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Match efficiency and firms' hiring standards

Petr Sedláček*

University of Bonn, Adenauerallee 24-42, 53113 Bonn, Germany

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ABSTRACT

During the last recession, new hires were lower than what would be predicted by a standard matching function and the observed ratio of searching workers and firms. This paper first estimates U.S. match efficiency as an exogenous residual in the matching function using a simple search and matching model. It finds match efficiency to be pro-cyclical and to account for about 1/4 of unemployment increases during the most severe recessions. Second, this paper proposes a model with endogenous separations and firing costs that endogenizes match efficiency, which is driven by firms' hiring standards. The model can explain almost 1/2 of the variation in the initial estimate of match efficiency.

1. Introduction

A popular way to model flows from unemployment to employment is by using a simple (matching) function, typically with aggregate unemployment and vacancies as the only inputs. Such a specification implies that a given number of searching workers and employers always leads to the same number of new hires. In reality this does not always hold, as was evident for instance during the Great Recession, pointing to other sources of variation. In this paper the residual variation in hires, i.e. that not accounted for by unemployment and vacancies, is called "match efficiency". The aim of this paper is to quantify fluctuations in match efficiency, their importance for unemployment and to propose a structural model explaining their underlying driving forces.

To this end, the paper first estimates match efficiency as an unobserved component of the matching function in a simple search and matching model calibrated in a standard fashion. Estimated match efficiency is pro-cyclical with its declines being responsible for 23% of the unemployment increases during the most severe downturns. Given that match efficiency is an important driver of unemployment fluctuations it is crucial to understand the sources of its variation. As a second step, this paper proposes a model with firing costs and endogenous separations in which movements in match efficiency are not exogenous, but rather an outcome of agents' behavior. Specifically, match efficiency is driven by firms' hiring standards which are endogenously counter-cyclical, as in the data.[1] The model is able to explain 46% of the variation in estimated match efficiency.

In the model, workers differ in their productivity levels. There exists a worker productivity threshold below which it is no longer optimal to continue with the employment relationship giving rise to endogenous separations. This threshold rises in recessions as the decline in aggregate productivity renders some previously viable employment relationships suboptimal. For unemployed workers, this represents an increase in firms' hiring standards as firms are willing to hire only the relatively more productive workers. For a given number of unemployed and vacancies this leads to a fall in the number of hires

* Tel.: +49 228 739 236.
E-mail addresses: sedlacek@uni-bonn.de, sedlacek.pe@gmail.com

[1] See e.g. Bewley (1999), Devereux (2002), and Quintini (2011).

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because the fraction of acceptable employment relationships shrinks. In other words, counter-cyclical hiring standards are reflected in pro-cyclical match efficiency movements when one considers a matching function with only aggregate unemployment and vacancies as inputs.

The presence of firing costs drives a wedge between the value of new and existing employment relationships. Because firms require compensation for expected future firing costs, the productivity threshold for newly hired workers is higher than for those in existing relationships. This, together with an upward-sloping density of worker productivity in the lower tail of the distribution, makes firms' hiring standards more sensitive to aggregate fluctuations.

The empirical part builds on a large body of the literature studying and estimating the matching function; see Petrongolo and Pissarides (2001) for an excellent survey. The paper contributes to recent findings that match efficiency declines exacerbated the rise in unemployment during the Great Recession.[2] Barlevy (2011), Dickens (2011), Lubik (2011) and Veracierto (2011) infer match efficiency from estimates of the matching function within a structural model, Sahin et al. (2011) measure mismatch using the social planner's solution in a theoretical model and Barnichon and Figura (2013) estimate match efficiency as the residual from a matching function regression. Unlike the above-mentioned studies, however, this paper utilizes information from several measures of job filling and finding rates to estimate match efficiency movements and does so on a sample starting already in 1948.

Several recent studies also analyze different channels that can explain changes in match efficiency. Using micro-data, Barnichon and Figura (2013) show that fluctuations in match efficiency can be related to the composition of the unemployment pool and dispersion in labor market conditions, Herz and van Rens (2011) highlight the role of mobility decisions across segmented labor markets, Sterk (2010) focuses on geographical mismatch exacerbated by house price movements, Kuang and Valletta (2010) analyze the role of reduced worker search intensity due to extended unemployment benefits, while Davis et al. (2010) stress the role of firms' recruiting intensity.[3] This paper emphasizes a different channel generating fluctuations in match efficiency that has received little attention so far, namely cyclical changes in firms' hiring standards.

The rest of the paper proceeds as follows: Section 2 introduces a simple search and matching model with exogenous shocks to match efficiency and the estimation procedure. Section 3 presents the estimation results. Section 4 lays out a model with endogenous separations and firing costs and briefly summarizes empirical evidence on counter-cyclical firm hiring standards. Section 5 discusses the calibration and analyzes how well this model explains movements in estimated match efficiency. Finally, Section 6 provides some concluding remarks.

2. Estimating match efficiency as a structural shock

The number of new hires, M_t, is typically modeled using a Cobb–Douglas matching function with constant returns to scale and with unemployment, u_t, and vacancies, v_t, as its only inputs. This paper defines match efficiency, m_t, as the residual of the matching function capturing variation in hires not accounted for by unemployment and vacancies. Under these assumptions the job finding rate, i.e. the rate at which unemployed workers transit into employment, can be written as

$$f_t = M_t/u_t = m_t(v_t/u_t)^{1-\mu}, \tag{1}$$

where μ is the elasticity of matching with respect to unemployment. In other words, while the literature often assumes match efficiency to be constant, here it is allowed to vary over time.

To estimate match efficiency fluctuations for the U.S. this paper uses a simple search and matching model. Because of its standard nature, the derivation of the model is left to the Appendix.[4,5] The model boils down to two equations describing the evolution of unemployment and vacancies. The first equation is the law of motion for unemployment

$$u_t = (1-m_{t-1}(v_{t-1}/u_{t-1})^{1-\mu})u_{t-1} + \rho_x(1-u_{t-1}) \tag{2}$$

where ρ_x is the exogenous separation rate and the labor force has been normalized to 1. Unemployment is thus the sum of newly separated workers and unemployed workers who did not find a job in the previous period. The second equation is a job creation condition equating the marginal costs of posting a vacancy with the marginal benefit of an extra worker

$$\frac{\kappa}{m_t(v_t/u_t)^{-\mu}} = \beta(1-\rho_x)\left[(z_{t+1}-b)(1-\eta) - \eta\kappa v_{t+1}/u_{t+1} + \frac{\kappa}{m_{t+1}(v_{t+1}/u_{t+1})^{-\mu}}\right], \tag{3}$$

where κ is the flow cost of posting vacancies, β is the discount factor, b is the value of non-work activities and η is the worker bargaining power. The productivity and match efficiency shocks are assumed to follow AR(1) processes

$$\log(z_t) = (1-\rho_z)\overline{z} + \rho_z \log(z_{t-1}) + \omega_{z,t}, \tag{4}$$

$$\log(m_t) = (1-\rho_m)\overline{m} + \rho_m \log(m_{t-1}) + \omega_{m,t}, \tag{5}$$

[2] Modeling match efficiency as an unobserved component is related to Borowczyk-Martins et al. (2013) who point out that OLS-based estimates suffer from an endogeneity bias due to agents' unobserved behavior.

[3] Other papers have focused on how match efficiency shocks propagate. For example Fulanetto and Groshenny (2012) analyze a New Keynesian model and show that the propagation of match efficiency shocks depends on the form of hiring costs and on the presence of nominal rigidities.

[4] The Appendix is available online on the journal's website.

[5] The advantage of this approach is its direct link to the structural model in the second part of this paper. However, the Appendix shows that a very similar match efficiency estimate is obtained from a "model-free" estimation of only the matching function.