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Product market regulation, trend inflation and inflation dynamics in the new Keynesian Phillips curve☆

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ABSTRACT

In this empirical paper, we take a close look at the impact of the observed decline in the product market regulation, and hence in the barriers to entry and in impediments to competition, on inflation dynamics since the early 1980s.
We use an enlarged new Keynesian Phillips curve (NKPC) allowing for entry of firms and increasing competitive pressures with the number of firms and non zero trend inflation.
Using OECD indicators on product market regulations, characterized by persistent fluctuations, and taking into account the non stationary properties of the inflation process, we investigate the empirical relevance of this NKPC for inflation dynamics in the US and France, assuming *VAR* expectations. The results point out that product market regulation is a good candidate as an exogenous structural source of the observed persistence in inflation for the past thirty years in both the US and France.

1. Introduction

Our theoretical departure point is a micro-founded new Keynesian Phillips Curve (NKPC) based on the standard Calvo (1983) optimal price setting with staggered prices, enlarged with a non zero steady state inflation, but also allowing for entry of firms and increasing competitive pressures with the number of firms. It has been proposed in the purpose to match with the macroeconomic developments observed in industrialized countries for the past thirty years: inertia in inflation dynamics in a context of disinflation and stabilization of inflation at a low level concomitant with a weakening in the barriers to entry in the product market and increasing competition. In comparison with the standard NKPC, it includes additional variables as expectation of inflation farther in the future, relative price dispersion and the number of firms, a state variable, and its lags. It is associated with a long run relation (the long run NKPC) between labor share, inflation and costs of entry in the product market (see appendix 7 and our companion paper Bloch (2010)).

In this empirical paper, we assess to which extent the interaction between shifts (actually decreases) both in the costs of entry on the product market – which raises barriers to entry and impediments to competition – and in the long run inflation can account for lag dynamics and persistence in inflation since the early 1980s, using our enlarged derived NKPC. We explicitly take into account the non-stationary properties of the inflation process but also those of the OECD indicator for product market regulation and costs of entry, characterized by persistent fluctuations of its underlying trend. We show that the OECD product market regulation indicator is a good candidate as an exogenous structural source of the observed persistence in inflation for the past thirty years for both the US and France.

We investigate the empirical relevance of our enlarged NKPC for inflation dynamics with its associated long run relation between labor share, trend inflation and trend in the number of firms (or costs of entry), with the additional assumption that private sector expectations of long run inflation coincide with inflation target. A restricted version of this long run relation corresponds to a monetary inflation target rule where shifts in monetary inflation target are tied to product market regulation's ones. Building on the hypothesis of a time varying trend inflation for the inflation process, in the same vein as Cogley and Sbordone (2008) or Cogley et al. (2010), we take also into account the trend in the number of varieties and estimate an empirical version of our enlarged NKPC assuming *VAR* expectations. Following Sbordone (2002, 2005), Fanelli (2008) and Cogley and Sbordone (2008) we estimate the model in two steps, first estimating an unrestricted *VAR*, and then estimating the NKPC by exploiting the cross-equations restrictions implied by the theoretical model on the *VAR* parameters. We restrict the empirical evidence to two countries: the US and France, the first one is representative of the

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Anglo-Saxon area, flexible and where large reforms in the product market regulation have already been conducted during the last thirty years, the second is representative of the euro area, less flexible and where changes in the product market regulation started ten years later, from the late 1980s and are still in progress.

On one hand, we address the issue of potential misspecification of the basic NKPC model in case of omitted variables by taking into account the entry of firms through the product market regulation variable. Our results complement recent empirical studies on this topic (Batini et al. (2005), Borio and Filardo (2007), Ball (2006), Ihrig et al. (2007), Bilbiie et al. (2008) and Sbordone (2009)). The latter focused on the impact of globalization and increased global market competition, rather than of product market regulation, on the slope of the Phillips curve – the sensitivity of inflation to the output gap or the real marginal costs – but they did not investigate other channels of impact in the NKPC except Bilbiie et al. (2008). Moreover, they did not take into account trend inflation except by means of filtering methods.

On the other hand, through the stationary relation between inflation, labor share and product market regulation (long run NKPC or monetary inflation target rule), we generate an exogenous structural source of persistence and thus we address the question of the observed inflation persistence in a forward looking model of inflation. Our econometric results show that the introduction of the product market regulation variable highly improves the adequation of the NKPC on the past thirty years, takes a part of the observed persistence in inflation and lowers the estimate of the partial indexation and hence of the backward looking component of inflation. Moreover, changes in product market regulation have a greater impact in the long run on inflation in the US than in France.

This paper is organized as follows. The next section gives the background and the related literature. Section 3 presents the enlarged NKPC allowing for non zero trend inflation, entry of firms and increasing competitive pressures with the number of firms. Section 4 assesses the empirical relevance of empirical versions of this NKPC for inflation dynamics for the US and France and discusses the robustness of the results. Section 5 shortly concludes.

2. Background and related literature

Our paper is mainly related to the literature focusing on inflation dynamics and inertia in the New Keynesian (NK) framework.

In its basic form, the Calvo model leads to a purely forward-looking inflation specification relating inflation to expected future inflation and fluctuations of real marginal costs of production. However, many empirical studies conclude that this version of the NKPC generates too little persistence to be consistent with empirical evidence. Consequently, many authors improve the empirical fit of the NKPC by adding backward looking elements in the NKPC (the so-called "hybrid NKPC" including backward and forward elements). The justifications of the introduction of lags of inflation are of different types: a fraction of agents use adaptative instead of rational expectations (Roberts (1997, 2006), Ball (2000)); the fraction of firms which are not re-optimizing their prices follow an indexation rule on some general price inflation (Christiano et al. (2005)); some firms use rule-of-thumb pricing (Gali and Gertler (1999)); or agents are concerned with real wage instead of nominal wage (Phelps–Taylor) in a model of overlapping wage contracts (Fuhrer and Moore (1995)). These justifications have often been criticized because of their lack of convincing microeconomic foundation and are considered as ad-hoc.

Over the last years, a few authors have tried to find more founded explanations to persistence in macroeconomic variables, in particular in inflation. Some authors departed from rational expectations and replaced it with learning mechanism. In that case, agents do not know the structural parameters of the economy and use historical data to infer parameters: they learn over time, updating their beliefs. For example, in Milani (2007), using Bayesian method, empirical evidence showed that learning can represent a potential mechanism which can induce persistence without having to invoke indexation in the model. Schorfheide (2005) put forward learning of firms and households about monetary policy shifts in the central bank target inflation rate, using learning rule to infer the current state of monetary policy regime. He found that the fall of actual and expected inflation in the early 1980s can well be captured by the delayed response of the learning specification. Other authors used learning as a tool that can help in understanding some particular episodes of US inflation and monetary policy, which are often harder to explain under rational expectations. They focused on explanations why monetary policy shifts occur over time and put forward that the central bank adjusts its target as it learns about the structure of the economy (Sargent (1999), Cogley and Sargent (2005), Primiceri (2006), and Sargent et al. (2006)).

Other authors argued that shifts in the public perceived long-run inflation target of monetary policy can be a potential source of lag dynamics in inflation. In particular, Kozicki and Tinsley (2003) estimated a multivariate *VAR* with shifting endpoints and proposed an estimate of "the anchor of long horizon inflation expectations" whose shifts contributed importantly to observed persistence in the US and Canada.

In the same vein, Cogley and Sbordone (2008) recently hypothesized that inflation persistence results mainly from variation in the long-run trend component of inflation. They argued that the apparent need for lagged inflation in the NKPC comes from neglecting the interaction between drift in trend inflation and non-linearities in a more exact version of the Calvo model taking into account a non zero shifting steady state associated with a time-varying inflation trend.

The consequences of the assumption of non zero steady state inflation in the derivation of the new Keynesian Phillips curve (NKPC) based on Calvo price setting with staggered prices have already been explored on the theoretical side (Ascari (2004), Ascari and Merkl (2009), Ascari and Ropele (2007), Bakhshi et al. (2007), King and Wolman (1996) and Sahuc (2006)). The presence of a non zero steady state inflation alters the structure of the NKPC [1]: the coefficients on past and future inflation as well as the slope of the NKPC then become functions of trend inflation. The NKPC then includes an additional forward-looking inflation variable with a complex structure. Furthermore, the slope of the NKPC decreases with trend inflation. This implication is not consistent with the stylized fact from the traditional Phillips curve literature and the conventional wisdom that Phillips curves are flatter at low inflation levels. To avoid this implication, Ascari (2004), Sahuc (2006) and Bakhshi et al. (2007) proposed an indexation of prices for firms, which do not reoptimize their prices in the Calvo price-setting, on trend inflation or on past inflation. They showed that such an indexation can weaken, even offset, the decrease of the slope with trend inflation. More realistically, Ascari (2004) and Bakhshi et al. (2007) put forward that if the frequency of price adjustment (the Calvo price adjustment signal) becomes an endogenous (i.e. state-dependent) feature of the economy and an increasing function of the trend inflation rate, then the decrease in the slope of the NKPC with trend inflation can be inverted.

On their side, Cogley and Sbordone (2008) were recently the first to provide an empirical estimation of the NKPC with a time varying inflation trend. Following Sbordone (2002, 2005) and Fanelli (2008), they estimated the model in two steps: first, estimating a Bayesian unrestricted *VAR* with drifting parameters and stochastic volatility; second, estimating the parameters of the pricing by exploiting cross-equations restrictions implied by the theoretical

[1] All the variables are written in log-deviation from the steady state.