Incentive analysis of labour dispatch under asymmetric information theory

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Received 1 July 2014, www.cmnt.lv

Abstract

Under the circumstances of the fierce market competition, great importance is attached to labour dispatch as an innovative employment way since it saves more labour costs for enterprises. However, there exists obvious asymmetric information among the dispatched employees, employers and accepting entities. This paper makes an analysis of the incentive offered by accepting entities to the dispatched employees and employers under the circumstances of asymmetric information and symmetric information. It verifies through models that in the case of symmetric information accepting entities can offer incentive to the dispatched employees and employers so as to achieve Pareto optimality by means of linear contracts. In case of asymmetric information, the expected revenue of accepting entities will be influenced by the abilities, degree of risk aversion and effort costs of the dispatched employees and employers, which is of great reference value to the enterprise practice.

Keywords: Labour Dispatch, Symmetric Information, Asymmetric Information, Risk Aversion, Effort Costs

1 Introduction

As the present market competition increasingly intensifies, the profit margin gets lower and lower. In order to develop well, more and more enterprises opt to outsource their non-core business, which results in the business of labour dispatch. From the very beginning, labour dispatch has been valued greatly and widely applied in the practice of enterprises. The employment of Foreign Representative Office began to adopt the way of labour dispatch in China from 1979. In the 1990s, in order to tackle the employment of laid-off workers and migrant workers, labour dispatch experienced primary development. Since the promulgation of Labour Contract Law of the People's Republic of China in 2008, the business of labour dispatch saw a rapid development since enterprises tried to reduce the labour costs and avert non-fixed term contract. Up to now, the number of labour dispatch reaches about 10 million [1], widely spreading in the field of construction, telecommunications, banks, the power sector and public institutions.

Labour dispatch involves three parties of the dispatched employees, employers (the dispatching entities) and the accepting entities (the actual recruiting enterprises). In general, the dispatched employees and the employers have more information than accepting entities, such as the quality, credibility, professional competence, service level and the actual strength of the dispatched employees and the employers. In case of asymmetric information, the problem demanding prompt solution is how the accepting entities offer incentive to the dispatched employees and the employyers. From the perspective of symmetric information and asymmetric information, this paper probes into the incentive offered by accepting entities to the dispatched employees and employers. It verifies through models that in the case of symmetric information accepting entities can offer incentive to the dispatched employees and employers so as to achieve Pareto optimality by means of linear contracts. In case of asymmetric information, the expected revenue of accepting entities will be influenced by the abilities, degree of risk aversion and effort costs of the dispatched employees and employers, which is of great reference value to the enterprise practice.

2 Related literature

Labour dispatch is clearly stipulated by Labour Contract Law of the People's Republic of China. Labour dispatch is that employers sign the dispatching agreement with accepting entities in accordance with the demands of accepting entities and dispatch the employees with labour contract relations to accepting entities so as to establish a special labour relation that the dispatched employees provide labour under the management of accepting entities while the employers get dispatching payment from the accepting entities and pay the dispatched employees labour remuneration. The business of labour dispatch involves three parties and two contracts. Three parties refer to the dispatched employees, employers and accepting entities. Two contracts refer to the one between the dispatched employees and accepting entities and the other between employers and accepting entities. In general, when signing the dispatch agreement, the accepting entities cannot get a full understanding about the credibility, professional ability, service level and actual strength of the dispatched employees and employers. Therefore, there exists obvious asymmetric information among the three parties.

Current literature about the study of labour dispatch mainly focuses on qualitative analysis. Literature [2] to [4]

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mainly analyses the development and characteristics of labour dispatch. Literature [5] to [7] mainly elaborates the status quo and existing problems of labour dispatch in China and puts forward some suggestions. Literature [8] to [10] analyses the game relationship among the three parties of labour dispatch from a legal point of view. This paper makes a qualitative analysis of the incentive offered by accepting entities to the dispatched employees and employers.

3 Model description

The model involves three parties: the dispatched employees, the employers (the intermediary agent) and the accepting entities (the actual employing party). The dispatched employees and the employers sign the labour contract. The employers and the accepting entities sign the dispatching agreement. The income of the dispatched employee consists of regular wage plus performance bonus. The income of the employer consists of a fixed rate (which is related to the regular wage of the dispatched employee) plus performance bonus. The real income of the accepting entity is directly connected with the dispatched employee and the employer. For example, the personal quality and effort of the employee will influence the real income of the accepting entity. The employer's selection and training of the dispatched employee will directly influence the real income of the accepting entity. In accordance with the above explanation, the following hypotheses are made from the model:

The marginal revenue of the accepting entity's products is m, and the production is

$$Q = A_1 f(\mathrm{e}_1) + A_2 f(\mathrm{e}_2) + B + \varepsilon . \tag{1}$$

Here: A_1 is the dispatched employee's ability coefficient, $f(\mathrm{e}_1)$ is the output function of the dispatched employee's effort e_1, A_2 is the employer's ability coefficient, $f(\mathrm{e}_2)$ is the output function of the employer's effort e_2, B is the basic workload of the dispatched employee, and ε is a random variable. $f(\mathrm{e})$ is the output function of effort e. According to the actual situation, it should meet the requirement $f'(\mathrm{e}) \succ 0$, signifying that the more effort the dispatched employee and the employer make, the larger the output of the accepting entity. If the function is $f''(\mathrm{e}) \le 0$, it signifies that the effort's marginal output is digressive (The equal sign signifies the marginal output is invariant). The function of the dispatched employee's effort is $\mathrm{C}(\mathrm{e}_1) = \frac{b_1 \mathrm{e}_1^{\,2}}{2}$, in which b_1 is the cost coefficient of the dispatched employee's effort. The function of the employer's effort is $\mathrm{C}(\mathrm{e}_2) = \frac{b_2 \mathrm{e}_2^{\,2}}{2}$, in which b_2 is the cost coefficient of the employer's effort. ε is a random variable, and let it be normally distribute $(0, \sigma^2)$.

The income of the dispatched employee is:

$$S_{the\ dispatched} = w + \beta_1 Qm . \tag{2}$$

The income of the employer is :

$$S_{the\ employer} = \alpha w + \beta_2 Qm . \tag{3}$$

Here: w is the regular wage of the dispatched employee paid by the accepting entity; β_1 is the ratio of the dispatched employee's performance bonus sharing; α is the sharing ratio paid by the accepting entity to the employer, which is related to the dispatched employee's regular wage; and β_2 is the employer's performance bonus sharing ratio.

Thus the income of the accepting entity is:

$$\begin{aligned} S_{the\ accepting} &= Qm - w - \beta_1 Qm - \alpha w - \beta_2 Qm \\ &= (1-\beta_1-\beta_2)Qm - (1+\alpha)w \end{aligned} . \tag{4}$$

To simplify the analysis, suppose $f(\mathrm{e}) = \mathrm{e}$, i.e., output is the linear function of effort. Here, suppose the accepting entity is risk neutral, and the dispatched employee and the employer are risk averse. Let the utility function of the dispatched employee and the employer be negative exponent function, and the utility function of the dispatched employee is $V_1(\mathrm{X}) = -e^{-r_1 x}$; the utility function of the employer is $V_2(\mathrm{X}) = -e^{-r_2 x}$. In the equation, r_1 and r_2 refer to the degree of risk aversion of the dispatched employee and the employer. If they are greater than zero, they stand for risk aversion; if equal to zero, risk neutrality; if less than zero, risk preference.

According to the above explanation, the utility functions of the three parties connecting with labour dispatch can be illustrated as follows, respectively:

$$\begin{aligned} &EUS_{the\ accepting} \\ &= (1-\beta_1-\beta_2)m(\mathrm{A}_1\mathrm{e}_1 + \mathrm{A}_2\mathrm{e}_2 + \mathrm{B}) - (1+\alpha)w \end{aligned} , \tag{5}$$

$$EVS_{the\ dispathced} = EV[S_{the\ dispathced} - \mathrm{C}(\mathrm{e}_1)] , \tag{6}$$

$$EVS_{the\ employer} = EV[S_{the\ employer} - \mathrm{C}(\mathrm{e}_2)] . \tag{7}$$

According to the book Game Theory and Information Economics by Zhang Weiying, solution of equations (6) and (7) are equivalent to that of certainty equivalent value, then:

$$\begin{aligned} &CE_{the\ dispathced} \\ &= w + \beta_1 m(\mathrm{A}_1\mathrm{e}_1 + \mathrm{A}_2\mathrm{e}_2 + \mathrm{B}) - \frac{b_1 e_1^2}{2} - \frac{1}{2} r_1 \beta_1^2 m^2 \sigma^2 \end{aligned} , \tag{8}$$

$$\begin{aligned} &CE_{the\ employer} \\ &= \alpha w + \beta_2 m(\mathrm{A}_1\mathrm{e}_1 + \mathrm{A}_2\mathrm{e}_2 + \mathrm{B}) - \frac{b_2 e_2^2}{2} - \frac{1}{2} r_2 \beta_2^2 m^2 \sigma^2 \end{aligned} . \tag{9}$$

In the three parties of labour dispatch, the accepting entity is the Principal and have the advantage of priority selection in the game. While pursuing the maximizing of self-interest, the accepting entity must take into consideration the incentive compatibility constraint and participation constraint of the dispatched employee and the employer. Thus the following programming model is formulated:

$$(P)\max_{\{e_1,e_2,\beta_1,\beta_2,\alpha,w\}}(1-\beta_1-\beta_2)\mathrm{m}(\mathrm{A_1e_1+A_2e_2+B})-(1+\alpha)\mathrm{w}, \quad (10)$$

$$s.t.\ e_1\in\arg\max w$$

$$+\beta_1 m(\mathrm{A_1e_1+A_2e_2+B})-\frac{b_1e_1^2}{2}-\frac{1}{2}r_1\beta_1^2m^2\sigma^2, \quad (11)$$

$$w+\beta_1 m(\mathrm{A_1e_1+A_2e_2+B})-\frac{b_1e_1^2}{2}-\frac{1}{2}r_1\beta_1^2m^2\sigma^2\ge s_1, \quad (12)$$

$$e_2\in\arg\max\alpha w$$

$$+\beta_2 m(\mathrm{A_1e_1+A_2e_2+B})-\frac{b_2e_2^2}{2}-\frac{1}{2}r_2\beta_2^2m^2\sigma^2, \quad (13)$$

$$\alpha w+\beta_2 m(\mathrm{A_1e_1+A_2e_2+B})-\frac{b_2e_2^2}{2}-\frac{1}{2}r_2\beta_2^2m^2\sigma^2\ge s_2. \quad (14)$$

Here: s_1 and s_2 stand for the reservation utility of the dispatched employee and the employer respectively.

3.1 UNDER SYMMETRIC INFORMATION

Under the circumstances, the accepting entity, the dispatched employee and the employer possess symmetric information. The accepting entity can observe the action and effort degree of the dispatched employee and the employer and pursues the maximizing of self-interest, that is to say, expressions (12) and (14) can only take equality sign. So the above programming problem can be revised as:

$$(\mathrm{P}')\max_{\{e_1,e_2,\beta_1,\beta_2,\alpha,w\}}(1-\beta_1-\beta_2)\mathrm{m}(\mathrm{A_1e_1+A_2e_2+B})-(1+\alpha)\mathrm{w}, \quad (15)$$

$$s.t.\ w+\beta_1 m(\mathrm{A_1e_1+A_2e_2+B})-\frac{b_1e_1^2}{2}-\frac{1}{2}r_1\beta_1^2m^2\sigma^2=s_1, \quad (16)$$

$$\alpha w+\beta_2 m(\mathrm{A_1e_1+A_2e_2+B})-\frac{b_2e_2^2}{2}-\frac{1}{2}r_2\beta_2^2m^2\sigma^2=s_2. \quad (17)$$

Substitute Eq.(16) and Eq.(17) into Eq.(15), we obtain:

$$e_1^*=\frac{mA_1}{b_1},\ e_2^*=\frac{mA_2}{b_2},\ \beta_1^*=0,\ \beta_2^*=0. \quad (18)$$

Substitute Eq. (18) into Eq. (16) and Eq. (17), we obtain:

$$w^*=s_1+\frac{m^2A_1^2}{2b_1},\ \alpha^*=\frac{2b_1b_2s_2+b_1m^2A_2^2}{2b_1b_2s_1+b_2m^2A_1^2}. \quad (19)$$

Now the marginal cost of the dispatched employee's effort is:

$$\mathrm{C'(e_1)}=(\frac{b_1\mathrm{e_1}^2}{2})'=b_1\mathrm{e_1}=mA_1. \quad (20)$$

The marginal cost of the employer's effort is:

$$\mathrm{C'(e_2)}=(\frac{b_2\mathrm{e_2}^2}{2})'=b_2\mathrm{e_2}=mA_2. \quad (21)$$

The marginal expected utility of the dispatched employee is:

$$\frac{\partial(EmQ)}{\partial e_1}=\frac{\partial[\mathrm{m(A_1e_1+A_2e_2+B)}]}{\partial e_1}=mA_1. \quad (22)$$

The marginal expected utility of the employer is:

$$\frac{\partial(EmQ)}{\partial e_2}=\frac{\partial[\mathrm{m(A_1e_1+A_2e_2+B)}]}{\partial e_2}=mA_2. \quad (23)$$

So it can be seen from above:

Eq.(20)= Eq.(22); and Eq.(21)= Eq.(23).

That is to say, the mariginal cost of the dispatched employee and the employer's respective effort is just equal to the effort's marginal expected utility, which conforms to Pareto optimality.

And the expected revenue of the accepting entity is:

$$EUS_{the\ accepting}{}^*=\frac{m^2A_1^2}{2b_1}+\frac{m^2A_2^2}{2b_2}+Bm-s_1-s_2. \quad (24)$$

The real income of the dispatched employee is:

$$S_{the\ dispathced}{}^*=s_1+\frac{b_1e_1^2}{2}=s_1+\frac{m^2A_1^2}{2b_1}. \quad (25)$$

The real income of the employer is:

$$S_{the\ employer}{}^*=s_2+\frac{b_2e_2^2}{2}=s_2+\frac{m^2A_2^2}{2b_2}. \quad (26)$$

Conclusion 1: Under symmetric information, the accepting entity may make the dispatched employee and the employer achieve Pareto optimality by means of linearity incentive contract.

3.2 UNDER ASYMMETRIC INFORMATION

In realitiy, it is difficult to achieve symmetric information among the three parties of the employer, the dispatched employee and the accepting entity. In general, the dispatched employee and the employer get hold of more information than that of the accepting entity, so the accepting entity cannot see clearly the effort degree of the dispatched employee and the employer. Then the dispatched employee and the employer will try to seek the maximizing of self-interest – hence the following equivelent programme problem:

$$(P^{"})\max_{\{e_1,e_2,\beta_1,\beta_2,\alpha,w\}}(1-\beta_1-\beta_2)m(A_1e_1+A_2e_2+B)-(1+\alpha)w, \quad (27)$$

$$s.t.\quad e_1=\frac{\beta_1 mA_1}{b_1}, \quad (28)$$

$$w+\beta_1 m(A_1e_1+A_2e_2+B)-\frac{b_1e_1^2}{2}-\frac{1}{2}r_1\beta_1^2m^2\sigma^2\geq s_1, \quad (29)$$

$$e_2=\frac{\beta_2 mA_2}{b_2}, \quad (30)$$

$$\alpha w+\beta_2 m(A_1e_1+A_2e_2+B)-\frac{b_2e_2^2}{2}-\frac{1}{2}r_2\beta_2^2m^2\sigma^2\geq s_2, \quad (31)$$

To solve the programme problem $P"$:

$$\begin{cases}\beta_1^{SB}=\frac{A_1^2}{A_1^2+r_1b_1\sigma^2}\\ \beta_2^{SB}=\frac{A_2^2}{A_2^2+r_2b_2\sigma^2}\\ e_1^{SB}=\frac{\beta_1^{SB}mA_1}{b_1}\\ e_2^{SB}=\frac{\beta_2^{SB}mA_2}{b_2}\\ w^{SB}=s_1-\beta_1^{SB}m(A_1e_1^{SB}+A_2e_2^{SB}+B)+\frac{b_1e_1^{SB2}}{2}+\frac{1}{2}r_1\beta_1^2m^2\sigma^2\\ \alpha=\frac{2s_2-2\beta_2^{SB}m(A_1e_1^{SB}+A_2e_2^{SB}+B)+b_2e_2^{SB2}+r_2\beta_2^{SB2}m^2\sigma^2}{2s_1-2\beta_1^{SB}m(A_1e_1^{SB}+A_2e_2^{SB}+B)+b_1e_1^{SB2}+r_1\beta_1^{SB2}m^2\sigma^2}\end{cases}. \quad (32)$$

Then, the expected income of the accepting entity is:

$$\begin{aligned}EUS_{the\ accepting}^{SB}&=m(A_1e_1+A_2e_2+B)-s_1-\frac{b_1e_1^2}{2}\\&-\frac{1}{2}r_1\beta_1^2m^2\sigma^2-s_2-\frac{b_2e_2^2}{2}-\frac{1}{2}r_2\beta_2^2m^2\sigma^2\\&=\frac{A_1^2m^2\beta_1}{b_1}+\frac{A_2^2m^2\beta_2}{b_2}+Bm-s_1-\frac{A_1^2m^2\beta_1^2}{2b_1}\\&-\frac{1}{2}r_1\beta_1^2m^2\sigma^2-s_2-\frac{A_2^2m^2\beta_2^2}{2b_2}-\frac{1}{2}r_2\beta_2^2m^2\sigma^2\\&=\frac{m^2A_1^6}{2b_1(A_1^2+r_1b_1\sigma^2)^2}+\frac{m^2A_2^6}{2b_2(A_2^2+r_2b_2\sigma^2)^2}+Bm-s_1-s_2\end{aligned}.$$

The real income of the dispatched employee is:

$$\begin{aligned}S_{the\ dispathced}^{SB}&=w+\beta_1^{SB}m(A_1e_1^{SB}+A_2e_2^{SB}+B)\\&=s_1+\frac{b_1e_1^{SB2}}{2}+\frac{1}{2}r_1\beta_1^{SB2}m^2\sigma^2\\&=s_1+\frac{\beta_1^{SB2}m^2A_1^2}{2b_1}+\frac{1}{2}r_1\beta_1^{SB2}m^2\sigma^2=s_1+\frac{m^2A_1^4}{2b_1(A_1+r_1b_1\sigma^2)}\end{aligned}.$$

The real income of the accepting entity is:

$$\begin{aligned}S_{the\ employer}^{SB}&=\alpha w+\beta_2^{SB}m(A_1e_1^{SB}+A_2e_2^{SB}+B)\\&=s_2+\frac{b_2e_2^{SB2}}{2}+\frac{1}{2}r_2\beta_2^{SB2}m^2\sigma^2\\&=s_2+\frac{\beta_2^{SB2}m^2A_2^2}{2b_2}+\frac{1}{2}r_2\beta_2^{SB2}m^2\sigma^2=s_2+\frac{m^2A_2^4}{2b_2(A_2+r_2b_2\sigma^2)}\end{aligned}.$$

Conclusion 2: From the equations $\beta_1^{SB}=\frac{A_1^2}{A_1^2+r_1b_1\sigma^2}$ and $\beta_2^{SB}=\frac{A_2^2}{A_2^2+r_2b_2\sigma^2}$, it can be seen that when the dispatched employee and the employer are the type of risk aversion (i.e., $r_1\succ 0$ and $r_2\succ 0$), the value of β will be less with the value of r becoming bigger; that is to say, the lower the risk tolerance of the dispatched employee and the emplioyer, the less the commission ratio paid by the accepting entity to the dispatched employee and the emplioyer. When r tends to be infinite, $\beta=1$, and the effort degree of the dispatched employee and the emplioyer is same as that under symmetric information.

Conclusion 3: From the equation

$$EUS_{the\ accepting}^{SB}=\frac{m^2A_1^6}{2b_1(A_1^2+r_1b_1\sigma^2)^2}+\frac{m^2A_2^6}{2b_2(A_2^2+r_2b_2\sigma^2)^2}+Bm-s_1-s_2$$

it can be seen:

(1) $\frac{\partial EUS_{the\ accepting}}{\partial A_1}=\frac{m^2A_1^5(A_1^2+3r_1b_1\sigma^2)}{b_1(A_1^2+r_1b_1\sigma^2)^3}\succ 0$, $\frac{\partial EUS_{the\ accepting}}{\partial A_2}=\frac{m^2A_2^5(A_2^2+3r_2b_2\sigma^2)}{b_2(A_2^2+r_2b_2\sigma^2)^3}\succ 0$, which shows that the greater the ability of the dispatched employee and the employer, the higher the expected income of the accepting entity;

(2) $\frac{\partial EUS_{the\ accepting}}{\partial r_1}=-\frac{2m^2A_1^7}{b_1(A_1^2+r_1b_1\sigma^2)^3}\prec 0$, $\frac{\partial EUS_{the\ accepting}}{\partial r_2}=-\frac{2m^2A_2^7}{b_2(A_2^2+r_2b_2\sigma^2)^3}\prec 0$ the greater the risk aversion degree of the dispatched employee and the employer, the lower the expected income of the accepting entity;

(3) $\frac{\partial EUS_{the\ accepting}}{\partial b_1}=-\frac{m^2A_1^6(A_1^2+3r_1b_1\sigma^2)}{2b_1(A_1^2+r_1b_1\sigma^2)^3}\prec 0$, $\frac{\partial EUS_{the\ accepting}}{\partial b_2}=-\frac{m^2A_2^6(A_2^2+3r_2b_2\sigma^2)}{2b_2(A_2^2+r_2b_2\sigma^2)^3}\prec 0$ and the larger the effort cost coefficient of the dispatched employee and the employer, the the lower the expected income of the accepting entity.

4 Conclusion

This paper makes an analysis of the incentive offered by accepting entities to the dispatched employees and employers. It verifies through models that in the case of symmetric information accepting entities can offer incentive to the dispatched employees and employers so as to achieve Pareto optimality by means of linear contracts. In case of asymmetric information, the expected revenue of accepting entities will be influenced by the abilities, degree of risk aversion and effort costs of the dispatched employees and employers, which is of great reference value to the enterprise practice. The accepting entity should choose the dispatched employee and the employer with a greater ability, a weaker degree of risk aversion and a smaller effort coefficient so as to reach a better income level of the accepting entity.

References

[1] Zheng Dongliang 2010 *The development and regulations of labour dispatch – a survey based on international experience and domestic Practice* China labour and social security publishing press: Beijing
[2] Atkinson J 1984 Manpower strategies for flexible organizations *Personnel management* **8** 28-31
[3] Hogler R L 1996 Transforming employment relationship: implycation for human resource management *Human resource management review* **6** 75-88
[4] Cohany S R 1998 Workers in alternative employment arrangements: a second look *Monthly labour review* **121**(11) 3-21
[5] Su Quanyong 2009 An analysis of the problems and countermeasures of labour dispatch *Journal of Shanxi finance and economics university* **31**(2) 38
[6] Guo Gang 2004 Labour dispatch – a mode of management of human resources needing furthur improvement *Human resource development of China* **11** 90-2
[7] Wan Xiaofeng, Xu Guochun 2007 On the promotion of talent dispatch *Theory and contemporary* **1** 47-8
[8] Wang Qaunxing, Hou Lingling 2004 Legal thinking on the double operation of labour relations *China labour* **4** 23-5
[9] Sun Fangfei 2009 Game analysis of the behaviour of tripartite labour-capital relations under the employment mode of labour dispatch *Legal system and society* 7 243
[10] Wu Xiuqi 2009 On regulation and perfection of labour dispatch *Hebei law science* **27**(4) 130-6
[11] Zhang Kairu 2005 The principal-agent model analysis of labour contracts in enterprises – an adverse selection problem occurring before moral hazard *Journal of management sciences* **18**(1) 26-30
[12] Li Shanliang 2005 Principal-agent analysis of supply chain incentive contract with asymmetric information *Computer integrated manufacturing systems* **11**(12) 1758-65
[13] Laffont 2002 *The theory of incentives I – the principal-agent model* China renmin university press: Beijing
[14] Hart O 1983 Optimal labour contracts under asymmetric information: an introduction *Review* (50) 3-35

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