Employment Fluctuations in a Dynamic Model with Long- and Short-term Contracts

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This study analyses the economy in which long- and short-term contracts coexist. The long- and short-term contracts differ in the stickiness of employment adjustments and explicit employment duration. This study shows that a high adjustment cost leads to a high short-term employment ratio and a decrease in employment fluctuations. In addition, this study shows that a high quit rate leads to high variations in long- and short-term employment due to shock and results in high employment fluctuations. The model in this study shows an oscillatory behaviour of employment to the shock, which is not observed in an adjustment cost model.

Keywords: employment dynamics; dynamic labour demand; labour market institutions; adjustment cost; employment duration
JEL classification: E24; J23; J32; J41; D90

1. Introduction

Labour market institutions are reformed frequently, which affects employment dynamics. Short-term contracts, such as fixed-term contracts (FTCs) and temporary agency work, are part of labour market institutions and are adopted in nu-

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merous countries. Portugal and Varejão (2009) point out that FTCs are used to save costs, screen for permanent positions, and for temporary replacements. Givord and Wilner (2015) focus on the differences in short-term contracts in respect of career prospects and show that FTCs are used as stepping stones to permanent positions. Nunziata and Staffolani (2007), using data from European countries, discover the same role of FTCs. Moreover, Faccini (2014) shows that the transition of temporary workers to permanent positions is frequent in most European countries.

In some studies on dual labour market theory, heterogeneous labour is represented as having different employment adjustment costs. If the difference in contract durations could be interpreted as a difference in adjustment costs, then another framework is not required. However, the nature of dynamics of the models with explicit employment contract durations is different from the nature of dynamics of the adjustment cost model. Therefore, this study constructs a model not only with adjustment costs but also explicit employment contract durations and analyses employment fluctuations through numerical experiments.

Some studies investigate the relationship between employment protection legislation (EPL) and temporary jobs. Banker et al. (2013) note that the strictness of EPL is a reliable proxy variable for labour adjustment costs. The results, based on the analysis of data from some OECD countries, show that a stricter EPL is associated with higher stickiness. Centeno and Novo (2012) analyse the effects of employment protection of permanent contracts in the Portuguese labour market, and indicate that stringent protection increases dependence on FTCs. Hijzen et al. (2017) investigate the effects of employment protection on the composition of the labour force and turnover in Italy and show that the incidence of temporary work increased when firms faced more stringent employment protection for permanent contracts. Sala et al. (2012) point out that the proportion of temporary

contracts tends to be high when the EPL on permanent contracts are relatively high, the firing costs are high, or the renewal and duration of temporary contracts are limited in OECD countries.

The relationship between EPL and fluctuations in employment has also been studied. Gnocchi et al.（2015）examine the labour market reforms from the 1970s to 2000s in some OECD countries and point out that the reforms relaxing EPL increase employment volatility. Faccini and Bondibene（2012）study labour market institutions and the cyclical behaviour of unemployment rates in OECD countries. The findings indicate that the EPL for workers reduces the volatility of unemployment rates. Sala et al.（2012）show that the higher the cost of firing temporary and permanent employees and the more severely limited the use of FTCs, the lower the fluctuations in unemployment in the simulation analysis. By contrast, the empirical evidences on Okun's law does not show conclusive results. Ball et al.（2019）and Ball et al.（2017）find little relationship between employment protection and the Okun's coefficient; that is, strong employment protection does not reduce the effects of the change in output on fluctuations in the unemployment rate. Bande and Martín-Román（2018）and Porras-Arena and Martín-Román（2019）investigate Okun's coefficients for Spanish regions and discover high variations in unemployment rates despite equal employment protection.

In a theoretical analysis of an economy in which long- and short-term contracts coexist, the differences between the contracts include stickiness of employment adjustments, employment duration, and types of jobs and skills. Berton and Garibaldi（2012）assume that permanent employment depends on worker turnover, whereas a firm can fire the temporarily employed at will. Blanchard and Landier（2002）suppose that firms hire workers in entry-level jobs, who are then retained in a regular job if not laid off. According to Caggese and Cuñat（2008），

Cahuc et al. (2016) and Cahuc and Postel-Vinay (2002), permanent contracts do not have a predetermined duration, and firms must pay a firing cost if they fire those in permanent employment; however, temporary contracts stipulate a fixed duration, and firms do not incur firing costs at the end of the contracts. Yang (2018) also assumes that firms pay a fixed firing cost when firing permanent employees. Smith (2007) supposes that the difference between permanent and temporary jobs is that the duration of a permanent contract is infinite, whereas that of a temporary contract is finite.

This study also assumes that the difference between long- and short-term contracts relates to the stickiness of employment adjustments and employment duration and analyses the responses of employment to productivity shock. The duration of long-term contracts is two periods, and that of short-term contracts is one period. This assumption about the long- and short-term contracts is also discussed by Macho-Stadler et al. (2014). Matsue (2018) focuses on the fixed employment duration and produces two types of dynamic labour demand models: one with FTCs, and the other with indefinite term contracts (ITCs). The study shows that an expected productivity shock causes an oscillatory behaviour of employment in the FTC model but not in the ITC model. This study shows that the same property in the FTC model is also observed when long- and short-term employment coexist.

In the numerical analysis, we investigate the effects of adjustment costs for long-term employment on fluctuations in labour demand. We find that the responses of long-term new hiring, long-term employment, short-term employment, and total employment are small when firms pay a high adjustment cost. The adjustment cost plays a role in smoothing employment fluctuations. Moreover, the fluctuations in short-term employment are more than those in long-term employment, which is in line with Caggese and Cuñat (2008) and Yang (2018). Caggese

and Cuñat (2008) indicate, using Italian data, that the fluctuations in fixed-term employment are more than those in permanent employment. Yang (2018) shows that high volatility in temporary employment is observed in the US labour market. In addition, the effects of the quit rate on employment fluctuations are analysed in this study. We find that the responses of long-term employment, short-term employment, and total employment to a shock are large when the quit rate is high.

The contributions of this study are as follows: the theoretical analysis indicates that the short-term employment ratio is raised by the increase in adjustment cost in a steady-state; we confirm that a productivity shock causes an oscillatory behaviour of employment in the model where long- and short-term employment coexist; the model shows that the productivity shock causes large employment fluctuations when the adjustment cost is low or quit rate is high. The framework may be one method for analysing the dual labour market.

The rest of the paper is organised as follows. Section 2 sets up a simple model and discusses its properties. Section 3 extends the model and investigates the effects of adjustment cost and quit rate on fluctuations in labour demand. Section 4 concludes the study.

2. Simple model

Consider a dynamic model that can analyse the economy in which long- and short-term contracts coexist. A firm plans its production during the finite period T. The inputs to production are long-term employment L_t^l and short-term employment L_t^s. The objective function of the firm takes the following form:

$$V=\sum_{t=0}^{T}\beta^t[F(L_t^l,\ L_t^s;\ A_t)-w^lL_t^l-w^sL_t^s],$$

where $0<\beta<1$ is a discount factor, $A_t>0$ is a productivity, $w^l>0$ is the wage rate of a long-term contract, and $w^s>0$ is the wage rate of a short-term contract. It is assumed that the firm enters a long-term contract or a short-term contract with

labour: The term of long-term contracts is two periods, and that of short-term contracts is one period. Then, the long-term employment at period t is the sum of the long-term new hiring at period t and $t-1$, that is $L_t^l=h_t^l+h_{t-1}^l$. The short-term employment at period t is equal to the short-term new hiring at period t, that is $L_t^s=h_t^s$. Further, h_{-1}^l, h_0^l, h_T^l and h_{T+1}^l are given as also L_0^l and L_{T+1}^l are given. The firm decides the number of newly hired workers $(h_1^l, h_2^l, \cdots, h_{T-1}^l)$ and $(h_0^s, h_1^s, \cdots, h_T^s)$ to maximise V. This assumption about the long- and short-term contracts is also discussed by Macho-Stadler et al. (2014). First-order conditions for long-term employment are as follows:

$$\sum_{i=t}^{t+1}\beta^i F_{L^l}(L_i^l, L_i^s; A_i)=\sum_{i=t}^{t+1}\beta^i w^l,\ t=1, 2, \cdots, T-1. \quad (1)$$

First-order conditions for short-term employment are as follows:

$$F_{L^s}(L_t^l, L_t^s; A_t)=w^s,\ t=0, 1, \cdots, T. \quad (2)$$

The left-hand sides of Equations (1) and (2) express the marginal product of labour, and the right-hand sides express the marginal cost of labour.

Suppose that the production function is a multiplicative form that satisfies $F_{L^l}>0$, $F_{L^lL^l}<0$, $F_{L^lL^s}>0$, $F_{L^s}>0$, $F_{L^sL^s}<0$, $F_{L^sL^l}>0$, $F_A>0$, $F_{L^lA}>0$, and $F_{L^sA}>0$. Then, Equation (2) is transformed as follows:

$$L_t^s=G(L_t^l; A_t),\ t=0, 1, \cdots, T. \quad (3)$$

Substituting Equation (3) into Equation (1), we have the following:

$$\sum_{i=t}^{t+1}\beta^i F_{L^l}(L_i^l; A_i)=\sum_{i=t}^{t+1}\beta^i w^l,\ t=1, 2, \cdots, T-1. \quad (4)$$

From Equations (3), (4), and $dL_t^l=dh_t^l+dh_{t-1}^l$, we obtain results of the comparative dynamics.

Let us specify that the planning period equals 5, that is, $T=4$. The model structure is illustrated in Figure 1. At the periods 0 and 5, the long-term new hiring is given by: $\bar{h}_{-1}^l$, $\bar{h}_0^l$, $\bar{h}_4^l$, $\bar{h}_5^l$. At period 0, the long-term employment L_0^l is a sum of the long-term new hiring $\bar{h}_0^l$ and $\bar{h}_{-1}^l$, who are hired at periods 0 and -1, respectively. The short-term employment at period 0 is equal to short-term new hiring

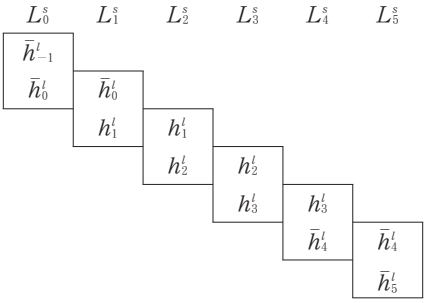

Fig. 1　The model with $T=4$

at period 0, that is $L_0^s=h_0^s$. Then, the total employment at period 0 is the sum of the long-term employment L_0^l and short-term employment L_0^s. Similarly, at period 1, the long-term employment L_1^l equals to the sum of h_l^1 and $\bar{h}_0^l$. The short-term employment at period 1 is $L_1^s=h_1^s$. Then, the total employment at period 1 equals the sum of L_1^l and L_1^s. The long-term, short-term, and total employment in the other period follow the same structure.

Table 1.　The effects of the change in A_i on h_j^l

	h_1^l	h_2^l	h_3^l
A_1	＋	－	＋
A_2	＋	＋	－
A_3	－	＋	＋
A_4	＋	－	＋

Suppose that an expected temporary positive productivity shock takes place. Then the comparative dynamic results are summarised in Tables 1-4. The signs in the tables express the effects of the change in A_i on h_j^l, L_j^l, L_j^s, $L_j^l+L_j^s$, that is $sign(dh_j^l/dA_i)$, $sign(dL_j^l/dA_i)$, $sign(dL_j^s/dA_i)$, and $sign(d(L_j^l+L_j^s)/dA_i)$. In the planning periods, the firm both increases and decreases each type of employment despite the positive productivity shock. If the positive productivity shock takes

place at period 1, the firm increases h_1^l to increase L_1^l. Then, if the firm does not decrease h_2^l, the firm undertakes too much long-term employment at period 2 because $L_2^l=h_2^l+h_1^l$. Similarly, the firm increases h_3^l to avoid too little long-term employment at period 3. The short-term employment is also adjusted to the change in long-term employment. These decisions lead to an oscillatory behaviour of employment. Both long- and short-term employment face the same change. Matsue (2018) also shows the oscillatory behaviour of labour demand using a dynamic labour demand model. The input is only labour, and the firm makes a fixed-term contract with labour in the model. The results in this study indicate that this be-

Table 2. The effects of the change in A_i on L_j^l

	L_1^l	L_2^l	L_3^l	L_4^l
A_1	+	+	−	+
A_2	+	+	+	−
A_3	−	+	+	+
A_4	+	−	+	+

Table 3. The effects of the change in A_i on L_j^s

	L_1^s	L_2^s	L_3^s	L_4^s
A_1	+	+	−	+
A_2	+	+	+	−
A_3	−	+	+	+
A_4	+	−	+	+

Table 4. The effects of the change in A_i on $L_j^l+L_j^s$

	$L_1^l+L_1^s$	$L_2^l+L_2^s$	$L_3^l+L_3^s$	$L_4^l+L_4^s$
A_1	+	+	−	+
A_2	+	+	+	−
A_3	−	+	+	+
A_4	+	−	+	+

haviour is also observed in the model with long- and short-term employment.

In the dynamic labour demand literature, adjustment cost models are widely used. Bentolila and Saint-Paul（1994）and Saint-Paul（1996）discuss dynamic labour demand models with adjustment costs. Cabo and Martín-Román（2019）discuss the dynamic labour demand literature in detail. Hamermesh and Pfann（1996）expound the property of the adjustment cost model. They do not show oscillatory behaviour. If a positive shock takes place, the firm increases new hiring to adjust the total employment for the period. Then, the firm does not decrease employment during planning periods.

3. Numerical experiments

To consider the effects of changes in adjustment cost and quit rate on employment dynamics, we extend the model discussed in Section 2.

3. 1 Baseline model

It is assumed that the firm incurs an adjustment cost and the long-term employment quits are at a constant rate at the end of the period in which he/she is hired. The adjustment cost includes, for example, the cost of advertising job positions, interviewing, and training. The objective function of the firm takes the following form:

$$V=\sum_{t=0}^{T}\beta^t\left[F(L_t^l, L_t^s; A_t)-w^lL_t^l-w^sL_t^s-\frac{1}{2}\tau(h_t^l)^2\right],$$

where $\tau>0$ is the adjustment cost of long-term new hiring. This type of adjustment cost function is also discussed in Cabo and Martín-Román（2019）, Campbell and Orszag（1998）, and Galí and van Rens（2010）. The long-term employment at period t is the sum of the long-term new hiring at period t and the long-term new hires at $t-1$ who did not quit, that is $L_t^l=h_t^l+(1-\delta)h_{t-1}^l$, where $0<\delta<1$ is

the quit rate. The short-term employment at period t is short-term new hiring at period t, that is $L_t^s=h_t^s$. Also, h_{-1}^l, h_0^l, h_T^l and h_{T+1}^l are given; then L_0^l and L_{T+1}^l are given. The firm decides the number of newly hired workers $(h_1^l, h_2^l, \cdots, h_{T-1}^l)$ and $(L_0^s, L_1^s, \cdots, L_T^s)$ to maximise V. First-order conditions for long-term employment are as follows:

$$\sum_{i=t}^{t+1}\beta^i F_{L^l}(L_i^l, L_i^s; A_i)=\beta^t(w^l+\tau h_t^l)+\beta^{t+1}(1-\delta)w^l,\ t=1, 2, \cdots, T-1. \tag{5}$$

First-order conditions for short-term employment are as follows:

$$F_{L^s}(L_t^l, L_t^s; A_t)=w^s,\ t=0, 1, \cdots, T. \tag{6}$$

In the numerical analysis, we suppose that the production function is $F(L_t^l, L_t^s; A_t)=A_t(L_t^l)^\alpha(L_t^s)^\gamma$, $\alpha>0$, $\gamma>0$ and $0<\alpha+\gamma<1$. Then, Equation (5) is as follows.

$$\begin{aligned}&\sum_{i=t}^{t+1}\beta^i\alpha(1-\delta)^{i-t}A_i[h_i^l+(1-\delta)h_{i-1}^l]^{\alpha-1}(L_i^s)^\gamma\\&=\beta^t(w^l+\tau h_t^l)+\beta^{t+1}(1-\delta)w^l,\ t=1, 2, \cdots, T-1,\end{aligned} \tag{7}$$

where $L_t^l=h_t^l+(1-\delta)h_{t-1}^l$. Similarly, Equation (6) is as follows.

$$\gamma A_t[h_t^l+(1-\delta)h_{t-1}^l]^\alpha(L_t^s)^{\gamma-1}=w^s,\ t=0, 1, \cdots, T. \tag{8}$$

We consider the case of $T=10$. The discount factor β is set to 0.96. The adjustment cost parameter τ is 0.1 and the quit rate δ is 0.15, which are the same as the values used in Cabo and Martín-Román (2019). The parameters α and γ are set to 0.4. The wage rates w^l and w^s are set to 0.5. The initial productivity level A is 1.0. It is supposed that h_{-1}^l, h_0^l, h_{10}^l and h_{11}^l are set to the steady-state value of long-term new hiring, and L_0^l and L_{11}^l are the steady-state values of long-term employment. The steady-state values are listed in Appendix. The short-term employment ratio $L^s/(L^l+L^s)$ in the steady-state is 0.5046.

Suppose that the temporary productivity shock takes place at period 1: The productivity increases by one percent at period 1 and then returns to the original at period 2. The results of the baseline simulation are presented in Figure 2. The short-term employment is more volatile than long-term employment, which is in

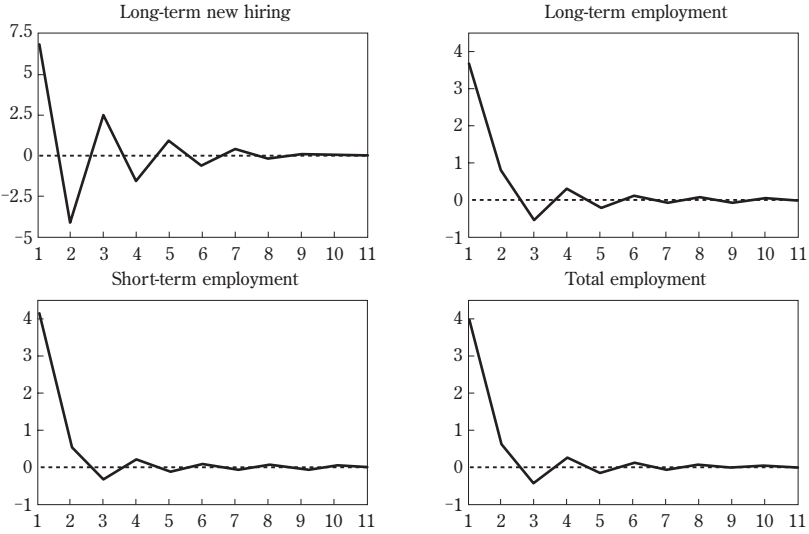

Fig. 2　Employment response in baseline simulations

Note: The solid line shows the percentage deviation of the variables from their steady-state values when the temporary productivity shock takes place. The dotted line represents the case without the shock.

line with Caggese and Cuñat（2008）and Yang（2018）. Caggese and Cuñat（2008）indicate, using Italian data, that the fluctuations in fixed-term employment are more than those in permanent employment. Yang（2018）shows that high volatility of temporary employment is observed in the US labour market.

If it is assumed that all long-term employment quit at the end of the first period in which they are hired（$\delta=1$）, there are no adjustment costs（$\tau=0$）and no wage differences（$w^l=w^s$）, and parameters in production function are the same（$\alpha=\gamma$）, then the difference between long- and short-term employment does not exist. Then, the firm adjusts employment only during the shock, and the response of long-term employment equals that of short-term employment.

3. 2 Adjustment cost and fluctuations in labour demand

In this section, we present an analysis of the effects of the adjustment cost on employment dynamics. The same parameters are used in the baseline simulation except for the adjustment cost, which is now set as $\tau=0.3$. It is also assumed that the temporary productivity shock takes place at period 1, which has a one percent increase in productivity.

The short-term employment ratio in the steady-state is 0.5123, which is larger than in the baseline case. The high adjustment cost results in the model's high short-term employment ratio. The result is supported by the literature on labour market institutions. The strictness of EPL is one of the proxy variables for labour adjustment costs. Centeno and Novo (2012) indicate that stringent protection increases dependence on FTCs. Hijzen et al. (2017) point out that temporary con-

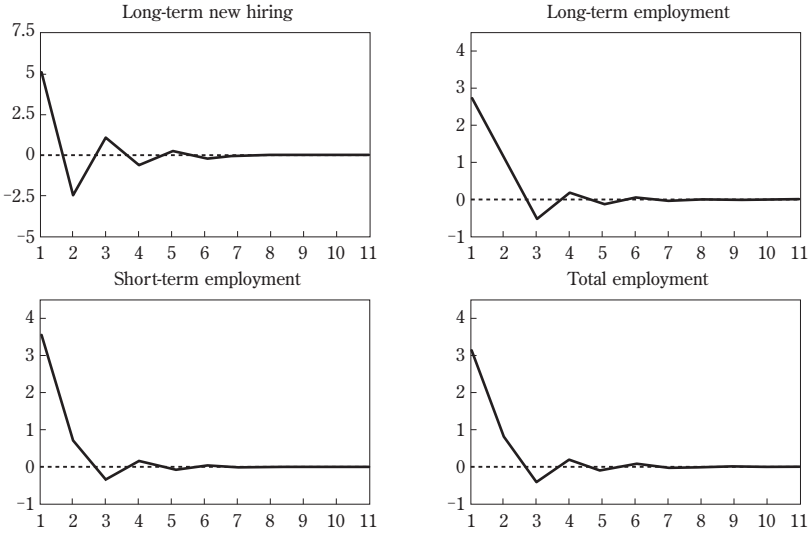

Fig. 3 Employment response with high adjustment cost

Note: The solid line shows the percentage deviation of the variables from their steady-state values when the temporary productivity shock takes place. The dotted line represents the case without the shock.

tracts increase when the employment protection for permanent contracts is strict. Sala et al.（2012）show that the proportion of temporary contracts tends to be high when the EPL on permanent contracts are at a relatively high level.

The results of numerical experiments are presented in Figure 3. The responses of all variables are smaller than those in the baseline simulations. The adjustment cost plays a role in smoothing the employment fluctuations, which is similar to the result found in the literature on dynamic labour demand（e.g., Nickell, 1986）. Moreover, the simulation results agree with those presented by Faccini and Bondibene（2012）. This indicates that the EPL for permanent workers reduces the volatility of unemployment rates.

3. 3　Quit rate and fluctuations in labour demand

Let us analyse the relationship between the quit rate and employment fluctuations. The same parameters are used in the baseline simulations except for the quit rate, which is now set as $\delta = 0.45$. It is also supposed that the temporary productivity shock takes place at period 1, which has a one percent increase in productivity.

The short-term employment ratio in the steady-state is 0.5063, which is larger than in the baseline case. The results of the numerical experiments are presented in Figure 4. The responses of long-term employment, short-term employment, and total employment are larger than that of the baseline simulations, whereas the response of long-term new hiring is smaller. The firm increases long- and short-term employment substantially. Thus, when the quit rate is high, the volatility of total employment increases.

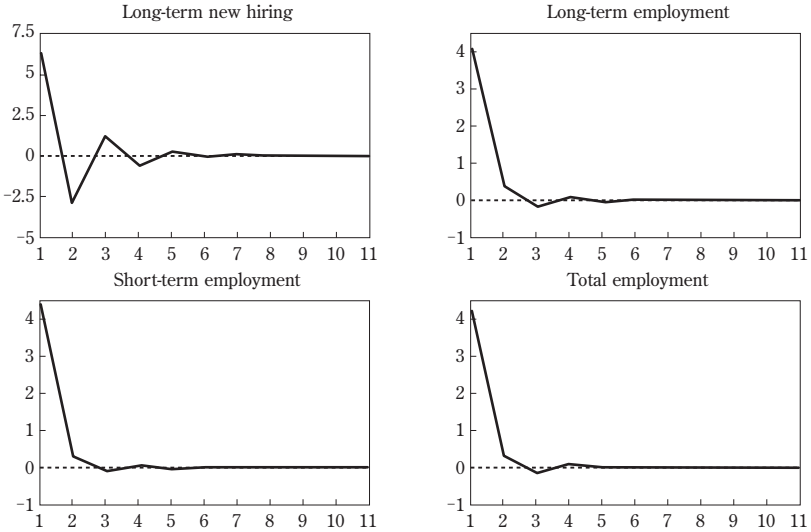

Fig. 4 Employment response with a higher quit rate

Note: The solid line shows the percentage deviation of the variables from their steady-state values when the temporary productivity shock takes place. The dotted line represents the case without the shock.

4. Concluding remarks

The relationship between the composition of the labour force and employment dynamics has been investigated in a number of studies. This study presents a framework that can analyse an economy in which long- and short-term contracts coexist. The theoretical analysis suggests that a productivity shock causes an oscillatory behaviour of employment in the model with long- and short-term employment. We also investigate the effects of adjustment cost and quit rate on fluctuations in labour demand through numerical experiments. The model shows that the response of employment to the productivity shock is small when the adjustment cost is high or the quit rate is low.

This study has some limitations. The model in this study is restricted to a sim-

ple case in which the term of long-term contracts is only two periods. It should be analysed further using more scenarios. In this study, we focus on the labour demand side. The model can be extended to consider the supply side of labour. Future research should focus on these issues in greater depth.

Appendix. Steady-state values in numerical experiments

To consider the steady-state value of long-term employment, we assume that $h^l_{t+1}=h^l_t=h^l$, $L^l=(2-\delta)h^l$, $L^s_t=L^s$ and $A_{t+1}=A_t=A$ in Equation（７）. Then, the following equation is obtained.

$$L^l=\left\{\frac{[1+\beta(1-\delta)]\alpha(2-\delta)A(L^s)^\gamma}{[1+\beta(1-\delta)](2-\delta)w^l+\tau L^l}\right\}^{\frac{1}{1-\alpha}} \tag{A1}$$

From $L^l=(2-\delta)h^l$, Equation（A1）is transformed as follows.

$$h^l=\left\{\frac{[1+\beta(1-\delta)]\alpha(2-\delta)A(L^s)^\gamma}{[1+\beta(1-\delta)](2-\delta)w^l+\tau L^l}\right\}^{\frac{1}{1-\alpha}}\frac{1}{2-\delta}, \tag{A2}$$

which is the steady-state value of long-term new hiring. It is supposed that $h^l_{t+1}=h^l_t=h^l$, $L^l=(2-\delta)h^l$, $L^s_t=L^s$ and $A_t=A$ in Equation（８）. Then, we can transform the equation as follows.

$$L^s=\left(\frac{\gamma A}{w^s}\right)^{\frac{1}{1-\gamma}}(L^l)^{\frac{\alpha}{1-\gamma}}, \tag{A3}$$

which is the steady-state value of short-term employment. From Equations（A1）-（A3）, we obtain the steady-state value of h^l, L^l and L^s in the numerical experiments.

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References

Ball L, Furceri D, Leigh D, Loungani P（2019）Does One Law Fit All? Cross-Country Evidence on Okun's Law. Open Econ Review 30: 841-874. https://doi.org/10.1007/s11079-019-09549-3

Ball L, Leigh D, Loungani P（2017）Okun's Law: Fit at 50? Journal of Money Credit Banking 49: 1413-1441. https://doi.org/10.1111/jmcb.12420

Bande R, Martín-Román Á（2018）Regional Differences in the Okun's Relationship: New Evidence for Spain（1980-2015）. Journal of Regional Research 41: 137-165.

Banker R D, Byzalov D, Chen L（2013）Employment Protection Legislation, Adjustment Costs and Cross-Country Differences in Cost Behavior. Journal of Accounting and

Economics 55 (1): 111–127. https://doi.org/10.1016/j.jacceco.2012.08.003

Bentolila S, Saint-Paul G (1994) A Model of Labor Demand with Linear Adjustment Costs. Labour Economics 1(3–4): 303–326. https://doi.org/10.1016/0927-5371(94)90015-9

Berton F, Garibaldi P (2012) Workers and Firms Sorting into Temporary Jobs. The Economic Journal 122(562): F125–F154. https://doi.org/10.1111/j.1468-0297.2012.2533.x

Blanchard O, Landier A (2002) The perverse Effects of Partial Labour Market Reform: Fixed-Term Contracts in France. The Economic Journal 112 (480): F214–F244. https://doi.org/10.1111/1468-0297.00047

Cabo F, Martín-Román A (2019) Dynamic Collective Bargaining and Labor Adjustment Costs. Journal of Economics 126: 103–133. https://doi.org/10.1007/s00712-018-0615-3

Caggese A, Cuñat V (2008) Financing Constraints and Fixed-term Employment Contracts. The Economic Journal 118 (533): 2013–2046. https://doi.org/10.1111/j.1468-0297.2008.02200.x

Cahuc P, Charlot O, Malherbet F (2016) Explaining the Spread of Temporary Jobs and its Impact on Labor Turnover. International Economic Review 57 (2): 533–572. https://doi.org/10.1111/iere.12167

Cahuc P, Postel-Vinay F (2002) Temporary Jobs, Employment Protection and Labor Market Performance. Labour Economics 9 (1): 63–91. https://doi.org/10.1016/S0927-5371(01)00051-3

Campbell C, Orszag J M (1998) A Model of the Wage Curve. Economics Letters 59 (1): 119–125. https://doi.org/10.1016/S0165-1765(98)00018-4

Centeno M, Novo Á A (2012) Excess Worker Turnover and Fixed-term Contracts: Causal Evidence in a Two-tier System. Labour Economics 19 (3): 320–328. https://doi.org/10.1016/j.labeco.2012.02.006

Faccini R (2014) Reassessing Labour Market Reforms: Temporary Contracts as a Screening Device. The Economic Journal 124 (575): 167–200. https://doi.org/10.1111/ecoj.12072

Faccini R, Bondibene C (2012) Labour Market Institutions and Unemployment Volatility: Evidence from OECD Countries. Bank of England Working Paper 461 SSRN Journal. https://doi.org/10.2139/ssrn.2137592

Galí J, van Rens T (2010) The Vanishing Procyclicality of Labor Productivity. IZA Discussion Paper 5099. https://doi.org/10.2139/ssrn.1651744

Givord P, Wilner L (2015) When does the Stepping-Stone Work? Fixed-term Contracts Versus Temporary Agency Work in Changing Economic Conditions. Journal of Applied Econometrics 30(5): 787–805. https://doi.org/10.1002/jae.2394

Gnocchi S, Lagerborg A, Pappa E（2015）Do Labor Market Institutions Matter for Business Cycles? Journal of Economic Dynamics and Control 51: 299–317. https://doi.org/10.1016/j.jedc.2014.10.005

Hamermesh D S, Pfann G A（1996）Adjustment Costs in Factor Demand. Journal of Economic Literature 34(3): 1264–1292. https://www.jstor.org/stable/2729502

Hijzen A, Mondauto L, Scarpetta S（2017）The Impact of Employment Protection on Temporary Employment: Evidence from a Regression Discontinuity Design. Labour Economics 46: 64–76. https://doi.org/10.1016/j.labeco.2017.01.002

Macho-Stadler I, Pérez-Castrillo D, Porteiro N（2014）Coexistence of Long-term and Short-term Contracts. Games and Economic Behavior 86: 145–164. https://doi.org/10.1016/j.geb.2014.03.013

Matsue T（2018）Fixed-term Contracts as a Source of Labour Demand Fluctuations. Applied Economics Letters 25(9): 611–614. https://doi.org/10.1080/13504851.2017.1352070

Nickell S J（1986）Dynamic Models of Labour Demand. In Ashenfelter O C, Layard R（ed）Handbook of Labor Economics, North Holland 1, pp 473–522. https://doi.org/10.1016/S1573-4463(86)01012-X

Nunziata L, Staffolani S（2007）Short-term Contracts Regulations and Dynamic Labour Demand: Theory and Evidence. Scottish Journal of Political Economy 54(1): 72–104. https://doi.org/10.1111/j.1467-9485.2007.00405.x

Porras-Arena M S, Martín-Román Á L（2019）Self-employment and the Okun's Law. Economic Modelling 77: 253–265. https://doi.org/10.1016/j.econmod.2018.09.006

Portugal P, Varejão J（2009）Why do Firms Use Fixed-term Contracts? IZA Discussion Paper 4380. https://doi.org/10.2139/ssrn.1489203

Saint-Paul G（1996）Dual Labor Markets: A Macroeconomic Perspective. MIT Press.

Sala H, Silva J I, Toledo M（2012）Flexibility at the Margin and Labor Market Volatility in OECD Countries. The Scandinavian Journal of Economics 114(3): 991–1017. https://doi.org/10.1111/j.1467-9442.2012.01715.x

Smith E（2007）Limited Duration Employment. Review of Economic Dynamics 10(3): 444–471. https://doi.org/10.1016/j.red.2007.01.001

Yang G（2018）Welfare under Friction and Uncertainty: General Equilibrium Evaluation of Temporary Employment in the U.S. Research in Economics 72(3): 404–413. https://doi.org/10.1016/j.rie.2018.07.005