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Inflation dynamics with search frictions: A structural econometric analysis ☆

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ABSTRACT

The New Keynesian Phillips curve explains inflation dynamics as being driven by current and expected future real marginal costs. In competitive labor markets, the labor share can serve as a proxy for the latter. In this paper, we study the role of real marginal cost components implied by search frictions in the labor market. We construct a measure of real marginal costs by using newly available labor market data on worker finding rates. Over the business cycle, the measure is highly correlated with the labor share. Estimates of the Phillips curve using generalized method of moments reveal that the marginal cost measure remains significant, and that inflation dynamics are mainly driven by the forward-looking component. Bayesian estimation of the full New Keynesian model with search frictions helps us disentangle which shocks are driving the economy to generate the observed unit labor cost dynamics. We find that mark-up shocks are the dominant force in labor market fluctuations.

1. Introduction

This paper studies the determinants of real marginal cost fluctuations when there are search frictions in the labor market. Without such frictions, or any other type of labor adjustment costs, real marginal costs are identical to unit labor costs. Search frictions are a particular form of labor adjustment costs that are determined by aggregate labor market conditions, rather than being internal to the firm. They therefore give rise to long-term employment relationships since both firm and worker save future search costs by continuing their match. This dual role of search frictions motivates our interest in how they alter the nature of real marginal costs, which in turn are the key determinants of inflation dynamics in business cycle models with monopolistic price setting and price rigidities.

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We illustrate the linkages between inflation and real marginal costs in a New Keynesian model with search and matching frictions in the labor market.[1] We first use the model to derive a (linearized) equation for real marginal costs. Our strategy is then to generate a synthetic time series for real marginal costs by calibrating the additional parameters in the equation. We use newly available labor market data for 1960 to 2005 on job-finding rates, vacancies, unemployment and wages, to construct the series. This, in turn, forms the basis of a limited-information generalized method of moments (GMM) estimation of the hybrid New Keynesian Phillips curve (NKPC) from the model. In a third step, we estimate the full general equilibrium model, using the same variables, to further understand the interaction between labor market variables and inflation, and the driving forces of their joint dynamics.

We find that search frictions do indeed matter for inflation dynamics, in that they tend to reduce the role of backward-looking price setting for generating persistence, and by changing the sensitivity of inflation to real marginal costs. At the same time, the synthetic measure of real marginal costs is fairly closely related to unit labor costs. We also find that, among the variables that matter for real marginal costs, the real wage has become more volatile since the 1980s, even though consumption is less volatile. Furthermore, real marginal costs have become procyclical from the 1980s, while they are countercyclical for the whole sample.

This paper is among the first to estimate an aggregate labor market search and matching model in a full-information setting.[2] The estimation allows us to disentangle the determinants of the joint fluctuations of labor market variables and inflation. Our findings confirm those from the calibration-based analysis in that search and matching frictions do not dramatically alter inflation dynamics. However, this conclusion hides three aspects of marginal cost dynamics that are not apparent from a limited-information perspective.

First, the main driving force of labor market variables are mark-up shocks, which substantiates the argument of Rotemberg (2006). Mark-up shocks generate volatile vacancies and unemployment, since they do not lead to wage increases that reduce firms' incentive to post vacancies. Second, we find that unit labor costs and real marginal costs can move together positively or negatively depending on the underlying shock. Whether labor market frictions are helpful in capturing inflation dynamics therefore depends on the incidence of specific shocks. We argue that over our sample period mark-up shocks played overall a smaller role, hence the measured conclusion regarding the importance of the labor market for inflation dynamics. Finally, we emphasize the importance of a fully structural analysis in addressing these questions. We extract an implied marginal cost series from the estimation that differs significantly from the calibrated series. The smoothing algorithm decomposes the 'residual' in the NKPC into an endogenous variable component and an exogenous shock component. In other words, the persistence and volatility of inflation stems from sources besides those already captured by the imputed marginal cost series.

The model we employ is standard in most of its components. We deviate from the search and matching model in that we assume that hiring of workers is instantaneous rather than with a lag as in most models. In this respect we unify the specifications of Rotemberg (2006) and Blanchard and Galí (2007). The former author assumes large firms with costs of job creation that are concave in the number of vacancies posted[3], while the latter authors make this timing assumption to allow a representation of the NKPC in terms of inflation and unemployment, rather than the output gap. The virtue of this specification is that real marginal costs can be expressed in terms of observable labor market variables. In contrast, the standard model implies a real marginal cost expression in terms of unobservable shadow values of employment. However, we note that the timing assumption as such does not deliver substantially different dynamics.

The paper proceeds as follows. The next section describes the full New Keynesian DSGE model. In Section 3, we derive an equation for real marginal costs from the model's job creation condition that explicitly shows the role of the labor market variables implied by search frictions and discuss the construction of a real marginal cost series using calibrated parameters and labor market data. Section 4 conducts the GMM estimation of the NKPC under labor market frictions. In Section 5, we take a general equilibrium perspective and estimate the full model using Bayesian methods. Section 6 concludes, while an Appendix provides key derivations.

2. A New Keynesian model with search frictions

Consider an economy that consists of households, firms, a government and a central bank. Households choose consumption over time and the allocation of consumption across differentiated products. They supply labor at both the intensive and extensive margins: workers search in order to find employment, and when employed, they supply hours and earn wages determined in bilateral Nash bargaining. Firms simultaneously choose hiring and prices subject to hiring and price adjustment costs. They hire workers in a frictional labor market and separate from them at an exogenous rate, and choose the price of their differentiated product in a monopolistically competitive product market. Employment is the outcome of firms' and workers' search behavior, while wages and hours worked are the outcome of bargaining. Wages are

[1] We follow a literature that has adopted the labor market model by Pissarides (2000) into dynamic general equilibrium frameworks, such as Merz (1995), Andolfatto (1996), and Den Haan et al. (2000) in real models, and Walsh (2005), Trigari (2006), and Krause and Lubik (2007a) for monetary models.

[2] Other recent contributions are Christoffel et al. (2006), and Gertler et al. (2007).

[3] The standard model features constant returns to scale job creation costs.