



Deep habits and the cyclical behaviour of equilibrium unemployment and vacancies

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ABSTRACT

We extend the standard textbook search and matching model by introducing deep habits in consumption. This assumption generates amplification in the response of labour market variables to technology shocks by producing endogenous countercyclical mark-ups. The cyclical fluctuations of vacancies and unemployment in our model can replicate those observed in the US data, with labour market tightness being 20 times more volatile than consumption. Vacancies display a hump-shaped response to technology shocks and the numerical simulations generate an artificial Beveridge curve that is in line with the data. Our model preserves the assumption of fully flexible wages for new hires and the calibration is consistent with the estimated elasticity of unemployment to unemployment benefits. Finally, we show that in contrast to models with exogenous mark-up shocks, the deep habits model does not require an implausible variation in the elasticity of demand to match the volatility of labour market variables, and the cyclical properties of the mark-up are in line with empirical evidence.

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1. Introduction

In a seminal contribution, [Shimer \(2005\)](#) shows that the standard textbook matching model is unable to account for the high volatility of unemployment and vacancies that is observed in the US data. Following his work, many studies have attempted to generate new sources of amplification in labour market variables. On the one hand, [Gertler and Trigari \(2009\)](#), [Hall \(2005a\)](#), [Hertweck \(2011\)](#), [Kennan \(2010\)](#), [Menzio \(2005\)](#), [Moen and Rosen \(2006\)](#) and [Rudanko \(2009\)](#) have shown that introducing wage rigidities for new hires into standard matching models can generate fluctuations in labour market variables that are in line with the data. But [Pissarides \(2009\)](#) and [Haefke et al. \(2009\)](#) argue that this assumption does not appear to be supported by microeconomic evidence. Their findings suggest that explanations of the unemployment volatility puzzle should preserve the cyclical volatility of wages. On the other hand, [Hagedorn and Manovskii \(2008\)](#) have shown that an alternative calibration of the standard search and matching model can generate sufficiently large fluctuations in unemployment and vacancies. Their results are driven by the value of the non-market activity being set close to the value of search to the worker. [Costain and Reiter \(2008\)](#) have however shown that this calibration implies an implausible elasticity of labour supply to unemployment insurance.

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In light of the above critiques, we develop a model where wages are fully flexible and analyse the implied business cycle properties of labour market variables using a non-controversial calibration. To facilitate the comparison with Shimer (2005), we assume that technology shocks are the only source of fluctuations and employment is the only factor of production. The key feature of our search and matching model is that we assume ‘deep’ habits in consumption, as in Ravn et al. (2006). This concept of habit formation implies that private agents form habits from the consumption of individual goods. It differs from the standard assumption of ‘superficial’ habits, which entails that consumers form habits based on their overall consumption level. There are two ways to think about the definition of deep habits. Under one interpretation, consumers form habits over narrowly defined categories of goods, such as clothing, food or cars. As such, the assumption of deep habits naturally provides a more accurate description of consumers’ behaviour than its superficial counterpart. Under an alternative interpretation, habits are formed on particular varieties of a specific good. This interpretation of deep habits is in line with empirical evidence: Chintagunta et al. (2001) find that the consumption of any particular brand of goods is affected by its past consumption.

The assumption of deep habits has important implications for macroeconomic dynamics. When habits are deeply rooted, firms anticipate that the future demand for the particular good they produce depends on their current level of sales. Hence, the problem of the firm becomes dynamic since firms internalise the impact of their pricing policy on the formation of habits and future demand. This is not the case under the standard definition of habits. When habits are formed at the level of aggregate consumption, the future demand for a particular good is independent of its current level of sales because, by setting prices, a firm can only affect the composition of aggregate demand, and not its level.

Ravn et al. (2006) have shown that the assumption of deep habits generates an interesting mechanism of propagation through which various types of shocks are transmitted to the economy. At the root of this mechanism is the endogenous countercyclical behaviour of mark-ups. In turn, countercyclical fluctuations in mark-ups are the result of two distinct forces: a ‘price elasticity effect’ and an ‘intertemporal effect’. With deep habits, the demand function depends on past sales, as in customer market models. This feature gives rise to a procyclical elasticity of demand, which implies that an increase in aggregate demand will translate in lower mark-ups. This is the so-called price elasticity effect. In addition, when aggregate demand is expected to increase, forward-looking firms have an incentive to lower their prices in order to capture a larger market share in the future via habits. This is the so-called intertemporal effect of deep habits.

Recent studies have shown that the assumption of deep habits has been helpful to solve a number of puzzles that models without habits or with superficial habits have a hard time explaining. For instance, the deep habits model predicts that private consumption rises with government expenditure. In addition, when deep habits are introduced in a sticky-price economy, the model can account for the price puzzle and for the persistence of consumption and inflation to monetary policy shocks (see Ravn et al., 2010b). Finally, a version of the deep habits model predicts that in response to a firm-specific increase in marginal costs, prices rise, but less than marginal costs, leading to a decline of the firm-specific mark-up of prices over marginal costs. This mechanism offers an explanation for the incomplete cost pass-through found in many empirical studies (see Ravn et al., 2010a).

Our paper explores the implications of deep habits for the transmission of technology shocks to the labour market. So long as the countercyclical behaviour of mark-ups has implications for the transmission of technology shocks to aggregate production, it is reasonable to expect that it will have implications also for the labour market. In this study, we show that a search and matching model with deep habits generates enough volatility in vacancies and unemployment to match the empirical moments calculated using US data. In particular, both in the model and in the data the volatility of labour market tightness is about 20 times the volatility of aggregate consumption. A technology shock in our model increases production and employment through two channels: a direct channel, whereby, as in the standard search and matching model, higher productivity of employment increases the marginal return to vacancies; an indirect channel, whereby higher current and future expected demand decreases the optimal mark-up, which in turn generates higher consumption demand, production and employment. It is this second amplification channel that is key in matching the quantitative response of vacancies and unemployment. The model is also successful at matching an extended number of facts. The model overcomes the critique posed by Fujita and Ramey (2007), who show that the standard matching framework fails to generate hump-shaped vacancy responses to technology shocks. Our model also improves on search and matching models with time-varying job destruction rates, such as Ramey (2008) and Shimer (2005), to the extent that it generates a downward sloping Beveridge curve. The correlation between vacancies and unemployment in our model is close to the corresponding measure in the data. Finally, in contrast with other search and matching models, our model with deep habits is consistent with the countercyclical behaviour of mark-ups that is observed in the US data.

In order to introduce deep habits in consumption, it is necessary to adopt a minimal number of assumptions that are non-conventional in the search and matching literature, such as multiple consumption goods, a CES aggregator and monopolistic competition in the product market. To isolate the impact of deep habits we compare the cyclical properties of the baseline model with an otherwise identical model where habits are formed at the level of the aggregate consumption good. We show that the volatility of vacancies and unemployment generated by a model with superficial habits is lower by an order of magnitude, and is very similar to the volatility generated by the standard textbook matching model. Hence, we conclude that deep habits are key to generate amplification in labour market variables.

The idea that fluctuations in mark-ups could explain fluctuations in employment is not a novel one. Rotemberg and Woodford (1991, 1999) provide a detailed analysis of the cyclical behaviour of mark-ups in the US and survey a range of models with variable mark-ups. They conclude that the countercyclical behaviour of mark-ups may account for

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