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## Journal of Macroeconomics

journal homepage: [www.elsevier.com/locate/jmacro](http://www.elsevier.com/locate/jmacro)

## Price subsidies and the conduct of monetary policy ☆

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## ARTICLE INFO

## Article history:

Received 9 May 2011

Accepted 26 March 2012

Available online 16 May 2012

## JEL classification:

E1

E5

## Keywords:

Taylor rules

Optimal monetary policy

Sticky prices

General equilibrium

Government subsidies

Bayesian estimation

## ABSTRACT

This paper investigates optimized monetary policy rules in the presence of government intervention to stabilize prices of certain categories of goods and services. The paper estimates a small-scale, structural equilibrium model with a sticky-price sector and a subsidized-price sector for a large number of countries using Bayesian methods. The main result of this paper is that strict headline inflation targeting could be outperformed by sectoral inflation targeting, output gap stabilization, or a combination of these. In addition, several country cases exhibit lower performance of both headline and core inflation stabilization, the two most common policies in modern central banks' practices. For practical monetary policy design, we numerically identify country specific thresholds for the degree of government intervention in price setting under which core inflation targeting turns out to be the optimal choice in the context of implementable Taylor rules.

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## 1. Introduction

Over the recent years, central banks have started paying particular attention to distinguishing short-term movements in the consumer price index (CPI) statistics from underlying or core inflation for both conducting analysis and designing policies. Practically, it turns out that inflation targeters tend to use different specifications of core inflation.<sup>1</sup> Although, many agree that core inflation corresponds to the common (or persistent) component underlying price movements, there is so far no agreement on a particular definition and on a specific method to measure it. The two most commonly used definitions of core inflation assume a priori exclusion of the most volatile prices (typically energy and food prices) and administered and regulated prices which are heavily influenced by government policies (price controls, subsidies, and indirect taxes) from the overall CPI.<sup>2</sup>

From a theoretical perspective, the rationale for excluding the most volatile prices from the overall CPI is discussed in the recent literature where optimal choices through simple monetary policy rules are emphasized. Aoki (2001) shows that in an

☆ This paper reflects the opinions of the authors and not necessarily those of the International Monetary Fund, its Board of Directors or the countries they represent. We thank Hassan Y. Aly, Hafedh Bouakez, Gaston Gelos, Dalia Hakura, Ronald Leung, Mico Loretan, Fatih Ozatay, Pau Rabanal, seminar participants at the IMF Institute and the Economic Research Forum annual meeting 2011, and an anonymous referee for helpful comments.

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<sup>1</sup> Examples are monetary authorities of Korea, Malaysia, Thailand, who target core inflation defined as CPI excluding petroleum products and agricultural products, items with highly volatile or administered prices, or raw food and energy, respectively.

<sup>2</sup> Alternative methods for defining core inflation definition are reviewed by Aucremanne and Wouters (1999). They include median and trimmed mean measures as well as more involved econometric procedures and theoretical aspect of inflation dynamics. While some these alternatives are employed inside central banks for analytical purposes, their complexity limits their usefulness in external communication.

economy with two sectors differentiated by the way prices are adjusted—flexible versus sticky prices—the best policy a monetary authority can undertake is the one that fully stabilizes inflation in the distorted sector and fully disregards inflation in the flexible price sector. Implicitly, Aoki defines core inflation as the inflation of sticky prices which, therefore, excludes fully flexible prices. This definition of core inflation tends to assume that goods with flexible prices are the ones exhibiting the most volatile prices and correspond to the items central banks are commonly excluding from the components of CPI. This implicit assumption seems intuitive, although debatable, since the author does not report any evidence in favor of the perfect mapping between flexible-price goods and volatile-price goods.<sup>3</sup> In fact, in many countries food and energy prices are to some extent subsidized, hence, not fully flexible by definition.

On the other hand, the literature is so far silent about whether central banks should be encouraged to target headline inflation or core inflation which abstracts from subsidized prices. In the present paper we revisit the concept of core inflation by assuming that a share of consumption basket goods are partially subsidized and a central bank defines core inflation by subtracting their prices from the overall CPI.<sup>4</sup> In particular, we extend the one-sector benchmark sticky-price New Keynesian economy by assuming the presence of a subsidized share of private consumption expenditures. More explicitly, the government intervenes following a preannounced rule to minimize inflation deviations of a category of goods—subsidized goods—from the historical average of headline inflation. Furthermore, as suggested by the data, the government is assumed to asymmetrically react to price fluctuations given a relative bias toward smoothing upward changes of prices (i.e., upward stickiness). Then, we estimate the model for a number of countries showing strong evidence of governmental price control.<sup>5</sup> Finally, a second order approximation of the model is applied to compare several Taylor rule's specifications based on alternative definitions of inflation rates (headline and sectoral price inflation rates) using household's welfare as a metric.

Results show that strict headline inflation targeting could be easily dominated by sectoral inflation targeting, output gap stabilization, or a combination of these. The appropriate monetary policy to adopt in the presence of subsidized prices and costly adjusting of prices is sensitive to the relative importance of the two distortions. Also, the way governments finance subsidies is crucial for designing the optimized monetary rule. Interestingly, we find cases where price subsidies are relatively more distorting than nominal price inertia in the non-subsidized sector. This is true even for some countries where the subsidized items have a low share in the total consumption basket. The intuition is that when subsidies are financed with distortionary taxes the distortion yielded by deviations from the flexible price equilibrium in the subsidized-good market is magnified. This result is driven by the positive comovement of labor supply elasticity and average tax rates. Higher labor supply elasticities amplify the response of employment to a given shock, leading in turn to a larger consumption volatility and significant welfare losses. The latter mechanism is not straightforward. For instance, under a standard symmetric rule of price smoothing, changes in tax rates under normally distributed shocks tend to virtually cancel out when accounting for their first-level effect on utility. Besides, the asymmetric adjustment of prices, owing to the aggressive reactions of the government towards upward changes in prices, mitigates negative changes in tax rates and amplifies the distortion effect of taxation following the same shocks. The rationale of our results are similar to Huang and Liu (2004) findings—welfare is superior if the monetary authority targets a combination of finished and intermediate goods inflation rates when both have nominal rigidities. Also, Erceg et al. (2000) show that strict inflation targeting is no longer optimal when wage inertia is added to price stickiness; the central bank should also respond to movements in the nominal wage or the output gap.

The estimation of the model for a large set of countries shows heterogeneity in the relative importance of sectoral distortions implying multiple scenarios for the design of monetary policy. The results clearly challenge the implementation of inflation targeting in many countries where prices are sticky and fiscal authorities subsidize a share of consumed goods and services. Consequently, policymakers should reduce the extent of price subsidies to allow for an optimized, comprehensive, credible, and transparent monetary policy rule that targets core inflation. Based on the estimated model we numerically identify country-specific thresholds for the degree of government intervention under which core inflation targeting turns out to be optimal.

The remainder of the paper is organized as follows. In Section 2, we describe the model. In Section 3, we outline the more relevant qualitative implications of the model in terms of optimal monetary policy using a class of modified Taylor rules. We describe the estimation method and discuss the parameter estimates in Section 4. In Section 5, we discuss the optimized parameterization for the monetary policy rule under alternative specifications of inflation-targeting Taylor-type rules, and we offer conclusions in Section 6.

## 2. The model

The economy consists of a representative household with an infinite planning horizon, a representative final good firm, a collection of monopolistically competitive firms that produce differentiated intermediate goods, and a monetary authority

<sup>3</sup> Bodenstein et al. (2008) take Aoki's analysis one step further in the sense that oil is explicitly introduced into the model. They still show that core inflation—non-oil inflation, is the optimal monetary target (in addition to wage inflation). The authors argue that the optimal monetary policy that maximizes the utility of household should stabilize a weighted average of core and nominal wage inflation as compared to headline inflation targeting under sticky wage and price settings.

<sup>4</sup> At the same time, Aoki's specification of core inflation turns out to be a particular case of our approach and his results could be easily replicated.

<sup>5</sup> Fourteen countries are included in the empirical analysis which are Argentina, Brazil, Czech Republic, Egypt, Hungary, Indonesia, Mexico, Morocco, Philippines, Poland, South Africa, Thailand, Tunisia, and Turkey.

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