Journal of Economic Dynamics & Control 37 (2013) 543–560

Contents lists available at SciVerse ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Changes in the effects of monetary policy on disaggregate price dynamics

Christiane Baumeister [a,*], Philip Liu [b], Haroon Mumtaz [c]

[a] International Economic Analysis Department, Bank of Canada, 234 Wellington Street, Ottawa, Ontario, Canada K1A 0G9
[b] Canadian Pension Plan Investment Board, 1 Queen Street East, Toronto, Ontario, Canada M5C 2W5
[c] Center for Central Banking Studies, Bank of England, Threadneedle Street, London EC2R 8AH, UK

ARTICLE INFO

Article history:
Received 1 November 2011
Received in revised form
24 June 2012
Accepted 18 September 2012
Available online 3 October 2012

JEL classification:
E30
E32

Keywords:
Structural FAVAR
Time variation
Monetary transmission
Disaggregate prices
Heterogeneous pricing decisions

ABSTRACT

Based on a time-varying factor-augmented vector autoregression, we demonstrate that the propagation mechanism of monetary policy disturbances differs across disaggregate components of personal consumption expenditures. While many disaggregate prices rise temporarily in response to a monetary tightening in the early part of the sample, there is no evidence of a price puzzle at the aggregate level. The share of disaggregate prices that exhibit the price puzzle diminishes from the early 1980s onwards. There also is evidence of a substantial decline in the dispersion of disaggregate price responses over time. This gradual decrease in cross-sectional heterogeneity of disaggregate price responses is associated with a dampening effect on aggregate real economic activity and a stronger effect on the aggregate price level. We illustrate by means of a multi-sector sticky-price model augmented by a cost channel how key structural parameters would have had to change to match this evolution of sectoral price dynamics.

1. Introduction

In formulating policy decisions, central banks not only rely on information about the aggregate economy but also carefully monitor sectoral conditions by conducting business surveys that provide important information about the price-setting process of firms (e.g., Blinder, 1991). For monetary authorities it is crucial to know how their policy actions affect the pricing decisions of firms in various sectors because this determines the effectiveness of monetary policy in stabilizing the economy as a whole. Altissimo et al. (2009), Bils and Klenow (2004), and Clark (2006) show that important differences in inflation dynamics arise at the aggregate and disaggregate level. Lastrapes (2006) and Balke and Wynne (2007) demonstrate that money supply shocks have long-run effects on the distribution of relative commodity prices implying an important degree of monetary non-neutrality. On the other hand, Boivin et al. (2009) make the case that discrepancies between aggregate and sectoral measures of inflation derive from the fact that the bulk of fluctuations in individual prices is due to sector-specific factors and that monetary policy shocks are of minor importance but induce sluggishness in price adjustment. In a recent contribution, De Graeve and Walentin (2011) show that if one takes special features of sectoral pricing behavior into account, the variance and persistence of disaggregate inflation are driven by both aggregate and idiosyncratic disturbances. These examples

* Corresponding author. Tel.: +1 613 782 7353; fax: +1 613 782 7658.
E-mail addresses: cbaumeister@bankofcanada.ca (C. Baumeister), pliu@cppib.ca (P. Liu), haroon.mumtaz@bankofengland.co.uk (H. Mumtaz).

0165-1889/$ - see front matter
http://dx.doi.org/10.1016/j.jedc.2012.09.009

illustrate the importance of understanding the effects of monetary policy on consumer prices not only at the aggregate level but also at the disaggregate level.

The disaggregate effects of monetary policy actions have to be viewed in the context of the Great Moderation. For example, the volatility of inflation and of output have declined considerably since the mid-1980s creating a more stable macroeconomic environment. In addition, the level and persistence of aggregate inflation have reached historical lows.[1] However, little is known about the evolution of the underlying components of aggregate price and output measures. Over the last decades, macroeconomic developments such as increased monetary policy credibility, enhanced competition due to globalization, financial innovations, and technological advances might have contributed to alter the price-setting behavior across sectors which ultimately changes the way monetary policy is transmitted to the macroeconomy. The main contribution of this paper is to analyze how disaggregate price dynamics have evolved over time in response to monetary policy shocks in order to inform central bankers about changes in the relative price effects of their policy actions which cannot be inferred from aggregate price measures.

Because exploring the monetary transmission mechanism at the disaggregate level requires an empirical framework that lends itself to including information from a large number of macroeconomic indicators and sectoral variables representing various dimensions of the economy, we employ an extended version of the factor-augmented VAR (FAVAR) model introduced in Bernanke et al. (2005). Given the possibility that disaggregate dynamics have changed over time, we extend the FAVAR model to allow for time variation in the coefficients and for stochastic volatility in the variances of the shocks. Previously, changes in the monetary transmission mechanism have been studied for the aggregate economy by incorporating time variation into small-scale VAR models that typically consist of three variables—a short-term interest rate, a measure of real economic activity and inflation (see, e.g., Primiceri, 2005). One problem with this approach is that the amount of information incorporated in these models is relatively limited which has two potential consequences. First, missing variables could lead to biases in the reduced-form VAR coefficients and in the estimates of persistence and volatility. Second, the omission of some variables could hinder the correct identification of structural shocks. One possible manifestation of these problems are impulse response functions that are at odds with economic theory. For instance, Bernanke et al. (2005) raise the issue that if the information set used by the econometrician is smaller than that employed by the monetary authority, then structural shocks and responses to them may be mismeasured because the empirical model excludes some variables that the central bank reacts to. Similarly, Castelnuovo and Surico (2010) and Benati and Surico (2009) building on Lubik and Schorfheide (2004) argue that during periods of indeterminacy, the dynamics of the economy are characterized by a latent variable. Therefore, reduced-form and structural estimates of the VAR model may be biased when estimation is carried out over these periods. Thus, with our estimation framework, we are not only able to provide novel insights about the time-varying responses of disaggregate prices and consumption quantities, but also to re-examine the mixed evidence on possible changes in the responses of the main macroeconomic variables after a monetary policy shock reported in earlier studies addressing some of the shortcomings discussed above.

Our empirical results show that the propagation mechanism of monetary disturbances is highly heterogeneous across components of personal consumption expenditures suggesting that monetary policy actions exert an important influence on relative prices in the US economy. We show that a considerable fraction of sectoral prices increases temporarily after a contractionary monetary policy shock, and that the share of disaggregate prices that respond positively gradually declined from the early 1980s onwards. On the other hand, there is no evidence of a price puzzle for any of the aggregate price level measures throughout the sample which suggests that the extra information used in the estimation is helpful in correctly identifying monetary policy shocks. In addition to considerable variation in the median responses of prices and quantities at the disaggregate level, we also find that the cross-sectional distribution of responses has undergone substantial changes over time. In particular, there has been a marked decline in the variance of the distribution of sectoral prices, while the median response has become more negative over time. The variance of the distribution of quantity responses has also declined, but the median response has become smaller in magnitude.

This paper is also related to empirical work by Nakajima et al. (2010) who, using alternative datasets and empirical methods building on Balke and Wynne (2007), similarly documented cross-sectional heterogeneity in the disaggregate price responses and the existence of a price puzzle at the disaggregate level after a monetary policy tightening. Our analysis differs from Nakajima et al. (2010) in several dimensions. First, we not only model the aggregate and disaggregate dynamics jointly and do so within a model framework that includes more information relative to medium-scale VAR models of the type used by Nakajima et al. (2010), but we also allow for time variation in the parameters of that model, whereas Nakajima et al. (2010) impose a time-invariant structure. Second, while Nakajima et al. (2010) are interested in contrasting the responses of disaggregate prices to technology and monetary policy shocks, our objective is to gain a better understanding of the monetary transmission mechanism at both the aggregate and disaggregate level. In addition to quantifying the extent of time variation in disaggregate price dynamics, we also study the evolution of the corresponding quantity dynamics and changes in their mutual interaction. Third, we use a version of the theoretical DSGE model proposed by Nakajima et al. (2010) that features heterogeneity in price stickiness across sectors and a cost channel of monetary policy to explore how key model parameters would have had to evolve over time to fit the time-varying dynamics of the estimated disaggregate price and quantity

[1] Evidence in support of these changes can be found in a number of recent papers including Kim and Nelson (1999b); McConnell and Pérez-Quirós (2000); Cogley and Sargent (2005), and Benati and Mumtaz (2007).