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Reallocation shocks, persistence and nominal rigidities ☆

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HIGHLIGHTS

- Unemployment and vacancies are strongly negatively correlated in the data.
- The literature argues that reallocation shocks are not important because they generate a positive correlation.
- Reallocation shocks do not always generate a positive correlation between unemployment and vacancies.
- The sign of the correlation depends on the degree of price rigidity and on the persistence of the shock.
- A non-negligible role for reallocation shocks cannot be dismissed on theoretical grounds.

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ABSTRACT

We reconsider the role of reallocation shocks in a simple New Keynesian model with search and matching frictions. The sign of the conditional correlation between unemployment and vacancies depends on the degree of price rigidity and on the persistence of the shock. Therefore, a non negligible role for reallocation shocks in driving business cycle fluctuations cannot be ruled out on theoretical grounds.

1. Introduction

In this paper, we reconsider the debate on the importance of reallocation shocks initiated by Lilien (1982) and we highlight the link between the degree of nominal rigidity and the propagation of persistent shocks to the matching efficiency in the labor market. Following the seminal paper by Andolfatto (1996), these shocks can be interpreted as reallocation shocks, as long as they capture some form of mismatch in skills, in geography or in other dimensions. In particular, we use a simple New Keynesian model with equilibrium search unemployment to investigate how variations in the effectiveness of the labor market matching process affect the correlation between unemployment and vacancies.

According to Lilien (1982), reallocation shocks could explain up to 50% of unemployment fluctuations in the postwar period. The empirical regularity underlying this result is a positive correlation between the dispersion of employment growth rates across sectors and the unemployment rate. However, Abraham and Katz (1986) show that this positive correlation is consistent not only with reallocation shocks but also with aggregate demand shocks. According to Abraham and Katz (1986), the use of data on unemployment and vacancies is more useful and leads to dismiss the importance of reallocation shocks. In fact, they argue that

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reallocation shocks, unlike aggregate demand shocks, deliver a positive correlation between unemployment and vacancies, while the two series are strongly negatively correlated in the data along the well-known Beveridge curve.

We contribute to the literature on the relationship between reallocation shocks and the conditional correlation between unemployment and vacancies by using a fully specified general equilibrium model. Furthermore, we show that the conditional correlation between unemployment and vacancies discussed in Abraham and Katz (1986) is positive only when prices are sufficiently rigid and the shock is highly persistent. When nominal rigidities are present, as in our baseline model, a negative shock leads to an increase in vacancies and creates a positive correlation. However, as we reduce the degree of nominal rigidities, the response of vacancies to a negative disturbance becomes less and less positive and eventually turns negative when prices are highly flexible. Hence, the conditional correlation between unemployment and vacancies declines substantially and can even become negative when the shock has limited persistence. Interestingly, this finding is reminiscent of Gali's (1999) result on the role of nominal rigidities for determining the sign of the employment response to a technology shock. We conclude that a non-negligible role for reallocation shocks cannot be ruled out on theoretical grounds.

Importantly, while other studies have considered shocks to the matching efficiency (cf. Lubik, 2009, Krause et al., 2008, and Justiniano and Michelacci, 2011, among others), the link between the degree of nominal rigidities, the shock's persistence and the sign of the correlation between unemployment and vacancies is a novel contribution of this paper. Hosios (1994) has also made the point that reallocation shocks do not necessarily generate a positive correlation between unemployment and vacancies in the context of a partial equilibrium model with flexible prices and temporary layoffs driven by a shock to the relative price dispersion across firms. We conduct our analysis in a general equilibrium model with nominal rigidities driven by a matching efficiency shock.

The paper proceeds as follows: Section 2 briefly describes the model, Section 3 presents our results and Section 4 concludes.

2. The model

The model relies largely on Kurozumi and Van Zandweghe (2010) and is purposely simple. The representative household is a large family, made up of a continuum of individuals of measure one. Family members pool their income before allowing the head of the household to choose its optimal per capita consumption.

Each period, N_t family members are employed. Each employee works a fixed amount of hours and earns the nominal wage W_t. The remaining $(1 - N_t)$ family members are unemployed and each receives nominal unemployment benefits b, financed through lump-sum nominal taxes T_t so that the government budget is always balanced. Unemployment benefits b are proportional to the steady-state nominal wage: $b = \tau W$. The representative household owns retail firms and receives each period the accumulated profits (D_t).

The family's period t budget constraint is given by

$$P_t C_t + \frac{B_t}{R_t} \leq B_{t-1} + W_t N_t + (1 - N_t)\, b - T_t + D_t, \tag{1}$$

where C_t represents a Dixit–Stiglitz aggregator of retail goods purchased for consumption purposes, P_t is the corresponding price index, B_t refers to the quantity of bonds purchases by the family and R_t denotes the gross nominal interest rate. The family's lifetime utility is described by $E_t \sum_{s=0}^{\infty} \beta^s \ln C_{t+s}$, where $0 < \beta < 1$.

Each intermediate good-producing firm $i \in [0, 1]$ enters in period t with a stock of $N_{t-1}(i)$ employees. New matches become productive in the period, as in Ravenna and Walsh (2008). The job destruction rate ρ is constant. The workers who have lost their jobs start searching immediately and can possibly still be hired in period t with a probability given by the job finding rate. Employment at firm i evolves according to $N_t(i) = (1 - \rho) N_{t-1}(i) + M_t(i)$ where the flow of new hires $M_t(i)$ is given by $M_t(i) = Q_t V_t(i)$. The term $V_t(i)$ denotes vacancies posted by firm i in period t and Q_t is the aggregate probability of filling a vacancy, defined as $Q_t = \frac{M_t}{V_t}$. The expressions $M_t = \int_0^1 M_t(i)\, di$ and $V_t = \int_0^1 V_t(i)\, di$ denote aggregate matches and vacancies respectively. Aggregate employment, $N_t = \int_0^1 N_t(i)\, di$, evolves according to

$$N_t = (1 - \rho) N_{t-1} + M_t. \tag{2}$$

The matching process is described by an aggregate constant-returns-to-scale Cobb Douglas matching function,

$$M_t = L_t S_t^{\sigma} V_t^{1-\sigma}, \tag{3}$$

where S_t denotes the pool of job seekers in period t given by $S_t = 1 - (1 - \rho) N_{t-1}$, and L_t is a time-varying scale parameter that captures the efficiency of the matching technology. It evolves exogenously following the autoregressive process,

$$\ln L_t = (1 - \rho_L) \ln L + \rho_L \ln L_{t-1} + \varepsilon_{Lt}, \tag{4}$$

where L denotes the steady-state value of the matching efficiency, while ρ_L measures the persistence of the shock, and ε_{Lt} is $i.i.d.\ N\left(0, \sigma_L^2\right)$.

The job-finding rate (F_t) is defined as $F_t = \frac{M_t}{S_t}$ and aggregate unemployment is $U_t \equiv 1 - N_t$. Firms face hiring costs measured in terms of the finished good $(H_t(i))$. Those costs depend linearly on the number of vacancies posted by the firm, $H_t(i) = \phi_N V_t(i)$, where the parameter ϕ_N governs the magnitude of the (pre-match) hiring cost.

Each period, firm i uses $N_t(i)$ homogeneous employees to produce $Y_t(i)$ units of intermediate good i according to the constant-returns-to-scale technology described by $Y_t(i) = N_t(i)$.

Each intermediate good-producing firm $i \in [0, 1]$ chooses employment and vacancies to maximize profits and sells its output $Y_t(i)$ in a perfectly competitive market at a price $Z_t(i)$ that represents the relative price of the intermediate good in terms of the final good. The firm maximizes

$$E_t \sum_{s=0}^{\infty} \beta^s \frac{\Lambda_{t+s+1}}{\Lambda_{t+s}} \left(Z_{t+s}(i) Y_{t+s}(i) - \frac{W_{t+s}(i)}{P_{t+s}} N_{t+s}(i) - H_{t+s}(i) \right), \tag{5}$$

where Λ_t represents the marginal utility of consumption.

The nominal wage $W_t(i)$ is determined through surplus sharing,

$$W_t(i) = \arg\max \left[\Delta_t(i)^{\eta} J_t(i)^{1-\eta} \right], \tag{6}$$

where $0 < \eta < 1$ represents the worker's bargaining power, $\Delta_t(i)$ is the worker's surplus and $J_t(i)$ is the firm's surplus.

There is a continuum of retail goods-producing firms indexed by $j \in [0, 1]$ that transform the intermediate good into a final good $Y_t^f(j)$ that is sold in a monopolistically competitive market at price $P_t(j)$. Cost minimization implies that the real marginal cost is equal to the real price of the intermediate good (Z_t) that is common across firms. Demand for good j is given by $Y_t^f(j) = C_t(j) = (P_t(j)/P_t)^{-\theta} C_t$, where θ represents the elasticity of substitution across final goods. Firms choose their price subject to a Calvo