The impact of short-term employment contracts on employment volatility and economic fluctuations

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Abstract

This study investigates the effects of short-term employment contracts on employment fluctuations using a dynamic model with long-term and short-term employment contracts. Numerical experiments show that an increase in the short-term employment ratio amplifies the fluctuations in total employment—when a shock to the total factor productivity occurs—because of the variations in short-term employment being larger than those in long-term employment.

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1. Introduction

In labor market analysis, some empirical studies examine the relationship between the employment volatility and short-term employment contracts such as fixed-term contracts and temporary agency work. de Serres and Murtin (2013), using data of OECD countries, indicate that the large fluctuations in unemployment are caused by an increase in the share of temporary workers. OECD (2017) indicates that the response of unemployment rates to aggregate demand shocks is augmented under a high incidence of temporary work. This study investigates the effects of short-term employment contracts on employment volatility using numerical experiments.

In theoretical analysis with heterogeneous labor contracts, some differences between contracts are, for example, stickiness of employment adjustments, employment duration, and types of jobs and skills. Caggese and Cuñat (2008), Cahuc et al. (2016) and Cahuc and Postel-Vinay (2002) assume a permanent contract and a temporary contract in their analyses; the permanent contract has an indefinite duration and an adjustment cost associated with firing, while the temporary contract has a fixed duration and no adjustment costs. Smith (2007) classifies permanent and temporary jobs according to whether a contract period exists. Macho-Stadler et al. (2014) analyze the firms' optimization of long-term and short-term employment contracts; the long-term contract lasts for two periods (junior and senior) and the short-term contract for one period (junior or senior). In the dynamic labor demand literature, Matsue (2019) creates a model with a long-term and a short-term employment contract, which supposes that both contracts have a predetermined duration; firms incur adjustment costs only for hiring long-term employees, but no costs are incurred for hiring short-term employees. It shows that an increase in the short-term employment ratio leads to an increase in employment fluctuations because of the high variations in short-term employment that are caused by the assumption of adjustment costs for hiring.

This study provides a dynamic framework with a long-term and a short-term employment contract. The differences between the contracts are the duration of employment periods and the wage determination. The analysis incorporates not only decisions on the demand side of labor but also on the supply side of labor. Numerical experiments indicate that the fluctuations in short-term employment are larger than those of long-term employment when a shock to the total factor productivity (TFP) takes place. The result can be explained by the assumption of short-term contracts that stipulates the same wage level until the date of termination. Then, an increase in the short-term employment ratio brings about an increase in the variations of total employment, which is consistent with de Serres and Murtin (2013) and OECD (2017).

The remainder of this paper is organized as follows. Section 2 presents the dynamic model with long-term and short-term contracts. Section 3 provides the numerical experiments of the model. Section 4 concludes the paper.

2. Model

Suppose that the economy consists of firms and households. The firms combine long-term employment L_t^l and short-term employment L_t^s to produce Y_t, according to a Cobb-Douglas production function $Y_t = A_t\left(L_t^l\right)^{\alpha}(L_t^s)^{1-\alpha}$, where $0 < \alpha < 1$ and A_t is the TFP. It is supposed that the TFP follows a first-order autoregressive process:

$$logA_{t+1} = (1-\rho)logA + \rho logA_t + \varepsilon_{t+1},$$

where $-1 < \rho < 1$ is the autoregressive parameter, A denotes the steady-state value of TFP, and $\varepsilon_{t+1} \sim N(0, \sigma_A^2)$. The same exogenous law of motion of TFP is assumed in the real business cycle literature. Suppose that the duration of the long-term contract is four periods and that of the short-term contract is two periods. Then, the long-term employment in period t is the sum of the long-term new hiring h_i^l in the periods t, $t-1$, $t-2$, and $t-3$, who do not quit:

$$L_t^l = h_t^l + (1-\delta)h_{t-1}^l + (1-\delta)^2 h_{t-2}^l + (1-\delta)^3 h_{t-3}^l, \quad (1)$$

where $0 \leq \delta \leq 1$ is the quit rate of the long-term contract. The short-term employment in period t is the sum of the short-term new hiring h_i^s in the periods t and $t-1$, who do not quit:

$$L_t^s = h_t^s + (1-\sigma)h_{t-1}^s, \quad (2)$$

where $0 \leq \sigma \leq 1$ is the quit rate of the short-term contract. It is assumed that the short-term wage is fixed during the contract period. Cahuc et al. (2016) also assume that firms pay workers a fixed wage prescribed in the contract for its duration. If all the long-term and short-term employees quit at the end of the first period in which they are hired ($\delta = \sigma = 1$), then no difference exists between the two types of contracts.

The objective function of the firm is as follows:

$$V = \sum_{t=0}^{T} \beta^t \left[A_t\left(L_t^l\right)^{\alpha}(L_t^s)^{1-\alpha} - w_t^l L_t^l - w_t^s h_t^s - w_{t-1}^s(1-\sigma)h_{t-1}^s\right],$$

where $0 < \beta < 1$ is the discount factor, w_t^l is the wage under the long-term contract and w_t^s is the wage under the short-term contract.

The firm chooses h_t^l and h_t^s to maximize V subject to (1) and (2), where h_{-3}^l, h_{-2}^l, h_{-1}^l, h_0^l, h_{T-2}^l, h_{T-1}^l, h_T^l, and h_{T+1}^l are given, that is, L_0^l and L_{T+1}^l are given; h_{-1}^s, h_0^s, h_T^s, and h_{T+1}^s are given, that is, L_0^s and L_{T+1}^s are given. The first-order conditions for long-term employment are as follows:

$$\sum_{i=t}^{t+3} \beta^i (1-\delta)^{i-t} \alpha A_i \left[\frac{h_i^l + (1-\delta)h_{i-1}^l + (1-\delta)^2 h_{i-2}^l + (1-\delta)^3 h_{i-3}^l}{h_i^s + (1-\sigma)h_{i-1}^s}\right]^{\alpha-1}$$

$$= \sum_{i=t}^{t+3} \beta^i (1-\delta)^{i-t} w_i^l, t = 1, 2, \cdots, T-3. \tag{3}$$

Meanwhile, the first-order conditions for short-term employment are as follows:

$$\sum_{i=t}^{t+1} \beta^i (1-\sigma)^{i-t} (1-\alpha) A_i \left[\frac{h_i^l + (1-\delta)h_{i-1}^l + (1-\delta)^2 h_{i-2}^l + (1-\delta)^3 h_{i-3}^l}{h_i^s + (1-\sigma)h_{i-1}^s}\right]^{\alpha}$$

$$= \sum_{i=t}^{t+1} \beta^i (1-\sigma)^{i-t} w_t^s, t = 1, 2, \cdots, T-1. \tag{4}$$

(3) and (4) indicate that the marginal product of labor equals to the marginal cost of labor.

The households have the following preference:

$$U = \sum_{t=0}^{T} \beta^t \left[logC_t - a\frac{(L_t^l)^{1+\gamma}}{1+\gamma} - b\frac{\{h_t^s + (1-\sigma)h_{t-1}^s\}^{1+\mu}}{1+\mu}\right],$$

where $\gamma > 0$ and $\mu > 0$ are the labor supply parameters, $a > 0$ and $b > 0$ are the scaling factors, C_t is the consumption. The budget constraint is as follows:

$$C_t = w_t^l L_t^l + w_t^s h_t^s + w_{t-1}^s (1-\sigma) h_{t-1}^s$$

The households choose C_t, L_t^l, and h_t^s to maximize U subject to the budget constraint, where h_{-3}^l, h_{-2}^l, h_{-1}^l, h_0^l, h_{T-2}^l, h_{T-1}^l, h_T^l, and h_{T+1}^l are given, that is, L_0^l and L_{T+1}^l are given; h_{-1}^s, h_0^s, h_T^s, and h_{T+1}^s are given, that is, L_0^s and L_{T+1}^s are given. From the optimization problem, the following labor supply equations are obtained:

$$a\left(L_t^l\right)^{\gamma} = \frac{w_t^l}{C_t}, t = 1, 2, \cdots, T. \tag{5}$$

$$\sum_{i=t}^{t+1} \beta^i (1-\sigma)^{i-t} b[h_i^s + (1-\sigma)h_{i-1}^s]^{\mu}$$

$$= \sum_{i=t}^{t+1} \beta^i (1-\sigma)^{i-t} \frac{w_t^s}{C_i}, t = 1, 2, \cdots, T-1. \tag{6}$$

The goods market clearing condition is given by the following:

$$Y_t = C_t, t = 1, 2, \cdots, T. \tag{7}$$

From (1)–(7) and the production function, $(w_1^l, w_2^l, \cdots, w_T^l)$, $(w_1^s, w_2^s, \cdots, w_{T-1}^s)$,

$(h_1^l, h_2^l, \cdots, h_{T-3}^l)$, $(L_1^l, L_2^l, \cdots, L_T^l)$, $(h_1^s, h_2^s, \cdots, h_{T-1}^s)$, $(L_1^s, L_2^s, \cdots, L_T^s)$, $(Y_1, Y_2, \cdots, Y_T)$, and $(C_1, C_2, \cdots, C_T)$ are determined. Suppose that the labor supply parameters are equal, that is, $\gamma = \mu$, in (5) and (6). Then, the steady-state values w^l, w^s, h^l, L^l, h^s, L^s, Y, and C are determined by (1)–(7) and the production function as follows:

$$w^l = \alpha A \left[\frac{\alpha b}{(1-\alpha)a}\right]^{\frac{\alpha-1}{1+\gamma}},$$

$$w^s = (1-\alpha) A \left[\frac{\alpha b}{(1-\alpha)a}\right]^{\frac{\alpha}{1+\gamma}},$$

$$h^l = \frac{1}{4-6\delta+4\delta^2-\delta^3}\left(\frac{\alpha}{a}\right)^{\frac{1}{1+\gamma}},$$

$$L^l = \left(\frac{\alpha}{a}\right)^{\frac{1}{1+\gamma}},$$

$$h^s = \frac{1}{2-\sigma}\left(\frac{1-\alpha}{b}\right)^{\frac{1}{1+\gamma}},$$

$$L^s = \left(\frac{1-\alpha}{b}\right)^{\frac{1}{1+\gamma}},$$

$$Y = A\left(\frac{\alpha}{a}\right)^{\frac{\alpha}{1+\gamma}}\left(\frac{1-\alpha}{b}\right)^{\frac{1-\alpha}{1+\gamma}},$$

$$C = A\left(\frac{\alpha}{a}\right)^{\frac{\alpha}{1+\gamma}}\left(\frac{1-\alpha}{b}\right)^{\frac{1-\alpha}{1+\gamma}}.$$

3. Numerical experiments

In this section, the effects of changes in the short-term employment ratio $L_t^S/(L_t^l + L_t^s)$ on employment fluctuations are explored through numerical analysis. The scaling factor b in the utility function is set to 1.0. The discount factor β is set at 0.99. The labor supply parameters γ and μ are set to 1.0. The quit rate δ and σ are set to 0.15. The parameter in the production function α is set to 0.5. The persistence of shock in TFP ρ is set to 0.95. The steady-state value of TFP A and the initial productivity level are the set to 1.0. It is assumed that planning period $T = 150$. The economy is in a steady-state at the beginning of the planning period and in the period $T + 1$: $h_{-3}^l = h_{-2}^l = h_{-1}^l = h_0^l = h_{158}^l = h_{159}^l = h_{150}^l = h_{151}^l = h^l$, that is, $L_0^l = L_{151}^l = L^l$; $h_{-1}^s = h_0^s = h_{150}^s =$

$h_{151}^s = h^s$, that is, $L_0^s = L_{151}^s = L^s$.

It is supposed that a positive temporary shock to TFP takes place. The TFP increases by 1% in period 1 and gradually returns to the steady-state. The scaling factor in the utility function a is set to 1.0 in the analysis. The result of numerical experiment is shown in Fig. 1. The solid line shows the deviation of long-term employment from the steady-state value and the dashed line shows the deviation of short-term employment from the steady-state value when the shock to TFP occurs. The fluctuations in short-term employment are larger than those of long-term employment. The large variations in short-term employment come from the short-term contract, which stipulates the same wage level during the contract periods.

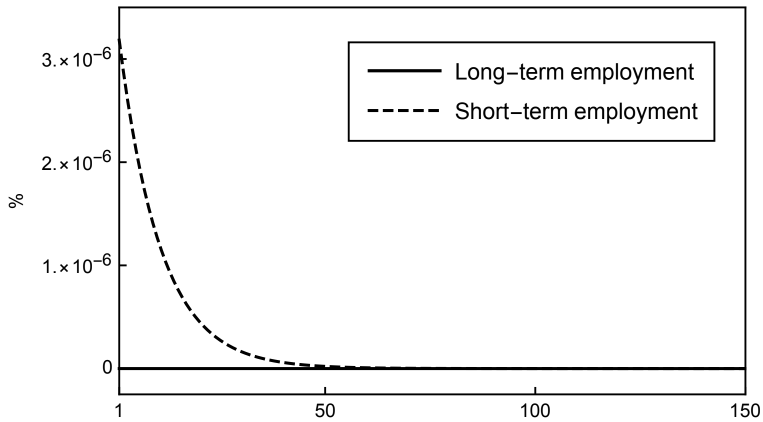

Fig. 1 Fluctuations in long-term employment and short-term employment

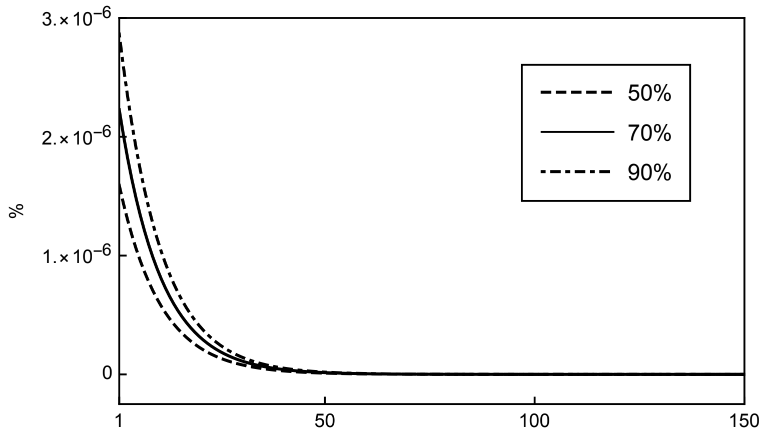

Fig. 2 Short-term employment ratio and fluctuations in total employment

The relationship between the short-term employment ratio and the fluctuations in total employment are shown in Fig. 2. The dashed line, solid line, and dot dashed line show the deviation of total employment from the steady-state value when a shock to TFP occurs. The relationship between the steady-state short-term employment ratio and the scaling factor a is as follows: the ratio is 50% if $a = 1.0$, 70% if $a = 5.44444$, and 90% if $a = 81.0$. The increase in the scaling factor a decreases long-term employment, and it raises the short-term employment ratio in the steady-state. The fluctuations in total employment are large when the short-term employment ratio is large. The fluctuations in short-term employment are larger than those of long-term employment, and thus, an increase in the short-term employment ratio amplifies the fluctuations in total employment.

4. Conclusion

This study provides a dynamic framework with a long-term and a short-term employment contract, both of which have a predetermined duration. The numerical experiments with the proposed model show that increasing the short-term employment ratio amplifies the variations in total employment.

Nevertheless, even though the model in this study focuses on short-term employment contracts, it could be extended to consider the effects of other aspects of the labor market, such as employment protection legislation and trade unions, on employment dynamics and economic fluctuations. Moreover, further empirical research on the parameter values in the numerical analysis should be undertaken. These topics are left for future research.

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