
9	IPS38	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - NONDURABLE GOODS MATERIALS
10	IPS43	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - MANUFACTURING (SIC)
11	IPS67e	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - MINING NAICS=21
12	IPS68e	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - ELECTRIC AND GAS UTILITIES
13	IPS10	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - TOTAL INDEX
14	PMI	1976:1 - 2005:6	5	PURCHASING MANAGERS' INDEX (SA)
15	PMP	1976:1 - 2005:6	5	NAPM PRODUCTION INDEX (PERCENT)
16	PYQ	1976:1 - 2005:6	5	PERSONAL INCOME (CHAINED) (BIL2000$,SAAR)
17	MYXPQ	1976:1 - 2005:6	5	PERSONAL INCOME LESS TRANSFER PAYMENTS (CHAINED) (BIL 2000$,SAAR)
18	IPS307	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - RESIDENTIAL UTILITIES
19	IPS316	1976:1 - 2005:6	5	INDUSTRIAL PRODUCTION INDEX - BASIC METALS
	EMP ---------- employment and hours			
20	LHEL	1976:1 - 2005:6	5	INDEX OF HELP-WANTED ADVERTISING IN NEWSPAPERS (1967=100;SA)
21	LHELX	1976:1 - 2005:6	4	EMPLOYMENT: RATIO; HELP-WANTED ADS:NO. UNEMPLOYED CLF
22	LHEM	1976:1 - 2005:6	5	CIVILIAN LABOR FORCE: EMPLOYED, TOTAL (THOUS.,SA)
23	LHNAG	1976:1 - 2005:6	5	CIVILIAN LABOR FORCE: EMPLOYED, NONAGRIC.INDUSTRIES (THOUS.,SA)
24	LHUR	1976:1 - 2005:6	1	UNEMPLOYMENT RATE: ALL WORKERS, 16 YEARS & OVER (%,SA)
25	LHU680	1976:1 - 2005:6	1	UNEMPLOY.BY DURATION: AVERAGE(MEAN)DURATION IN WEEKS (SA)
26	LHU5	1976:1 - 2005:6	1	UNEMPLOY.BY DURATION: PERSONS UNEMPL.LESS THAN 5 WKS (THOUS.,SA)
27	LHU14	1976:1 - 2005:6	1	UNEMPLOY.BY DURATION: PERSONS UNEMPL.5 TO 14 WKS (THOUS.,SA)
28	LHU15	1976:1 - 2005:6	1	UNEMPLOY.BY DURATION: PERSONS UNEMPL.15 WKS + (THOUS.,SA)
29	LHU26	1976:1 - 2005:6	1	UNEMPLOY.BY DURATION: PERSONS UNEMPL.15 TO 26 WKS (THOUS.,SA)
30	BLS_LPNAG	1976:1 - 2005:6	5	Total Nonfarm Employment - Seasonally Adjusted - CES0000000001
31	BLS_LP	1976:1 - 2005:6	5	Total Private Employment - Seasonally Adjusted - CES0500000001
32	BLS_LPGD	1976:1 - 2005:6	5	Goods-producing Employment - Seasonally Adjusted - CES0600000001
33	BLS_LPMI	1976:1 - 2005:6	5	Natural Resources and Mining Employment - Seasonally Adjusted - CES1000000001
34	BLS_LPCC	1976:1 - 2005:6	5	Construction Employment - Seasonally Adjusted - CES2000000001
35	BLS_LPEM	1976:1 - 2005:6	5	Manufacturing Employment - Seasonally Adjusted - CES3000000001
36	BLS_LPED	1976:1 - 2005:6	5	Durable Goods Manufacturing Employment - Seasonally Adjusted - CES3100000001
37	BLS_LPEN	1976:1 - 2005:6	5	Nondurable Goods Manufacturing Employment - Seasonally Adjusted - CES3200000001
38	BLS_Ser.-EMP	1976:1 - 2005:6	5	Service-providing Employment - Seasonally Adjusted - CES0700000001
39	BLS_Tra.EMP	1976:1 - 2005:6	5	Trade, Transportation, and Utilities Employment - Seasonally Adjusted - CES4000000001
40	BLS_Ret.- EMP	1976:1 - 2005:6	5	Retail Trade Employment - Seasonally Adjusted - CES4200000001
41	BLS_Whol. EMP	1976:1 - 2005:6	5	Wholesale Trade Employment - Seasonally Adjusted - CES4142000001
42	BLS_Fin.-EMP	1976:1 - 2005:6	5	Financial Activities Employment - Seasonally Adjusted - CES5500000001
43	BLS_P-ser.EMP	1976:1 - 2005:6	5	Private Service-providing Employment - Seasonally Adjusted - CES0800000001
44	BLS_LPGOV	1976:1 - 2005:6	5	Government Employment - Seasonally Adjusted - CES9000000001
45	BLS_LPHRM	1976:1 - 2005:6	1	Manufacturing Average Weekly Hours of Production Workers - Seasonally Adjusted - CES30000
46	BLS_LPMOSA	1976:1 - 2005:6	1	Manufacturing Average Weekly Overtime of Production Workers - Seasonally Adjusted - CES30
47	PMEMP	1976:1 - 2005:6		NAPM EMPLOYMENT INDEX (PERCENT)
	HSS ---------- housing starts and sales			
48	HSFR	1976:1 - 2005:6	4	HOUSING STARTS:NONFARM(1947-58);TOTAL FARM&NONFARM(1959-)(THOUS.,SA
49	HSNE	1976:1 - 2005:6	4	HOUSING STARTS:NORTHEAST (THOUS.U.)S.A.
50	HSMW	1976:1 - 2005:6	4	HOUSING STARTS:MIDWEST(THOUS.U.)S.A.
51	HSSOU	1976:1 - 2005:6	4	HOUSING STARTS:SOUTH (THOUS.U.)S.A.
52	HSWST	1976:1 - 2005:6	4	HOUSING STARTS:WEST (THOUS.U.)S.A.
53	HSBR	1976:1 - 2005:6	4	HOUSING AUTHORIZED: TOTAL NEW PRIV HOUSING UNITS (THOUS.,SAAR)
54	HMOB	1976:1 - 2005:6	4	MOBILE HOMES: MANUFACTURERS' SHIPMENTS (THOUS.OF UNITS,SAAR)
	INV ---------- real inventories and inventory-sales ratios			
55	PMNV	1976:1 - 2005:6	1	NAPM INVENTORIES INDEX (PERCENT)
	ORD---------- orders and unfilled orders			
56	PMNO	1976:1 - 2005:6	1	NAPM NEW ORDERS INDEX (PERCENT)

57	PMDEL	1976:1 - 2005:6	1	NAPM VENDOR DELIVERIES INDEX (PERCENT)
58	MOCMQ	1976:1 - 2005:6	5	NEW ORDERS (NET) - CONSUMER GOODS & MATERIALS, 1996 DOLLARS (BCI)
59	MSONDQ	1976:1 - 2005:6	5	NEW ORDERS, NONDEFENSE CAPITAL GOODS, IN 1996 DOLLARS (BCI)
	SPR ---------- stock prices			
60	FSPCOM	1976:1 - 2005:6	5	S&P'S COMMON STOCK PRICE INDEX: COMPOSITE (1941-43=10)
61	FSPIN	1976:1 - 2005:6	5	S&P'S COMMON STOCK PRICE INDEX: INDUSTRIALS (1941-43=10)
62	FSDXP	1976:1 - 2005:6	1	S&P'S COMPOSITE COMMON STOCK: DIVIDEND YIELD (% PER ANNUM)
63	FSPXE	1976:1 - 2005:6	1	S&P'S COMPOSITE COMMON STOCK: PRICE-EARNINGS RATIO (%,NSA)
64	FSDJ	1976:1 - 2005:6		COMMON STOCK PRICES: DOW JONES INDUSTRIAL AVERAGE
	EXR ---------- exchange rates			
65	EXRSW	1976:1 - 2005:6	5	FOREIGN EXCHANGE RATE: SWITZERLAND (SWISS FRANC PER U.S.$)
66	EXRJAN	1976:1 - 2005:6	5	FOREIGN EXCHANGE RATE: JAPAN (YEN PER U.S.$)
67	EXRUK	1976:1 - 2005:6	5	FOREIGN EXCHANGE RATE: UNITED KINGDOM (CENTS PER POUND)
68	EXRCAN	1976:1 - 2005:6	5	FOREIGN EXCHANGE RATE: CANADA (CANADIAN $ PER U.S.$)
	INT ---------- interest rates			
69	FYFF	1976:1 - 2005:6	1	INTEREST RATE: FEDERAL FUNDS (EFFECTIVE) (% PER ANNUM,NSA)
70	FYGM3	1976:1 - 2005:6	1	INTEREST RATE: U.S.TREASURY BILLS,SEC MKT,3-MO.(% PER ANN,NSA)
71	FYGM6	1976:1 - 2005:6	1	INTEREST RATE: U.S.TREASURY BILLS,SEC MKT,6-MO.(% PER ANN,NSA)
72	FYGT1	1976:1 - 2005:6	1	INTEREST RATE: U.S.TREASURY CONST MATURITIES,1-YR.(% PER ANN,NSA)
73	FYGT5	1976:1 - 2005:6	1	INTEREST RATE: U.S.TREASURY CONST MATURITIES,5-YR.(% PER ANN,NSA)
74	FYGT10	1976:1 - 2005:6	1	INTEREST RATE: U.S.TREASURY CONST MATURITIES,10-YR.(% PER ANN,NSA)
75	FYAAAC	1976:1 - 2005:6	1	BOND YIELD: MOODY'S AAA CORPORATE (% PER ANNUM)
76	FYBAAC	1976:1 - 2005:6	1	BOND YIELD: MOODY'S BAA CORPORATE (% PER ANNUM)
77	SFYGM3	1976:1 - 2005:6	1	Spread FYGM3 - FYFF
78	SFYGM6	1976:1 - 2005:6	1	Spread FYGM6 - FYFF
79	SFYGT1	1976:1 - 2005:6	1	Spread FYGT1 - FYFF
80	SFYGT5	1976:1 - 2005:6	1	Spread FYGT5 - FYFF
81	SFYGT10	1976:1 - 2005:6	1	Spread FYGT10 - FYFF
82	SFYAAAC	1976:1 - 2005:6	1	Spread FYAAAC - FYFF
83	SFYBAAC	1976:1 - 2005:6	1	Spread FYBAAC - FYFF
	MON ---------- money and credit quantity aggregates			
84	FM1	1976:1 - 2005:6	5	MONEY STOCK: M1(CURR,TRAV.CKS,DEM DEP,OTHER CK'ABLE DEP)(BIL$,SA)
85	FM2	1976:1 - 2005:6	5	MONEY STOCK:M2(M1+O'NITE RPS,EURO$,G/P&B/D MMMFS&SAV&SM TIME DEP(BIL$,
86	FM3	1976:1 - 2005:6	5	MONEY STOCK: M3(M2+LG TIME DEP,TERM RP'S&INST ONLY MMMFS)(BIL$,SA)
87	FM2DQ	1976:1 - 2005:6	5	MONEY SUPPLY - M2 IN 1996 DOLLARS (BCI)
88	FMFBA	1976:1 - 2005:6	5	MONETARY BASE, ADJ FOR RESERVE REQUIREMENT CHANGES(MIL$,SA)
89	FMRRA	1976:1 - 2005:6	5	DEPOSITORY INST RESERVES:TOTAL,ADJ FOR RESERVE REQ CHGS(MIL$,SA)
90	FMRNBA	1976:1 - 2005:6	5	DEPOSITORY INST RESERVES:NONBORROWED,ADJ RES REQ CHGS(MIL$,SA)
91	FCLBMC	1976:1 - 2005:6	1	WKLY RP LG COM'L BANKS:NET CHANGE COM'L & INDUS LOANS(BIL$,SAAR)
92	CCINRV	1976:1 - 2005:6	5	CONSUMER CREDIT OUTSTANDING - NONREVOLVING(G19)
93	IMFCLNQ	1976:1 - 2005:6		COMMERCIAL & INDUSTRIAL LOANS OUSTANDING IN 1996 DOLLARS
	PRI ---------- price indexes			
94	PMCP	1976:1 - 2005:6	1	NAPM COMMODITY PRICES INDEX (PERCENT)
95	PWFSA	1976:1 - 2005:6	5	PRODUCER PRICE INDEX: FINISHED GOODS (82=100,SA)
96	PWFCSA	1976:1 - 2005:6	5	PRODUCER PRICE INDEX:FINISHED CONSUMER GOODS (82=100,SA)
97	PWIMSA	1976:1 - 2005:6	5	PRODUCER PRICE INDEX:INTERMED MAT.SUPPLIES & COMPONENTS(82=100,SA)
98	PWCMSA	1976:1 - 2005:6	5	PRODUCER PRICE INDEX:CRUDE MATERIALS (82=100,SA)
99	PUNEW	1976:1 - 2005:6	5	CPI-U: ALL ITEMS (82-84=100,SA)
100	PU83	1976:1 - 2005:6	5	CPI-U: APPAREL & UPKEEP (82-84=100,SA)
101	PU84	1976:1 - 2005:6	5	CPI-U: TRANSPORTATION (82-84=100,SA)
102	PU85	1976:1 - 2005:6	5	CPI-U: MEDICAL CARE (82-84=100,SA)
103	PUC	1976:1 - 2005:6	5	CPI-U: COMMODITIES (82-84=100,SA)
104	PUCD	1976:1 - 2005:6	5	CPI-U: DURABLES (82-84=100,SA)
105	PUXF	1976:1 - 2005:6	5	CPI-U: ALL ITEMS LESS FOOD (82-84=100,SA)
106	PUXHS	1976:1 - 2005:6	5	CPI-U: ALL ITEMS LESS SHELTER (82-84=100,SA)
107	PUXM	1976:1 - 2005:6	5	CPI-U: ALL ITEMS LESS MIDICAL CARE (82-84=100,SA)
108	PSCCOM	1976:1 - 2005:6	5	SPOT MARKET PRICE INDEX:BLS & CRB: ALL COMMODITIES(1967=100)
	AHE ---------- average hourly earnings			
109	BLS_LEHCC	1976:1 - 2005:6	5	Construction Average Hourly Earnings of Production Workers - Seasonally Adjusted - CES2000
110	BLS_LEHM	1976:1 - 2005:6	5	Manufacturing Average Hourly Earnings of Production Workers - Seasonally Adjusted - CES300
	OTH ---------- miscellaneous			
111	HHSNTN	1976:1 - 2005:6	1	U. OF MICH. INDEX OF CONSUMER EXPECTATIONS(BCD-83)

APPENDIX B - Personal Consumption Expenditures (price indexes and nominal expenditure)

Format is as above: series number; series; data span; transformation code and series description as appears in the database. The transformation for all data was first difference of logarithms, which is coded as 5. This data set contains 194 monthly price series on Personal Consumption Expenditures with no missing observations, and 194 monthly real consumption series on Personal Consumption Expenditures. We describe here the 194 price series. The 194 corresponding real consumption series were ordered and transformed in a similar fashion. Series were downloaded from the underlying tables of the Bureau of Economic Analysis.

1	P1NDCG3	1976:1 - 2005:6	5	New domestic autos
2	P1NFCG3	1976:1 - 2005:6	5	New foreign autos
3	P1NETG3	1976:1 - 2005:6	5	Net transactions in used autos
4	P1MARG3	1976:1 - 2005:6	5	Used auto margin
5	P1REEG3	1976:1 - 2005:6	5	Employee reimbursement
6	P1TRUG3	1976:1 - 2005:6	5	Trucks, new and net used
7	P1REVG3	1976:1 - 2005:6	5	Recreational vehicles
8	P1TATG3	1976:1 - 2005:6	5	Tires and tubes
9	P1PAAG3	1976:1 - 2005:6	5	Accessories and parts
10	P1FNRG3	1976:1 - 2005:6	5	Furniture, including mattresses and bedsprings (29)
11	P1MHAG3	1976:1 - 2005:6	5	Major household appliances
12	P1SEAG3	1976:1 - 2005:6	5	Small electric appliances
13	P1CHNG3	1976:1 - 2005:6	5	China, glassware, tableware, and utensils (31)
14	P1RADG3	1976:1 - 2005:6	5	Video and audio goods, including musical instruments, and computer goods (91)
15	P1FLRG3	1976:1 - 2005:6	5	Floor coverings
16	P1CLFG3	1976:1 - 2005:6	5	Clocks, lamps, and furnishings
17	P1TEXG3	1976:1 - 2005:6	5	Blinds, rods, and other
18	P1WTRG3	1976:1 - 2005:6	5	Writing equipment
19	P1HDWG3	1976:1 - 2005:6	5	Tools, hardware, and supplies
20	P1LWNG3	1976:1 - 2005:6	5	Outdoor eqpt and supplies
21	P1OPTG3	1976:1 - 2005:6	5	Ophthalmic products and orthopedic appliances (46)
22	P1GUNG3	1976:1 - 2005:6	5	Guns
23	P1SPTG3	1976:1 - 2005:6	5	Sporting equipment
24	P1CAMG3	1976:1 - 2005:6	5	Photographic equipment
25	P1BCYG3	1976:1 - 2005:6	5	Bicycles
26	P1MCYG3	1976:1 - 2005:6	5	Motorcycles
27	P1BOAG3	1976:1 - 2005:6	5	Pleasure boats
28	P1AIRG3	1976:1 - 2005:6	5	Pleasure aircraft
29	P1JRYG3	1976:1 - 2005:6	5	Jewelry and watches (18)
30	P1BKSG3	1976:1 - 2005:6	5	Books and maps (87)
31	P1GRAG3	1976:1 - 2005:6	5	Cereals
32	P1BAKG3	1976:1 - 2005:6	5	Bakery products
33	P1BEEG3	1976:1 - 2005:6	5	Beef and veal
34	P1PORG3	1976:1 - 2005:6	5	Pork
35	P1MEAG3	1976:1 - 2005:6	5	Other meats
36	P1POUG3	1976:1 - 2005:6	5	Poultry
37	P1FISG3	1976:1 - 2005:6	5	Fish and seafood
38	P1GGSG3	1976:1 - 2005:6	5	Eggs
39	P1MILG3	1976:1 - 2005:6	5	Fresh milk and cream
40	P1DAIG3	1976:1 - 2005:6	5	Processed dairy products

41	P1FRUG3	1976:1 - 2005:6	5	Fresh fruits
42	P1VEGG3	1976:1 - 2005:6	5	Fresh vegetables
43	P1PFVG3	1976:1 - 2005:6	5	Processed fruits and vegetables
44	P1JNBG3	1976:1 - 2005:6	5	Juices and nonalcoholic drinks
45	P1CTMG3	1976:1 - 2005:6	5	Coffee, tea and beverage materials
46	P1FATG3	1976:1 - 2005:6	5	Fats and oils
47	P1SWEG3	1976:1 - 2005:6	5	Sugar and sweets
48	P1OFDG3	1976:1 - 2005:6	5	Other foods
49	P1PEFG3	1976:1 - 2005:6	5	Pet food
50	P1MLTG3	1976:1 - 2005:6	5	Beer and ale, at home
51	P1WING3	1976:1 - 2005:6	5	Wine and brandy, at home
52	P1LIQG3	1976:1 - 2005:6	5	Distilled spirits, at home
53	P1ESLG3	1976:1 - 2005:6	5	Elementary and secondary school lunch
54	P1HSLG3	1976:1 - 2005:6	5	Higher education school lunch
55	P1OPMG3	1976:1 - 2005:6	5	Other purchased meals
56	P1APMG3	1976:1 - 2005:6	5	Alcohol in purchased meals
57	P1CFDG3	1976:1 - 2005:6	5	Food supplied civilians
58	P1MFDG3	1976:1 - 2005:6	5	Food supplied military
59	P1FFDG3	1976:1 - 2005:6	5	Food produced and consumed on farms
60	P1SHUG3	1976:1 - 2005:6	5	Shoes (12)
61	P1WGCG3	1976:1 - 2005:6	5	Clothing for females
62	P1WICG3	1976:1 - 2005:6	5	Clothing for infants
63	P1WSGG3	1976:1 - 2005:6	5	Sewing goods for females
64	P1WUGG3	1976:1 - 2005:6	5	Luggage for females
65	P1MBCG3	1976:1 - 2005:6	5	Clothing for males
66	P1MSGG3	1976:1 - 2005:6	5	Sewing goods for males
67	P1MUGG3	1976:1 - 2005:6	5	Luggage for males
68	P1MICG3	1976:1 - 2005:6	5	Standard clothing issued to military personnel (n.d.)
69	P1GASG3	1976:1 - 2005:6	5	Gasoline and other motor fuel
70	P1LUBG3	1976:1 - 2005:6	5	Lubricants
71	P1OILG3	1976:1 - 2005:6	5	Fuel oil
72	P1LPGG3	1976:1 - 2005:6	5	Liquified petroleum gas and other fuel
73	P1TOBG3	1976:1 - 2005:6	5	Tobacco products (7)
74	P1SOAG3	1976:1 - 2005:6	5	Soap
75	P1CSMG3	1976:1 - 2005:6	5	Cosmetics and perfumes
76	P1OPHG3	1976:1 - 2005:6	5	Other personal hygiene goods
77	P1SDHG3	1976:1 - 2005:6	5	Semidurable house furnishings (33)
78	P1CLEG3	1976:1 - 2005:6	5	Cleaning preparations
79	P1LIGG3	1976:1 - 2005:6	5	Lighting supplies
80	P1PAPG3	1976:1 - 2005:6	5	Paper products
81	P1RXDG3	1976:1 - 2005:6	5	Prescription drugs
82	P1NRXG3	1976:1 - 2005:6	5	Nonprescription drugs
83	P1MDSG3	1976:1 - 2005:6	5	Medical supplies
84	P1GYNG3	1976:1 - 2005:6	5	Gynecological goods
85	P1DOLG3	1976:1 - 2005:6	5	Toys, dolls, and games
86	P1AMMG3	1976:1 - 2005:6	5	Sport supplies, including ammunition
87	P1FLMG3	1976:1 - 2005:6	5	Film and photo supplies
88	P1STSG3	1976:1 - 2005:6	5	Stationery and school supplies
89	P1GREG3	1976:1 - 2005:6	5	Greeting cards
90	P1ARTG3	1976:1 - 2005:6	5	Government expenditures abroad

91	P1ARSG3	1976:1 - 2005:6	5	Other private services
92	P1REMG3	1976:1 - 2005:6	5	Less: Personal remittances in kind to nonresidents
93	P1MGZG3	1976:1 - 2005:6	5	Magazines and sheet music
94	P1NWPG3	1976:1 - 2005:6	5	Newspapers
95	P1FLOG3	1976:1 - 2005:6	5	Flowers, seeds, and potted plants (95)
96	P1OMHG3	1976:1 - 2005:6	5	Owner occupied mobile homes
97	P1OSTG3	1976:1 - 2005:6	5	Owner occupied stationary homes
98	P1TMHG3	1976:1 - 2005:6	5	Tenant occupied mobile homes
99	P1TSPG3	1976:1 - 2005:6	5	Tenant occupied stationary homes
100	P1TLDG3	1976:1 - 2005:6	5	Tenant landlord durables
101	P1FARG3	1976:1 - 2005:6	5	Rental value of farm dwellings (26)
102	P1HOTG3	1976:1 - 2005:6	5	Hotels and motels
103	P1HFRG3	1976:1 - 2005:6	5	Clubs and fraternity housing
104	P1HHEG3	1976:1 - 2005:6	5	Higher education housing
105	P1HESG3	1976:1 - 2005:6	5	Elem and second education housing
106	P1TGRG3	1976:1 - 2005:6	5	Tenant group room and board
107	P1TGLG3	1976:1 - 2005:6	5	Tenant group employee lodging
108	P1ELCG3	1976:1 - 2005:6	5	Electricity (37)
109	P1NGSG3	1976:1 - 2005:6	5	Gas (38)
110	P1WSMG3	1976:1 - 2005:6	5	Water and sewerage maintenance
111	P1REFG3	1976:1 - 2005:6	5	Refuse collection
112	P1LOCG3	1976:1 - 2005:6	5	Local and cellular telephone
113	P1INCG3	1976:1 - 2005:6	5	Intrastate toll calls
114	P1ITCG3	1976:1 - 2005:6	5	Interstate toll calls
115	P1DMCG3	1976:1 - 2005:6	5	Domestic service, cash
116	P1DMIG3	1976:1 - 2005:6	5	Domestic service, in kind
117	P1MSEG3	1976:1 - 2005:6	5	Moving and storage
118	P1FIPG3	1976:1 - 2005:6	5	Household insurance premiums
119	P1FIBG3	1976:1 - 2005:6	5	Less: Household insurance benefits paid
120	P1RCLG3	1976:1 - 2005:6	5	Rug and furniture cleaning
121	P1EREG3	1976:1 - 2005:6	5	Electrical repair
122	P1FREG3	1976:1 - 2005:6	5	Reupholstery and furniture repair
123	P1PSTG3	1976:1 - 2005:6	5	Postage
124	P1MHOG3	1976:1 - 2005:6	5	Household operation services, n.e.c.
125	P1ARPG3	1976:1 - 2005:6	5	Motor vehicle repair
126	P1RLOG3	1976:1 - 2005:6	5	Motor vehicle rental, leasing, and other
127	P1TOLG3	1976:1 - 2005:6	5	Bridge, tunnel, ferry, and road tolls
128	P1AING3	1976:1 - 2005:6	5	Insurance
129	P1IMTG3	1976:1 - 2005:6	5	Mass transit systems (79)
130	P1TAXG3	1976:1 - 2005:6	5	Taxicab (80)
131	P1IRRG3	1976:1 - 2005:6	5	Railway (82)
132	P1IBUG3	1976:1 - 2005:6	5	Bus (83)
133	P1IAIG3	1976:1 - 2005:6	5	Airline (84)
134	P1TROG3	1976:1 - 2005:6	5	Other (85)
135	P1PHYG3	1976:1 - 2005:6	5	Physicians (47)
136	P1DENG3	1976:1 - 2005:6	5	Dentists (48)
137	P1OPSG3	1976:1 - 2005:6	5	Other professional services (49)
138	P1NPHG3	1976:1 - 2005:6	5	Nonprofit
139	P1FPHG3	1976:1 - 2005:6	5	Proprietary
140	P1GVHG3	1976:1 - 2005:6	5	Government

141	P1NRSG3	1976:1 - 2005:6	5	Nursing homes
142	P1MING3	1976:1 - 2005:6	5	Medical care and hospitalization
143	P1IING3	1976:1 - 2005:6	5	Income loss
144	P1PWCG3	1976:1 - 2005:6	5	Workers' compensation
145	P1MOVG3	1976:1 - 2005:6	5	Motion picture theaters
146	P1LEGG3	1976:1 - 2005:6	5	Legitimate theaters and opera, and entertainments of nonprofit institutions (except athletics)
147	P1SPEG3	1976:1 - 2005:6	5	Spectator sports
148	P1RTVG3	1976:1 - 2005:6	5	Radio and television repair
149	P1CLUG3	1976:1 - 2005:6	5	Clubs and fraternal organizations
150	P1SIGG3	1976:1 - 2005:6	5	Sightseeing
151	P1FLYG3	1976:1 - 2005:6	5	Private flying
152	P1BILG3	1976:1 - 2005:6	5	Bowling and billiards
153	P1CASG3	1976:1 - 2005:6	5	Casino gambling
154	P1OPAG3	1976:1 - 2005:6	5	Other comml participant amusements
155	P1PARG3	1976:1 - 2005:6	5	Pari-mutuel net receipts
156	P1REOG3	1976:1 - 2005:6	5	Other
157	P1SCLG3	1976:1 - 2005:6	5	Shoe repair
158	P1DRYG3	1976:1 - 2005:6	5	Drycleaning
159	P1LGRG3	1976:1 - 2005:6	5	Laundry and garment repair
160	P1BEAG3	1976:1 - 2005:6	5	Beauty shops, including combination
161	P1BARG3	1976:1 - 2005:6	5	Barber shops
162	P1WCRG3	1976:1 - 2005:6	5	Watch, clock, and jewelry repair
163	P1CRPG3	1976:1 - 2005:6	5	Miscellaneous personal services
164	P1BROG3	1976:1 - 2005:6	5	Brokerage charges and investment counseling (61)
165	P1BNKG3	1976:1 - 2005:6	5	Bank service charges, trust services, and safe deposit box rental (62)
166	P1IMCG3	1976:1 - 2005:6	5	Commercial banks
167	P1IMNG3	1976:1 - 2005:6	5	Other financial institutions
168	P1LIFG3	1976:1 - 2005:6	5	Expense of handling life insurance and pension plans (64)
169	P1GALG3	1976:1 - 2005:6	5	Legal services (65)
170	P1FUNG3	1976:1 - 2005:6	5	Funeral and burial expenses (66)
171	P1UNSG3	1976:1 - 2005:6	5	Labor union expenses
172	P1ASSG3	1976:1 - 2005:6	5	Profession association expenses
173	P1GENG3	1976:1 - 2005:6	5	Employment agency fees
174	P1AMOG3	1976:1 - 2005:6	5	Money orders
175	P1CLAG3	1976:1 - 2005:6	5	Classified ads
176	P1ACCG3	1976:1 - 2005:6	5	Tax return preparation services
177	P1THEG3	1976:1 - 2005:6	5	Personal business services, n.e.c.
178	P1PEDG3	1976:1 - 2005:6	5	Private higher education
179	P1GEDG3	1976:1 - 2005:6	5	Public higher education
180	P1ESCG3	1976:1 - 2005:6	5	Elementary and secondary schools
181	P1NSCG3	1976:1 - 2005:6	5	Nursery schools
182	P1VEDG3	1976:1 - 2005:6	5	Commercial and vocational schools
183	P1REDG3	1976:1 - 2005:6	5	Foundations and nonprofit research
184	P1POLG3	1976:1 - 2005:6	5	Political organizations
185	P1MUSG3	1976:1 - 2005:6	5	Museums and libraries
186	P1FOUG3	1976:1 - 2005:6	5	Foundations to religion and welfare
187	P1WELG3	1976:1 - 2005:6	5	Social welfare
188	P1RELG3	1976:1 - 2005:6	5	Religion
189	P1FTRG3	1976:1 - 2005:6	5	Foreign travel by U.S. residents (110)
190	P1EXFG3	1976:1 - 2005:6	5	Less: Expenditures in the United States by nonresidents (112)

191	P1TDGG3	1976:1 - 2005:6	5	Durable goods
192	P1TNDG3	1976:1 - 2005:6	5	Nondurable goods
193	P1TSSG3	1976:1 - 2005:6	5	Services
194	PPCE	1976:1 - 2005:6	5	Personal Consumption Expenditures (all items)

APPENDIX C – Producer Price indices

Format is as in Stock and Watson (2002) paper: series number; series mnemonic (NAICS code); data span; transformation code and series description as appears in the database. The transformation for all data was first difference of logarithms, which is coded as 5. This data set contains 154 monthly series with no missing observations. All series are downloaded from the website of BLS.

1	311119	1976:1 - 2005:6	5	Other animal food manufacturing
2	311119p	1976:1 - 2005:6	5	Other animal food manufacturing (primary products)
3	311211	1976:1 - 2005:6	5	Flour Milling
4	311212	1976:1 - 2005:6	5	Rice milling
5	311213	1976:1 - 2005:6	5	Malt mfg
6	311223a	1976:1 - 2005:6	5	Other oilseed processing (Cottonseed cake and meal and other byproducts)
7	311225p	1976:1 - 2005:6	5	Fats and oils refining and blending (Primary products)
8	311311	1976:1 - 2005:6	5	Sugarcane mills
9	311313	1976:1 - 2005:6	5	Beet sugar manufacturing
10	311412	1976:1 - 2005:6	5	Frozen specialty food manufacturing
11	311520	1976:1 - 2005:6	5	Ice cream and frozen dessert mfg
12	311920	1976:1 - 2005:6	5	Coffee and tea manufacturing
13	312140	1976:1 - 2005:6	5	Distilleries
14	32211-	1976:1 - 2005:6	5	Pulp mills
15	32213-	1976:1 - 2005:6	5	Paperboard mills
16	325620p	1976:1 - 2005:6	5	Toilet preparation mfg (Primary products)
17	325920	1976:1 - 2005:6	5	Explosives manufacturing
18	32731-	1976:1 - 2005:6	5	Cement mfg
19	327320	1976:1 - 2005:6	5	Ready mixed concrete mfg and dist
20	327410	1976:1 - 2005:6	5	Lime
21	327420	1976:1 - 2005:6	5	Gypsum building products manufacturing
22	327910	1976:1 - 2005:6	5	Abrasive product manufacturing
23	331210	1976:1 - 2005:6	5	Iron steel pipe & tube mfg from purch steel
24	333210	1976:1 - 2005:6	5	Sawmill & woodworking machinery mfg
25	334310	1976:1 - 2005:6	5	Audio & video equipment mfg
26	335110	1976:1 - 2005:6	5	Electric lamp bulb & part mfg
27	336370	1976:1 - 2005:6	5	Motor vehicle metal stamping
28	337910	1976:1 - 2005:6	5	Mattress mfg
29	311421	1976:1 - 2005:6	5	Fruit and vegetable canning
30	311423	1976:1 - 2005:6	5	Dried and dehydrated food manufacturing
31	311513	1976:1 - 2005:6	5	Cheese manufacturing
32	311611	1976:1 - 2005:6	5	Animal except poultry slaughtering
33	311612	1976:1 - 2005:6	5	Meat processed from carcasses
34	311613	1976:1 - 2005:6	5	Rendering and meat byproduct processing
35	311711	1976:1 - 2005:6	5	Seafood canning
36	311712	1976:1 - 2005:6	5	Fresh & frozen seafood processing
37	311813p	1976:1 - 2005:6	5	Frozen cakes pies & other pastries mfg (Primary products)
38	3118233	1976:1 - 2005:6	5	Dry pasta manufacturing (Macaroni spaghetti vermicelli and noodles)
39	312111p	1976:1 - 2005:6	5	Soft drinks manufacturing (Primary products)
40	312221	1976:1 - 2005:6	5	Cigarettes
41	3122291	1976:1 - 2005:6	5	Other tobacco product mfg (Cigars)
42	313111	1976:1 - 2005:6	5	Yarn spinning mills
43	3133111	1976:1 - 2005:6	5	Broadwoven fabric finishing mills (Finished cotton broadwoven fabrics not finished in weaving mills)
44	315111	1976:1 - 2005:6	5	Sheer hosiery mills
45	315191	1976:1 - 2005:6	5	Outerwear knitting mills
46	315223	1976:1 - 2005:6	5	Men's boy's cut & sew shirt exc work mfg
47	315224	1976:1 - 2005:6	5	Men's boy's cut & sew trouser slack jean mfg
48	315993	1976:1 - 2005:6	5	Men's and boys' neckwear mfg
49	316211	1976:1 - 2005:6	5	Rubber and plastic footwear manufacturing
50	316213	1976:1 - 2005:6	5	Men's footwear exc athletic mfg
51	316214	1976:1 - 2005:6	5	Women's footwear exc athletic mfg
52	316992	1976:1 - 2005:6	5	Women's handbag & purse mfg
53	321212	1976:1 - 2005:6	5	Softwood veneer or plywood mfg
54	3212191	1976:1 - 2005:6	5	Reconstituted wood product mfg (Particleboard produced at this location)
55	3219181	1976:1 - 2005:6	5	Other millwork including flooring

				(Wood moldings except prefinished moldings made from purchased moldings)
56	321991	1976:1 - 2005:6	5	Manufactured homes mobile homes mfg
57	3221211	1976:1 - 2005:6	5	Paper except newsprint mills (Clay coated printing and converting paper)
58	322214	1976:1 - 2005:6	5	Fiber can tube drum & oth products mfg
59	324121	1976:1 - 2005:6	5	Asphalt paving mixture & block mfg
60	324122	1976:1 - 2005:6	5	Asphalt shingle & coating materials mfg
61	324191p	1976:1 - 2005:6	5	Petroleum lubricating oils and greases (Primary products)
62	325181	1976:1 - 2005:6	5	Alkalies and chlorine
63	3251881	1976:1 - 2005:6	5	All other basic inorganic chemical manufacturing (Sulfuric acid gross new and fortified)
64	3251921	1976:1 - 2005:6	5	Cyclic crude and intermediate manufacturing (Cyclic coal tar intermediates)
65	325212	1976:1 - 2005:6	5	Synthetic rubber manufacturing
66	325222	1976:1 - 2005:6	5	Manufactured noncellulosic fibers
67	325314	1976:1 - 2005:6	5	Fertilizer mixing only manufacturing
68	3254111	1976:1 - 2005:6	5	Medicinal & botanical mfg (Synthetic organic medicinal chemicals in bulk)
				Unsupported plastics film sheet excluding packaging manufacturing
69	3261131	1976:1 - 2005:6	5	(Unsupported plastics film and sheet)
70	326192	1976:1 - 2005:6	5	Resilient floor covering manufacturing
71	326211	1976:1 - 2005:6	5	Tire manufacturing except retreading
72	327111	1976:1 - 2005:6	5	Vitreous plumbing fixtures access ftg mfg
73	327121	1976:1 - 2005:6	5	Brick and structural clay tile
74	327122	1976:1 - 2005:6	5	Ceramic wall and floor tile
75	327124	1976:1 - 2005:6	5	Clay refractories
76	327125	1976:1 - 2005:6	5	Nonclay Refractory Manufacturing
77	327211	1976:1 - 2005:6	5	Flat glass manufacturing
78	327213	1976:1 - 2005:6	5	Glass container manufacturing
79	327331	1976:1 - 2005:6	5	Concrete block and brick manufacturing
80	3279931	1976:1 - 2005:6	5	Mineral wool manufacturing
81	331111	1976:1 - 2005:6	5	Iron and steel mills
82	331112	1976:1 - 2005:6	5	Electrometallurgical ferroalloy product mfg
83	331221	1976:1 - 2005:6	5	Rolled steel shape manufacturing
84	331312	1976:1 - 2005:6	5	Primary aluminum production
85	331315	1976:1 - 2005:6	5	Aluminum sheet plate & foil mfg
86	331316	1976:1 - 2005:6	5	Aluminum extruded products
87	331421	1976:1 - 2005:6	5	Copper rolling drawing & extruding
				Other nonferrous metal roll draw extruding
88	3314913	1976:1 - 2005:6	5	(Titanium and titanium base alloy mill shapes excluding wire)
89	3314923	1976:1 - 2005:6	5	Other nonferrous secondary smelt refine alloying (Secondary lead)
90	331511	1976:1 - 2005:6	5	Iron foundries
				Hand and edge tools except machine tools and handsaws
91	3322121	1976:1 - 2005:6	5	(Mechanics' hand service tools)
92	332213	1976:1 - 2005:6	5	Saw blade & handsaw mfg
				Prefabricated metal building and component manufacturing (Prefabricated
93	3323111	1976:1 - 2005:6	5	metal building systems excluding farm service bldgs & residential buildings)
94	332321	1976:1 - 2005:6	5	Metal window and door manufacturing
95	332431	1976:1 - 2005:6	5	Metal can mfg
				Other metal container manufacturing
96	324393	1976:1 - 2005:6	5	(Steel shipping barrels & drums exc beer barrels more than 12 gallon capacity)
97	332611	1976:1 - 2005:6	5	Spring heavy gauge mfg
98	3326122	1976:1 - 2005:6	5	Spring light gauge mfg (Precision mechanical springs)
				Bolt nut screw rivet & washer mfg
99	3327224	1976:1 - 2005:6	5	(Externally threaded metal fasteners except aircraft)
100	332913	1976:1 - 2005:6	5	Plumbing fixture fitting & trim mfg
101	332991	1976:1 - 2005:6	5	Ball and roller bearings
102	332992	1976:1 - 2005:6	5	Small arms ammunition mfg
103	332996	1976:1 - 2005:6	5	Fabricated pipe & pipe fitting mfg
104	332998	1976:1 - 2005:6	5	Enameled iron & metal sanitary ware mfg
105	333111	1976:1 - 2005:6	5	Farm machinery & equipment mfg
106	333131	1976:1 - 2005:6	5	Mining machinery & equipment mfg
107	333132	1976:1 - 2005:6	5	Oil and gas field machinery and equipment mfg
108	333292	1976:1 - 2005:6	5	Textile machinery
109	333293	1976:1 - 2005:6	5	Printing machinery & equipment mfg
110	3332941	1976:1 - 2005:6	5	Food products machinery mfg (Dairy and milk products plant machinery)
				All other industrial machinery mfg
111	3332981	1976:1 - 2005:6	5	(Chemical manufacturing machinery equipment and parts)
				Automatic vending machine mfg
112	3333111	1976:1 - 2005:6	5	(Automatic merchandising machines coin operated excluding parts)
113	333512	1976:1 - 2005:6	5	Machine tool metal cutting types mfg
114	333513	1976:1 - 2005:6	5	Machine tool metal forming types mfg
				Cutting tool & machine tool accessory mfg
115	3335151	1976:1 - 2005:6	5	(Small cutting tools for machine tools and metalworking machinery)
116	333612	1976:1 - 2005:6	5	Speed changer industrial high speed drive & gear mfg
117	333618	1976:1 - 2005:6	5	Other engine equipment mfg
				Pump & pumping equipment mfg
118	3339111	1976:1 - 2005:6	5	(Industrial pumps except hydraulic fluid power pumps)
119	333922	1976:1 - 2005:6	5	Conveyor & conveying equipment mfg
120	3339233	1976:1 - 2005:6	5	Overhead crane hoist & monorail system mfg

				(Overhead traveling cranes and monorail systems)
				Industrial truck tractor trailer stacker machinery mfg
121	3339241	1976:1 - 2005:6	5	(Industrial trucks and tractors motorized and hand powered)
122	333992	1976:1 - 2005:6	5	Welding & soldering equipment mfg (Welding & soldering equipment mfg)
123	333997	1976:1 - 2005:6	5	Scale & balance except laboratory mfg
124	334411	1976:1 - 2005:6	5	Electron tube mfg
125	334414	1976:1 - 2005:6	5	Electronic capacitor mfg
126	334415	1976:1 - 2005:6	5	Electronic resistor mfg
127	334417	1976:1 - 2005:6	5	Electronic connector mfg
				Electricity measuring testing instrument mfg
128	3345153	1976:1 - 2005:6	5	(Test equipment for testing electrical radio & communication circuits & motors)
129	334517p	1976:1 - 2005:6	5	Irradiation apparatus manufacturing (Primary products)
				Residential electric lighting fixture mfg
130	3351211	1976:1 - 2005:6	5	(Residential electric lighting fixtures except portable & parts)
131	335122	1976:1 - 2005:6	5	Commercial electric lighting fixture mfg
132	335129	1976:1 - 2005:6	5	Other lighting equipment mfg
133	335212	1976:1 - 2005:6	5	Household vacuum cleaner mfg
134	335221	1976:1 - 2005:6	5	Household cooking appliance mfg
135	335311	1976:1 - 2005:6	5	Power distribution specialty transformer mfg
136	335312	1976:1 - 2005:6	5	Motor & generator mfg
137	335314p	1976:1 - 2005:6	5	Relay & industrial control mfg (Primary products)
138	335911	1976:1 - 2005:6	5	Storage battery mfg
				Other communication and energy wire mfg
139	3359291	1976:1 - 2005:6	5	(Power wire and cable made in plants that draw wire)
140	335932	1976:1 - 2005:6	5	Noncurrent carrying wiring device mfg
141	335991p	1976:1 - 2005:6	5	Carbon & graphite product mfg (Primary products)
142	336321p	1976:1 - 2005:6	5	Vehicular lighting equipment mfg (Primary products)
143	337121	1976:1 - 2005:6	5	Upholstered household furniture mfg
144	337122	1976:1 - 2005:6	5	Wood household furniture except upholstered
145	337124	1976:1 - 2005:6	5	Metal household furniture
146	337211	1976:1 - 2005:6	5	Wood office furniture mfg
147	3372141	1976:1 - 2005:6	5	Nonwood office furniture (Office seating including upholstered nonwood)
				Jewelry except costume mfg
148	3399111	1976:1 - 2005:6	5	(Jewelry made of solid platinum metals and solid karat gold)
149	3399123	1976:1 - 2005:6	5	Silverware & hollowware mfg (Flatware and carving sets made wholly of metal)
150	339931	1976:1 - 2005:6	5	Doll & stuffed toy mfg
151	339932	1976:1 - 2005:6	5	Game toy & children's vehicle mfg
152	339944	1976:1 - 2005:6	5	Carbon paper & inked ribbon mfg
				Fastener button needle & pin mfg
153	3399931	1976:1 - 2005:6	5	(Buttons and parts except for precious or semiprecious metals and stones)
154	3399945	1976:1 - 2005:6	5	Broom brush & mop mfg (Other brushes)

APPENDIX D – Cross-Sectional Industry characteristics

For the cross-sectional regressions we use the following data sources:

C4 - Concentration ratio. Represents the percentage of sales made by the largest 4 firms in the industry. Source. Bureau of the Census 1997.

Profit rates – average gross profit rates for 1997-2001 based on tax accounting.
Source: 2001 Annual Survey of Manufacturers.