Review of Economic Dynamics 17 (2014) 191–205

Contents lists available at ScienceDirect

Review of Economic Dynamics

www.elsevier.com/locate/red

Credit, vacancies and unemployment fluctuations ☆

Nicolas Petrosky-Nadeau *

Tepper School of Business, Carnegie Mellon University, 5000 Forbes Ave., Pittsburgh, PA 15213, United States

ARTICLE INFO

Article history:
Received 4 March 2012
Received in revised form 2 October 2013
Available online 23 October 2013

JEL classification:
E32
E44
J63
J64

Keywords:
Vacancies and unemployment dynamics
Search and matching
Credit-market frictions

ABSTRACT

Propagation in equilibrium models of search unemployment is altered when vacancy costs require some external financing on frictional credit markets. The easing of financing constraints during an expansion as firms accumulate net worth reduces the opportunity cost for resources allocated to job creation. The dynamics of market tightness are affected by (i) a cost channel, increasing the incentive to recruit for a given benefit from a new hire, and (ii) a wage channel, whereby firms' improved bargaining position limits the upward pressure of market tightness on wages. Agency related credit frictions endogenously generate persistence in the dynamics of labor-market tightness, and have a moderate endogenous effect on amplification.

1. Introduction

The standard Mortensen and Pissarides (1994) search-and-matching model of equilibrium unemployment has been argued in many places to be inconsistent with key business cycle facts. In particular, it can explain neither the high volatilities of unemployment, vacancies and market tightness (Shimer, 2005), nor the persistence in the adjustment of these variables to exogenous shocks (Fujita and Ramey, 2007). Subsequent research has focused on whether the lack of internal propagation, both in terms of amplification and persistence, stems from the structure of the model itself or whether it is a question of setting an appropriate calibration.

Firms in these models must expend resources to fill job vacancies, a time-consuming process in the presence of search frictions on labor markets. Under Nash bargaining as a wage mechanism, wages absorb much of the change in the expected benefit to a new worker induced by fluctuations in labor productivity. As a result, Shimer (2005) argues, the incentive to post vacancies changes little over the business cycle. Quite naturally, subsequent research has focused on the dynamics of wages as a means of generating amplification of exogenous innovations. Such studies have either altered the particulars of the wage-determination mechanism (e.g., Shimer, 2004) or followed an alternative calibration strategy that results in

☆ This research has benefited from discussions with Steve Ambler, Alain Delacroix, Etienne Wasmer and Lu Zhang. I thank seminar participants at Carnegie Mellon University, the University of Melbourne, the University of Adelaide, the Bank of Canada, the 2008 Midwest Macro, Society for Economic Dynamics, Canadian Economic Association and Econometric Society Summer meetings, and anonymous referees for helpful comments. Financial support from FQRSC is gratefully acknowledged.

* Fax: +1 412 268 7345.
E-mail address: npn@cmu.edu.

1094-2025/$ – see front matter
http://dx.doi.org/10.1016/j.red.2013.10.001

a rigid wage (Hagedorn and Manovskii, 2008).[1] In order to address the second empirical shortcoming, the persistence of labor-market adjustments to productivity shocks, a second strand of research has focused on the structure of vacancy costs. Fujita and Ramey (2007), for example, develop a story about sunk costs to vacancy creation such that the strongest change in market tightness occurs several periods after the original shock. Their approach, however, does not generate additional amplification.[2]

This paper extends the baseline search-and-matching model of equilibrium unemployment by assuming that external finance must be called upon to fund part of a firm's vacancy costs, and that agency problems cause credit markets to be frictional. The thrust of this paper is to show that evolving conditions on credit markets over the business cycle change the opportunity cost for resources firms use to create new jobs in the face of small changes in the expected benefit to a new worker. This addresses, in part, the lack of persistence to productivity shocks outlined above and, when empirically documented time variation in both the costs of liquidation and rates of recovery on loans to U.S. firms is introduced into the model, can address the lack of amplification.[3] Acemoglu (2001) and Wasmer and Weil (2004) have shown that credit-market imperfections lead to higher equilibrium unemployment by restricting firm entry.[4] Petrosky-Nadeau and Wasmer (2013) show that the interactions between credit and labor-market frictions in Wasmer and Weil (2004) generate a financial multiplier analogous to that discussed in this paper. That is, the financial frictions introduce an essentially acyclical component to the cost of job creation. As pointed out by Pissarides (2009), this introduces additional rigidity in the cost of creating jobs over the business cycle and increases the elasticity of labor-market tightness to shocks. This paper, with an agency problem in credit markets rather than search frictions, contributes to making a broader case for the role credit-market imperfections play in understanding aggregate dynamics, in this instance operating through workers as opposed to investment flows (e.g., Kiyotaki and Moore, 1997; Bernanke et al., 1999).

The model developed in this paper works as follows. Due to a problem of costly state verification in lending relationships, firms write standard debt contracts (Gale and Hellwig, 1985; Williamson, 1987) to fund vacancies over accumulated assets. The higher shadow cost of external over internal funds increases the cost of vacancies, leading to a higher rate of equilibrium unemployment. However, the degree of agency costs is alleviated during economic upturns, both because of increased firm net worth, reducing their reliance on external funds, and an assumption of counter-cyclical liquidation costs. As discussed in detail in Section 2, there is extensive empirical evidence in corporate finance for time variation in both the costs of liquidation and rates of recovery on loans to U.S. firms. The model adopts the specifics of time variation in the costs from Livdan et al. (2009), allowing in addition for exogenous innovations interpreted as credit shocks. The elasticity of the costs is estimated on U.S. data on bond spreads, along with the process to productivity and credit-market shocks.

The shadow cost of resources allocated to job creation declines during expansion, and tightens during recessions. This opens two channels that alter the dynamics job vacancies in response to productivity shocks: (i) a cost channel, driving a time-varying wedge in the job-creation condition in which the lowered opportunity cost of resources allocated to job creation during an upturn increases the incentive to post vacancies; (ii) a wage channel – under Nash bargaining as a wage mechanism, the lowered opportunity cost of vacancies limits part of the upward pressure of market tightness on wages by improving firms' bargaining position. Note that this is an effect of frictional credit markets, not an inherent feature of the wage rule or a particular calibration of the model. This is operative only in the period an innovation occurs, is reversed by the changing conditions in the labor market, and results in a flexible aggregate wage. In addition, the opportunity cost for resources used for recruiting is distinct from the *fixed* unit cost of a job vacancy and the *average cost* of recruiting a worker, which is a function of the degree of congestion on labor markets. Just as in the canonical model, this average cost, which appears in the job-creation condition, will be procyclical. However, it will be more rigid due to the presence of a counter-cyclical premium on external funds. Finally, the progressive easing of financing constraints as firms accumulate assets induces persistence in the adjustments of labor-market variables to productivity shocks. Whereas in standard equilibrium-unemployment search models, or models with increased wage rigidity for that matter, the largest response of market tightness is contemporaneous to the exogenous shock, the height of the response in this setting is reached with a lag after the innovation.[5]

Section 3 details the model's quantitative results and sets them against a comparable framework without credit frictions. Conditional on productivity shocks being the only driving force, frictions in the credit market increase the volatility of

[1] Examples of alternative wage determination include a demand-game auction (Hall, 2005) or staggered wage contracting (Gertler and Trigari, 2009). In essence, Hagedorn and Manovskii's (2008) parametrization of the non-market activities' value and the relative Nash bargaining weight ensures that the wage is highly inelastic to its time-varying components, i.e. labor productivity and the degree of market tightness.

[2] Fujita and Ramey (2007) argue that by combining their modeling of job vacancies with Hagedorn and Manovskii's (2008) calibration, their model can address both issues pertaining to the propagation of productivity shocks. Alternative approaches to modeling vacancy costs include Yashiv (2006) and Rotemberg (2006) in which the cost of vacancies is a declining function of the number of vacancies a firm posts.

[3] This result is independent of whether external funding applies to recruiting costs alone or includes the wage bill. Results are available from the author upon request. Linking current costs to financial markets is also a features of bank-loan models, as in Christiano et al. (2005), or commercial debt models, as in Carlstrom and Fuerst (2000).

[4] Acemoglu (2001) provides evidence that credit-constrained industries have lower employment shares and Rendon (2001) finds that labor demand is both restricted and more elastic at credit-constrained firms.

[5] The staggered nature of wage contracts in Gertler and Trigari (2009) is an exception in this literature in that persistence to productivity shocks does arise.