research paper series

Globalisation and Labour Markets Programme

Research Paper 2001/35

On the Trade-off Between Work-related Training and Labor Mobility: The Role of Firing and Exit Costs

By N. Adnett, S. Bougheas and Y. Georgellis

The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

Leverhulme Centre
for Research on Globalisation and Economic Policy

The Authors

Nick Adnett is a Professor in Economics in the Division of Economics, Staffordshire University, Spiros Bougheas is a Lecturer in the School of Economics, University of Nottingham and Yannis Georgellis is a Lecturer in the Department of Economics and Finance, Brunel University.

Acknowledgements

We would like to thank participants at the November 2001 IZA workshop on "Apprenticeship training: A model for the future?", the 1998 European Economic Association Conference in Berlin, where an earlier version of the paper was presented, and seminar participants at Brunel University, University of Surrey and University of Newcastle for helpful comments. We also thank Stephen Hardy and Peter Reynolds for comments and suggestions.

On the Trade-off Between Work-related Training and Labor Mobility: The Role of Firing and Exit Costs

by

N. Adnett, S. Bougheas and Y. Georgellis

Abstract

Within an incomplete contracts theoretic framework, we examine the consequences of contract renegotiation for contract design/enforcement and training market efficiency. Specifically, we show how the imposition of either firing costs or exit costs can bind together employers and employees in longer-lasting employment relationships that allow both agents to amortise their training investment. Nevertheless, the model implies that although firing and exit costs provide institutional solutions to the training under-investment problem, this is achieved at the expense of allocative efficiency (efficient separations). Empirical evidence supports the existence of such a trade-off.

Outline

Non-Technical Summary

According to human capital theory, a longer employment relationship offers a stronger incentive for both firms and workers to share the cost of work-related training, by allowing both agents a longer horizon over which they can recoup their investment. Because the returns to training are lost when a job match terminates, firms have an incentive to selectively provide job training to those workers who are less likely to quit. Uncertainty about workers' future mobility, may also result in some firms delaying training until later in the employment relationship when more information about the quality of the match becomes available and when workers' propensity to quit is lower than that at the early stages of the job match. A long employment relationship is also a necessary condition for workers to bear all or part of the training costs, especially when such training is mostly job specific. With imperfect capital markets, workers usually share the cost of training by accepting low initial wages in anticipation of higher post training wages. Therefore, workers expect that the employment relationship will last over a sufficiently long horizon so that the present value of expected post training wages covers the training costs (unskilled worker wage minus training wage). By facilitating the formation of longer lasting employment relationships, employment protection legislation offers some reassurance to workers who bear part of the cost of work-related training that they will be able to recoup their investment. From an employer's point of view, in the presence of incomplete contracts the existence of various exit costs imposed on workers act as assurance against the risk of trained workers quitting, especially when training provides mostly general skills.

In this paper, we examine how exit and firing costs affect the trade-off between efficient labor turnover and the incentives for efficient investment in skill acquisition. Within an incomplete contracts theoretic framework, we use a two-period model to examine the consequences of contract renegotiation for contract design/enforcement and training market efficiency. We show that the imposition of either firing costs or exit costs can bind together employers and employees in longer-lasting employment relationships that allow both agents to amortise their training investment. More specifically, we demonstrate that when workers share the cost of training, firing costs provide an incentive for the firm to continue the employment relationship, thus offering workers protection against the possibility that the firm terminates the relationship after an initial period of low wages. Similarly, when firms bear the full cost of training, exit costs offer protection for the firm's investment against quits, thus strengthening their incentives to sponsor training. Nevertheless, the model also implies that although firing and exit costs provide institutional solutions to the training under-investment problem, this is achieved at the expense of allocative efficiency in that they prevent efficient separations.

1. Introduction

Since Becker's (1964) seminal work, work-related training has been the focus of numerous theoretical and empirical studies that shed light on the incentives for firms and workers to provide, participate and share the cost of such training. A well-established empirical regularity emerging from these studies is the inverse relationship between labor turnover and the incidence of work-related training. Reviewing the evidence, Bishop (1997) shows that, *ceteris paribus*, workers who are more likely to receive such training are those in regular, non-temporary and full-time jobs. The incidence of work-related training is also higher in large unionised manufacturing establishments, in firms that have long probationary periods and firms where firing an employee is difficult once the probationary period is over. Such evidence suggests that workers with lower expected rates of turnover are more likely to receive on-the-job training, a view also supported by cross-country comparisons finding a strong correlation between lower turnover rates and higher levels of on-the-job training (OECD, 1991, 1993).[1]

According to human capital theory, a longer employment relationship offers a stronger incentive for both firms and workers to share the cost of work-related training, by allowing both agents a longer horizon over which they can recoup their investment.[2] Because the returns to training are lost when a job match terminates, firms have an incentive to selectively provide job training to those workers who are less likely to quit. Uncertainty about workers' future mobility, may also result in some firms delaying training until later in the employment relationship when more information about the quality of the match becomes available and when workers' propensity to quit is lower than that at the early stages of the job match.[3] A long employment relationship is also a necessary condition for workers to bear all or part of the

---

[1] Note that although the literature confirms a negative relationship between anticipated labor turnover and the incidence of training, there is uncertainty about the impact of training on future labor mobility (see for example, Green *et al*., 2000).

[2] The incentives for firms and workers to share the cost of work-related training depend on whether such training is job-specific or general. Firms are more reluctant to pay for general training, which is of value to other employers, as there is an increased risk of trained workers to be "poached" away. For a review of why firms may sponsor general training see Acemoglu and Pischke (1999).

[3] Loewenstein and Spletzer (1997) argue that delayed training occurs more often than commonly believed even if it means that firms forgo the returns to training in the early part of the employment relationship. If there were complete information about match quality and a worker's underlying mobility propensity, one might expect this training to be provided at the start of the employment relationship.

training costs, especially when such training is mostly job specific. With imperfect capital markets, workers usually share the cost of training by accepting low initial wages in anticipation of higher post training wages. Therefore, workers expect that the employment relationship will last over a sufficiently long horizon so that the present value of expected post training wages covers the training costs (unskilled worker wage minus training wage). By facilitating the formation of longer lasting employment relationships, employment protection legislation offers some reassurance to workers who bear part of the cost of work-related training that they will be able to recoup their investment. From an employer's point of view, in the presence of incomplete contracts the existence of various exit costs imposed on workers act as assurance against the risk of trained workers quitting, especially when training provides mostly general skills.

In this paper, we examine how exit and firing costs affect the trade-off between efficient labor turnover and the incentives for efficient investment in skill acquisition. Within an incomplete contracts theoretic framework, we use a two-period model to examine the consequences of contract renegotiation for contract design/enforcement and training market efficiency. We show that the imposition of either firing costs or exit costs can bind together employers and employees in longer-lasting employment relationships that allow both agents to amortise their training investment. More specifically, we demonstrate that when workers share the cost of training, firing costs provide an incentive for the firm to continue the employment relationship, thus offering workers protection against the possibility that the firm terminates the relationship after an initial period of low wages. Similarly, when firms bear the full cost of training, exit costs offer protection for the firm's investment against quits, thus strengthening their incentives to sponsor training. Nevertheless, the model also implies that although firing and exit costs provide institutional solutions to the training under-investment problem, this is achieved at the expense of allocative efficiency in that they prevent efficient separations.

Our analysis complements Chang and Wang's (1995) work that also identifies a trade-off between efficient labor turnover and efficient human capital investment. Chang and Wang (1995) show that in the presence of asymmetric information about workers' quality, adverse selection in the labor market reduces the wage for job-changing workers, thus reducing efficient turnover. However, when workers expect low wages associated with job changes they have a

stronger incentive to invest in human capital in order to reduce the probability of losing their current jobs. In such a context, when job-matching uncertainty is small, a low turnover equilibrium, associated with a higher level of human capital investment, is Pareto superior to a high turnover equilibrium.[4] In our model, the source of the possible trade-off between efficient turnover and efficient investment in human capital is the existence of firing and exit costs, rather than asymmetric information. In this respect, our explanation for the existence of such a trade-off is consistent with Hall and Lazear's (1984) argument that aspects of employment legislation that restrict labor mobility provide incentives for relationship-specific investments at the expense of efficient separations.

Direct evidence that supports our model can be found in non-traditional labor markets such as sports, armed forces and the UK academic labor market, where a direct link between exit costs and training exists. What all these markets have in common is that labor mobility is of much less importance either because it is socially undesirable or because the protection of the investment in training returns is a priority. Historically, professional sports leagues in the US have used a number of contracting institutions to reduce potential hold-up problems by restricting player mobility. In particular, long-term exclusive contracts were used to limit payments to the most successful players. In baseball, for example, these institutions provided owners with incentives to fund extensive scouting and minor-league training systems. With the advent of free agency in baseball, monopsony power was reduced and owners' training investments were reduced (Rosen and Sanderson, 2001). Similarly, in European soccer the recent strengthening of contractual freedom for players is threatening the viability of the previous training system based upon a transfer fee-system (Simmons, 1997). Similar behaviour can be found in the entertainment industry, for example, the Hollywood star system and exclusive recording contracts.

The G.I. Bill in the US is an example of funding training programmes available to veterans of US military service. Aiming at helping veterans to readjust to civilian life following military service, this programme offers financial assistance for funding higher education or educational programmes that lead to business, technical and other vocational certificates or diplomas.

---

[4] Acemoglu and Pischke (1998) also use an adverse selection model to explain the link between higher turnover rates and lower rates of human capital investment. Morita (2001) investigates the existence of such a link from a choice of technology perspective that addresses two main differences between the US and Japanese labor markets: differences in continuous process improvement and firm-specificity of training.

Upon entry into the armed forces, participants may elect to have their military pay reduced by $100 per month for the first 12 months of service in return for a $400 per months for 36 months toward tuition and other educational expenses. Length of service requirements, explicitly included in the G.I. Bill legislation, determine eligibility to the scheme.[5]

Another example of significant exit costs imposed on workers can be found in the UK academic market in the light of recent Research Assessment Exercises (RAE), used for research funding allocation in higher education. To protect universities' investment in training high quality research staff, specific criteria for assessing research output have been adopted that limit the transfer of published research output of academic staff that leave their current institution to their new institution.[6]

Although evidence also supports the existence of a trade-off between efficient separations and efficient training in traditional labor markets, such evidence is based mostly on the link between labor turnover and training without explicitly highlighting the role of exit or firing costs. In general, empirical studies that establish a direct link between firing and exit costs and work-related training are rather sparse. The empirical literature on firing costs focuses mainly on the employment effects of such costs whilst direct empirical studies on the link between exit costs and work-related training are virtually non-existent**.** In section 4, we review various empirical evidence and stylised facts on exit and firing costs, efficient separations and efficient investment in work-related training. From this review, it emerges that a trade-off between efficient separations and efficient training does indeed exist.

2. The Model

In our framework, contracts are incomplete because investment in work-related training is non-verifiable. If employment contracts can be renegotiated by mutual agreement, this renegotiation might reduce transaction costs by allowing adjustments to changing circumstances. However, in the case of previous investments that are specific to a particular employee-firm match, the threat of terminating employment can be used to alter the distribution

---

[5] See Veterans Benefits Administration (2001)

[6] See HEFCE (1999) for details.

of returns from that originally agreed. This is the hold-up problem initially examined by Grout (1984).[7] Building upon the theoretical framework of MacLeod and Malcomson (1993), we extend their analysis of specific training to the case where skills are transferable and therefore training raises their potential earnings with other employers.

We assume that there is a competitive market for unskilled labor. At the beginning of the first period the firm offers a contract to an unskilled worker. During the first period the firm can make a costly investment in training which improves the worker's productivity during the following period. The investment is not contractible. For the moment, we assume that there are no restrictions on labor mobility and, therefore, either party can terminate the relationship at the end of the first period.[8] Nevertheless, the two parties can renegotiate the original contract by mutual consent.

Formally, let y_1 denote the worker's first period output and I the firm's investment in training. The worker's second period product is given by $y_2(I)+\varepsilon_f$, where ε_f is a firm specific productivity shock. Let w_1 and w_2 denote the first and second period wages offered by the firm. The first period competitive wage is equal to w_1^m while the second period market wage is given by $w_2^m(I)+\varepsilon_m$, where ε_m is a random market shock. This last expression specifies that the firm's investment affects the worker's second period market opportunities. Put differently, their new skills are transferable. Let $[\underline{\varepsilon}_i, \bar{\varepsilon}_i]$ and f_i, $(i=f,m)$ denote the supports and density functions of the two random shocks. At the beginning of the second period, the realisations of the two random variables will become publicly known. We assume that the two parties are risk-neutral and that they do not discount the future. Let π denote the firm's second period outside option and normalise the worker's value of leisure to zero. In addition, let $\theta \in \{0,1\}$ denote the second period separation decision, where $\theta=0$ indicates separation. Then, the firm's expected payoff, when the worker accepts the original contract, is given by:

---

[7] The literature on the hold-up problem is surveyed by Malcomson (1997).

[8] Even if the contract specifies wages for both periods it is assumed that the worker is still free to seek employment elsewhere at the end of the first period. Malcomson (1997) observes that, in contrast with Europe, U.S. courts have consistently taken the position that workers are free to terminate employment agreements without notice ("employment at will" contracts). U.S. courts also take a similar stance with respect to employers, while employment law in Europe makes it more difficult for employers to terminate employment.

$$\Pi = (y_1 - w_1 - I) + E\{\theta[y_2(I) + \varepsilon_f - w_2] + (1-\theta)\pi\}$$

and the worker's corresponding payoff is:

$$U = w_1 + E\{\theta w_2 + (1-\theta)[w_2^m(I) + \varepsilon_m]\}$$

where E is the expectation operator. The payoff of a worker who rejects the firm's original contract is given by the market competitive wage for unskilled labor.

We begin the analysis of the optimal contract by examining the effects of contract renegotiation on the second period wage.

2.1. The Second-Period Renegotiation Game

We view negotiation as a Rubinstein bargaining game with outside options. The outside options refer to the best alternative payoffs that the two parties can receive should they end the match. In our case, these are given by π for the firm and $w_2^m(I)+\varepsilon_m$ for the worker, and we assume that both are non-negative. These should be distinguished from any payoffs that the two parties might receive while they are negotiating which without any loss of generality we set equal to zero. It is implicitly assumed that during negotiations the firm does not hire another worker and the employee cannot find temporary employment elsewhere. According to Shaked and Sutton (1984), the latter payoffs define the threat points in bilateral bargaining while the outside options serve as lower bounds to the payoffs that the two parties receive. In other words, in the event of contract renegotiation the two parties will split the gains from continuing the match relative to those they receive while they are negotiating given that the resulting payoffs are above their corresponding outside options.[9]

Let w_2^c denote the second period wage that is specified in the original contract. The actual second period wage, w_2, will depend on the decisions that the two parties will take at the beginning of the second period. We need to consider three cases, shown in figure 1:

[9] See Malcomson (1997) for an extensive discussion on the appropriate choice of a bargaining equilibrium concept within the context of labor markets.

[Insert figure 1]

1) Separation: $w_2^m(I)+\varepsilon_m+\pi>y_2(I)+\varepsilon_f$.

In this case, the two parties decide to separate. This decision is efficient because the outside options offer the highest possible payoff.[10]

2) No Renegotiation: $y_2(I)+\varepsilon_f - w_2^c \geq \pi$ *and* $w_2^c \geq w_2^m(I)+\varepsilon_m$.

In this case, the two parties decide to continue their relationship according to the specifications of the original contract because both of them prefer that contract to their outside options, thus:

$$w_2=w_2^c.$$

In figure 1, as w_2^c increases, the vertical line shifts to the right and the horizontal solid line shifts up. The intersection of these lines is always on the line that defines the *separation* region.

3) Renegotiation.

If the above two conditions do not hold then the two parties will renegotiate the original contract because it is efficient to continue their relationship. The outcome of the renegotiation process depends on the following sub-cases:

a) $y_2(I)+\varepsilon_f - w_2^c<0$ *or* $w_2^c<0$.

One party prefers not to trade. The first inequality could hold for low realisations (negative) of the firm specific shock. In figure 1, this corresponds to the part of the area labelled as *renegotiation initiated by the firm* that is below the horizontal dotted line. The second inequality would only hold for negative contractual second period wages and is not shown in figure 1. In the absence of renegotiation, and before the two parties take up their outside options, each party's payoff is zero (the threat points are equal to zero). Then, the outcome of the renegotiation is an equal split of the surplus (Nash bargaining solution) which is equal to $y_2(I)+\varepsilon_f$. The final agreement depends on the outside options:

i) $[y_2(I)+\varepsilon_f]/2>\pi$ *and* $[y_2(I)+\varepsilon_f]/2>w_2^m(I)+\varepsilon_m$.

[10] Notice that at the beginning of the second period the realisations of the two random variables are known.

Both parties prefer the negotiation outcome to their outside options, thus:

$$w_2=[y_2(I)+\varepsilon_f]/2.$$

In figure 1, the new payoffs correspond to a point inside the *no renegotiation* region.

ii) $[y_2(I)+\varepsilon_f]/2<\pi$.

The firm prefers its outside option. Because continuation of the relationship is efficient, the worker accepts an increase in the firm's share so that its payoff is equal to its outside option:

$$w_2=y_2(I)+\varepsilon_f-\pi.$$

At the contract wage w_2^c the payoffs correspond to a point inside the region labelled *renegotiation initiated by the firm*. At the new wage the horizontal line shifts down to meet that point.

iii) $[y_2(I)+\varepsilon_f]/2<w_2^m(I)+\varepsilon_m$.

Similarly, in this case the wage is set equal to the worker's outside option:

$$w_2= w_2^m(I)+\varepsilon_m.$$

At the contract wage w_2^c the payoffs correspond to a point inside the region labelled *renegotiation initiated by the worker*. At the new wage the vertical line shifts to the right to meet that point.

b) $y_2(I)+\varepsilon_f- w_2^c>0$ *and* $w_2^c>0$.

Both parties prefer to continue their relationship, however, one of them prefers the outside option:

i) $\pi> y_2(I)+\varepsilon_f-w_2^c$.

This is similar to case (3aii). The firm's payoff is set equal to its outside option.

ii) $w_2^m(I)+\varepsilon_m> w_2^c$.

This is similar to case (3aiii). The wage is set equal to the worker's outside option.

The above analysis determines the second-period wage.

2.2. First-Best Level of Investment

Our main objective is to investigate the extent to which the ability of workers to use their skills with other firms can be responsible for training underinvestment. The following maximisation problem provides the solution for the efficient level of investment:

$$\underset{I}{Max} \int_{\underline{\varepsilon}_m}^{\bar{\varepsilon}_m} \left[\int_{\underline{\varepsilon}_f}^{w_2^m(I)+\varepsilon_m+\pi-y_2(I)} [w_2{}^m(I)+\varepsilon_m+\pi] f_f(\varepsilon_f) d\varepsilon_f + \int_{w_2^m(I)+\varepsilon_m+\pi-y_2(I)}^{\bar{\varepsilon}_f} [y_2(I)+\varepsilon_f] f_f(\varepsilon_f) d\varepsilon_f \right] f_m d\varepsilon_m$$

$$-I$$

The first term of the objective function captures the joint expected benefit given that the two parties separate efficiently while the second term shows the corresponding benefit given that they continue their relationship. After some simplification, the first order condition gives:

$$prob(separation) w_2^m{}'(I) + prob(no\ separation) y_2'(I) = 1 \qquad (1)$$

From an efficiency point of view, it does not matter whether the worker stays or finds another job. The left-hand side captures the expected marginal benefit of training, taking into account the worker's productivity in either job, which must be set equal to the marginal cost of investment. There are three interesting cases to consider:

1) *Job Specific Skills:* $w_2^{m'}(I)=0$.

In this case, the investment in training does not have any effect on the worker's outside option. The efficient level of investment is given by:

$$prob(no\ separation)y_2'(I)=1$$

2) *General Training:* $w_2^{m}(I)= y_2'(I)$.

In this case, skills are fully transferable and the efficient level of investment is given by:

$$y_2'(I)=1$$

3) *Transferable Skills:* $w_2^{m'}(I)< y_2'(I)$.

This is the most general case, where training has both specific and general characteristics and it is the case emphasised in the work of Stevens (1994, 2001).

Next, we consider the contract that the two parties will sign at the beginning of the first period.

2.3. The Optimal Contract

The important question is whether the firm will underinvest in training given that the initial contract might be renegotiated with the worker capturing part of the benefits. When training is job-specific (case 1) there is a simple solution to the hold-up problem. Suppose that the original contract does not specify a second-period wage.[11] Then, given that trade is efficient, the second period wage will be set equal to the worker's outside option (case 3bii in section 2.1.). Because the latter is independent of the level of investment, the firm has the incentive to invest optimally in the first period.

[11] In this case, the worker weakly prefers trade to no trade. However, any initial contract that specifies a second-period wage above zero will be strictly preferred by the worker to no trade and will have exactly the same effect.

The more interesting case is when skills are transferable (case 2 is just the extreme case) because even if the two parties prefer to trade the firm might still underinvest. The reason is that if the two parties either renegotiate the original contract, or negotiate a new contract in the event that the original contract does not specify a second-period wage, the wage rate can not be set less than the worker's outside option. But the outside option depends on the level of training and when the firm decides the level of training it will perceive the effect of its investment decision on the outcomes of any future renegotiation. Since the outside option is positively related to the firm's investment, it has a negative effect on its expected profits and, consequently, the firm will underinvest.

The above argument suggests that if there is any contract that provides incentives to the firm to invest optimally, it must specify a second period wage which is high enough so that the worker's outside option never binds. Formally, this restriction implies:

$$w_2{}^m(I) + \bar{\varepsilon}_m \leq w_2{}^c \qquad (2)$$

In figure 1, this would shift the vertical line to the extreme right and the horizontal line up so that the two lines meet at the point where the separation line meets the edge of the graph. It is clear that if there is any renegotiation it will be initiated by the firm. The above condition is necessary but not sufficient. From a first-best point of view, training is beneficial independently of the separation decision. However, if the two parties separate the firm will not get the full return on its investment. Anticipating this possibility the firm will underinvest. The underinvestment problem due to the possibility of separation is more severe when training is more general. In figure 1, the separation line, when training is general, is further to the left than when training is specific.

The above analysis makes it clear that when skills are transferable there are two causes of underinvestment. The first is the possibility of a hold-up problem in the case of wage renegotiation. A sufficient condition to avoid this problem is to set the second period wage in the contract sufficiently high. Therefore, if renegotiation takes place it will be because the firm's constraint binds and not the worker's. The second cause is the possibility of efficient separation where the training firm receives no reward from future employers for its investment.

The above argument requires that we examine the flexibility provided by a two-period contract. The firm might agree to commit to a sufficiently high second period wage, thus, avoiding the hold-up problem, if its first period offer, w_1, is below the competitive wage, w_1^m. This is exactly what Becker (1975) proposed as a solution to the problem of general training. However, in our case this is not enough. Becker assumed that labor contracts are complete. Therefore, it is possible for the firm to specify both the level and the quality of training in a manner that is verifiable by third parties (courts of law). When the parties can only write incomplete contracts (in our case, training is not contractible) the above solution is problematic. The reason is that the firm might find it profitable to hire the worker at the initial low wage without providing any training and, subsequently, dissolve the relationship, thus, avoiding the high second period wage. If the worker anticipates the firm's reaction, she will not sign the original contract.

It is clear that the issue of enforceability of long-term contracts is of primary importance. Signing a long-term contract need not provide sufficient assurance to workers, if the courts interpret its terms as specifying a second period wage should the employment continue. This would be the case, if the court's presumption is that employment is on an *at will* basis.[12] However, as Hall and Lazear (1984) argue, there is a trade-off between provision of incentives for relationship-specific investments (i.e. aspects of employment law that restrict the mobility of labor) and allocative efficiency (efficient separations). In the following section, we examine how the imposition of either firing costs on employers or exit costs on workers affect the above trade-off.

3. Firing Costs, Exit Costs and the Optimal Allocation of Skills

3.1. Firing Costs

We argued above that when the investment in training is not contractible workers might be reluctant to accept low initial offers if they believe that the firm's promise of future training and higher wages is not credible. The firm benefits from firing the worker without providing any training if:

[12] See section 2.2. in Malcomson (1997). Though recently in the US this presumption is less commonly made (Muhl, 2001).

$$y_2(I) + E[\varepsilon_f / no - separation] - E[w_2 / no - separation] - I < \pi \qquad (3)$$

The first two terms on the left-hand side are equal to the worker's expected productivity given that it is not efficient for the two parties to separate. The third term is the expected second-period wage given that there is no separation. If the benefits net of investment costs are less than the firm's outside option, the firm will not provide any training. As we indicated above, the hold-up problem can be avoided by setting the second-period wage, $w_2{}^c$, equal to the highest possible value of the worker's outside option, $w_2{}^m(I) + \bar{\varepsilon}_m$. If the contract is renegotiated, the new wage will be such that the firm's profit will be equal to its outside option. This case is shown graphically in Figure 2.

[Insert figure 2]

When the horizontal line meets the separation line on the extreme right, the realisation of the firm-specific productivity shock is such that the firm's profit is exactly equal to its outside option. Let, ε_f^*, denote this critical value. If $\varepsilon_f > \varepsilon_f^*$ the firm's profit is equal to $y_2(I) + \varepsilon_f - w_2{}^m(I) - \bar{\varepsilon}_m$. If $\varepsilon_f \leq \varepsilon_f^*$ and the two parties do not separate the firm's profit is equal to its outside option. It follows that (3) can be written as:

$$\int_{\varepsilon_f{}^*}^{\bar{\varepsilon}_f} [y_2(I) + \varepsilon_f - w_2{}^m(I) - \bar{\varepsilon}_m] f_f(\varepsilon_f) d\varepsilon_f + prob\{(\varepsilon_f < \varepsilon_f{}^*) and (no - separation)\}\pi - I < \pi \qquad (3a)$$

When the above inequality is not satisfied the firm has an incentive to fire the worker. Imposing firing costs lowers the firm's outside option and if they are sufficiently high the inequality will be reversed. Because of the possibility of separation, the reduction of the firm's

outside option has a stronger effect on the right-hand side of (3a). Figure 3, shows the effects of firing costs.

[Insert figure 3]

Notice that the new separation line is below the old one. This shift captures the costs of firing costs in terms of allocative efficiency. In the absence of firing costs the two parties separate when the realisations of the two random variables are between the two lines, while with firing costs it is optimal to continue their relationship.

3.2. Exit Costs

As Acemoglu (1997) observed, imposing exit penalties on workers who quit might not only promote efficient investment in transferable skills but it may also encourage sharing the costs of investment. The firm might be willing to share the cost of training with the worker, by offering a higher first-period wage, if it is assured that the worker will not quit at the end of the first period. Without exit penalties the worker has an incentive to quit (or initiate a renegotiation) if:

$$w_2^m(I)+\varepsilon_m>w_2^c.$$

Exit costs lower the worker's outside option, thus, reducing the worker's incentive to quit. The effects of exit costs are shown in figure 4:

[Insert figure 4]

Notice that the reduction of the worker's outside option shifts the separation line down and the vertical line to the right. The second shift produces the desired effect because it reduces the probability that the worker will initiate a wage renegotiation. However, as in the case of firing costs, the first shift affects allocative efficiency because it decreases the separation region.

4. Evidence

In this section we review the evidence regarding firing and exit costs and their role in facilitating investment in work-related skills. Firing costs can arise from a variety of institutional arrangements including employment protection legislation, collective bargaining agreements, and even court interpretations of legislative and contractual agreements. Exit costs can directly be imposed on workers though contractual agreements, but in the absence of such contracts the most common way for firms to introduce exit costs on workers is through job-specific compensation packages that are not fully portable. Most notable examples of exit costs include non-portable pension contribution plans and employer provided health insurance coverage. Depending on the nature of work-related training (general vs. specific) and who bears the cost of such training, firing and exit costs can offer protection for firms and/or workers training investment. Booth and Chatterji (1989), among others, illustrate this point clearly by showing that when training is firm-specific with uncertain returns and uncertainty about the outside options of workers, an optimal contract will involve the firm bearing only a part of the training costs because workers may quit. Since workers bear part of the cost of training, they will have to be compensated by a redundancy payment if dismissed.

4.1. Firing Costs

Protection against dismissals in the form of advance notice periods and severance payments are the most prevalent forms of firing costs in most OECD countries, as part of Employment Protection Legislation (EPL). However, the strictness of such legislation varies not only between countries but also by industry, firm size and job tenure within individual countries. In the 1990s, notice periods for no-fault individual dismissals of workers with 20 years of job tenure varied between 2 and 9 months in most European countries, with notice period in Belgium of 9 months and in Germany 7 months. In comparison, notice period for workers with the same tenure in the UK was 2.8 months while in Japan was only 1 month and 0 in the United States. Notice period for workers with 9 months of service was about 1 month in most countries (see OECD, 1999, Table 2.2). Severance payments are available to long-tenured workers in regular employment in about two-thirds of OECD countries, with more generous entitlements in Southern European countries (reaching 20 months). Among other European countries, workers in Austria are entitled to 9 months severance pay after 20 years of service, while in the UK and France such entitlement is limited to 2.4 and 2.7 months respectively. In comparison, entitlement in Japan is 4 months. Severance pay is available only to a minority of workers in the US, usually in larger firms. With the exception of Portugal and Mexico, where

workers with 9 months of service are entitled to 3 months severance pay, such payments are generally not available in other OECD countries. A summary indicator, based on additional indicators of procedural requirements and difficulty of dismissals, ranks Germany, Netherlands, Portugal, and Japan among the countries with the strictest employment protection legislation and the United States and United Kingdom at the opposite end of the spectrum (see OECD, 1999, Table 2.2).

To the extent that stricter EPL is associated with longer job tenure it provides incentives to both employers and employees to invest in training. Evidence suggests that indeed mean job tenure is higher in countries with stricter employment protection, with the US having the lowest mean job tenure and the lowest index of EPL strictness among OECD countries. In contrast, Germany and Japan rank among the highest OECD countries in terms of both mean job tenure (or five year retention rates) and the overall strictness of EPL (see OECD, 1999). As Bishop (1997) argues, one of the main reasons why American workers receive less work-related training than workers in Germany and Japan is the higher turnover rate in the US labor market, due mainly to fewer institutional constraints on layoffs and dismissals. More direct evidence on the link between stricter EPL and work-related training is also provided in the OECD (1999) study, which shows that on-the-job training is more strongly concentrated on younger and more educated workers in countries with stricter EPL, lower job turnover and higher trade union density.

Although the above evidence suggests that EPL has beneficial effects on the provision of work-related training by offering protection for workers against layoffs, it is possible that EPL can also adversely affect training investment by increasing quits or by the resulting lower flows in the labor market reducing the quality of job matches. Empirical research, surveyed by Addison and Texeira (2001), provides some limited evidence that EPL reduces the speed of response of employment to labor market shocks. A similar argument for the possible adverse effects of EPL on training applies in the case of advance notice. Although advance notice, as a firing cost, may protect workers against layoffs it may also encourage workers who receive such notice to quit before actually being laid off. This is an argument against advance notice legislation, quite often put forward by employers who claim that labor productivity may fall during the notice period due “destructive attrition”. This can be particularly costly to firms, especially when these workers who quit early are concentrated in a small number of establishments, they are the most productive ones or they perform essential functions for whom other employees are not easily substituted (see Fallick, 1994).

Significant firing costs can be imposed on firms by unions, one main function of which is to protect workers from dismissals. Booth and Chatterji (1998) show that union bargaining at the local level can counter-balance firms' *ex post* monopsonistic power. In the absence of other institutional structures that prevent firms from offering workers credible long-term contracts, unions can increase skilled workers' bargaining power and wages, thereby reducing quits. This explains the positive relationship between firm-sponsored training and trade union presence in many OECD countries (Booth, 1991) and the negative relationship between union presence and quits (Freeman, 1980; Blau and Kahn, 1983). Other forms of employment protection legislation such as severance payments and advance notice, both viewed as firing costs imposed on employers and generally perceived as impediments to labor market flexibility, are positively correlated with the incidence of work-related training.[13]

Arulampalam and Booth (1998) offer some direct evidence on the existence of a trade-off between work-related training and flexibility in the British labor market, by using the lack of union coverage, employment contract type (short-term vs. long-term) and part-time employment as proxies for labor market flexibility. Another notable study, offering direct evidence on the link between employment protection legislation and training, is by Neumark and Wascher (2001) who examine whether minimum wages, a form of social/employment protection legislation, reduce on-the-job training. They find that indeed higher minimum wages reduce formal work-related training in the US, as predicted by the basic human capital model.

4.2. Exit Costs

Although a direct link between exit costs and work-related training can most often be observed in non-traditional labor markets, in most cases such a link is supported by indirect evidence based on the presumption that exit costs have a negative effect on turnover. Changing jobs quite often implies significant costs for workers in the form of lost job benefits and rights that are not fully portable to the new employer. For example, an issue of particular relevance in the US labor market is to what extent health insurance deters mobility. Workers who receive health insurance benefits in their current employer do not necessarily receive identical coverage when they change jobs, either because many employers exclude pre-existing conditions in their health plans or they impose length-of-service requirements before new employees become eligible for

[13] See OECD (1999).

coverage. Therefore, workers may decide to keep jobs they would rather leave due to the non-portability of health insurance coverage across jobs, a possibility known in the literature as "job-lock". Madrian (1994) finds support for this hypothesis, showing that "job-lock" reduces the voluntary turnover rate of those with employer-provided health insurance by 25 percent. Kapur (1998), using the same data as Madrian, but correcting for some methodological issues, finds that "job-lock" is small and statistically insignificant, while Buchmueller and Valetta (1996) find strong evidence of "job-lock" for women, but only weak evidence for men. Reviewing the empirical evidence, Monheit and Cooper (1994) conclude that although "job-lock" is present in the US labor market, estimates of its magnitude and importance vary considerably across studies. Although in Germany health care is provided by the state, a substantial number of workers are covered by employer health care plans. Holtz-Eakin (1994) estimates that about 50 percent of German workers face a change in health insurance rates if they change jobs, a factor that potentially acts as a deterrent of mobility. Using data from the German Socio-economic Panel (GSOEP), Holtz-Eakin presents empirical evidence that provide some support for the "job-lock" hypothesis of health insurance in the case of Germany.[14]

Another potentially important exit cost for workers who change jobs is the lack of portability of pension plans across employers. A prominent idea in the economic literature on pensions is that defined benefit tenure and retirement incentives raise productivity by encouraging and preserving training investment in workers. As Carmichael (1989) argues, the loss from quitting a job with a defined benefit pension may be seen as "severance tax", which is a desirable feature in long-term contracts to prevent workers from leaving productive job matches. This argument reinforces Becker's (1964) view that delayed vesting is a policy to reduce quits of trained workers. Dorsey and Macphearson (1997) provide a direct empirical test of the relationship between pensions and training. Their results strongly support the prediction that pensions and training are joint outcomes of employment contracts: controlling for other worker and firm characteristics, they estimate a positive and significant relationship between pension coverage and training. Further tests do not clarify the mechanism that links pensions and training, however. They do not find consistent evidence that pension coverage is more likely to

[14] Although Holtz-Eakin's (1994) empirical evidence is relatively weak and the estimated effects small, he concludes that the institutional structure of the health insurance system in Germany can be viewed as an additional factor that explains the low mobility rates in the German labor market.

complement firm-specific rather than general training.[15] Using establishment data, Schnabel and Wagner (2001) provide some of the first direct empirical evidence on the existence a positive and significant relationship between pension coverage and firm-sponsored training in the German labor market.

A substantial body of empirical work also offers indirect evidence on the existence of a link between pensions and training. It is a well-established empirical fact that workers with pensions have lower mobility rates (see for example, Mitchell, 1982, 1983; McCormick and Hughes, 1984; Gustman *et al*, 1994). However, it is not totally clear whether the non-portability of pensions is the main culprit for the low mobility. As Gustman and Steinmeier (1993) argue, the higher compensation premium that workers with pensions receive accounts for the lower turnover among pension covered workers, rather than the losses associated with the "backloading" of pension benefits. This finding casts doubt on the idea that the central purpose of backloaded pensions is to preserve or recover training costs.[16]

Exit costs can also arise as a result of unionised workers enjoying more benefits that they may forgo when changing employers. Another possibility is better knowledge about the quality of the match in the current employer, especially for workers with longer tenure, may by itself be considered as a significant exit cost. As already mentioned, other fringe benefits such as paid holiday allowances and sickness leave may act as exit costs deterring workers' mobility. Mitchell (1982, 1983) provides evidence to this effect.

---

[15] Based on a model of deferred compensations and severance pay, Johnson (1996) shows that pensions are positively correlated with job-specific training, a prediction supported by US data.

[16] Defined contribution pensions (calculated using formulae based on job tenure and wages) accrue value disproportionately in later years implying some "backloading" of pension benefits. So, in a sense such pension plans lack portability. For a detailed discussion of the evidence challenging the view that the non-portability of pensions accounts for low turnover rates see Gustman and Steinmeier (1993).

5. Conclusion

Various pieces of evidence seem to suggest that a trade-off between labor market flexibility (broadly defined) and investment in work-related training exist. Our contract theoretic model highlights how such a trade-off can arise in the light of possible contract renegotiation when workers and firms can only write incomplete contracts. Under such circumstances, exit and firing costs can offer viable institutional responses to the potential problem of training under-investment. Although the effect of exit and firing costs in affecting the trade-off between efficient separations and efficient investment in training is clearly established at a theoretical level, direct empirical evidence on such trade-off is rather scarce. The existence of an inverse relationship between labor turnover and work-related training and the related question of whether labor market flexibility undermines investments in skill acquisition has been addressed to some extent within the broader context of an ongoing debate regarding the link between social protection and labor market flexibility. In this debate, proponents of social protection programmes quite often stress their importance in enhancing human capital investment.[17] However, much of the related literature focuses on the costs of social protection programmes in terms of hampering adjustment in the labor market rather than their potential benefits, with only a small number of studies offering direct evidence on how social protection legislation affects investment in training. Most empirical studies focus on the effect of various exit and firing costs on labor turnover, thus offering only indirect evidence. Future empirical work on how exit costs such as health insurance coverage and pensions portability as well as firing costs affect the incidence of work-related training could offer valuable direct evidence on the above trade-off.

[17] For a review and evaluation of recent evidence on the link between social protection and labor market flexibility see Blank (1994).

References

Acemoglu, D. (1997), "Training and Innovation in an Imperfect Labor Market", *Review of Economic Studies*, **64**, 445-464.

Acemoglu, D. and Pischke J.S. (1998), "Why Do Firms Train? Theory and Evidence", *Quarterly Journal of Economics*, **113**, 79-119.

Acemoglu, D. and Pischke J.S. (1999), "Beyond Becker: Training in Imperfect Labor Markets", *Economic Journal*, **109**, F112-F142.

Addison, J. and Texeira, P. (2001), "The Economics of Employment Protection", IZA Discussion Paper, No. 381.

Arulampalam, W. and Booth, A. (1998), "Training and Labour Market Flexibility: Is There a Trade-off?", *British Journal of Industrial Relations*, **36**, 521-536.

Becker, G. (1964), *Human Capital*, Chicago: The University of Chicago Press.

Becker, G. (1975), *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, New York: Columbia University Press.

Bishop, J. (1997), "What we Know about Employer Provided Training: A Review of the Literature", *Research In Labor Economics*, **16**, 19-87.

Blank, R. (1994), *Social Protection versus Economic Flexibility: Is there a Trade-off?*, NBER Comparative Labor Market Series, Chicago: The University of Chicago Press.

Blau, F. and Kahn, L. (1983), "Unionism, Seniority and Turnover", *Industrial Relations*, **22**, 362-373.

Booth, A. (1991), "Job-Related Formal training: Who receives it and what is it worth?", *Review of Economics and Statistics*, **53**, 281-294.

Booth, A. and Chatterji, M. (1989), "Redundancy Payments and Firm-specific Training", *Economica*, **56**, 505-521.

Booth, A. and Chatterji, M. (1998), "Unions and Efficient Training", *Economic Journal*, **108**, 328-343.

Buchmueller, T. and Valetta, R. (1996), "The Effects of Employer-Provided Health Insurance on Worker Mobility", *Industrial and Labor Relations Review*, **49**, 439-455.

Carmichael, L. (1989), "Self-Enforcing Contracts, Shirking, and Life Cycle Incentives", *Journal of Economic Perspectives*, **3**, 65-83.

Chang, C. and Wang, Y. (1995), "A Framework for Understanding Differences in Labor Turnover and Human Capital Investment", *Journal of Economic Behavior and Organization*, **28**, 91-105.

Dorsey, S. and Macphearson, D. (1997), "Pensions and Training", *Industrial Relations*, **36**, 81-96.

Fallick, B. (1994), "The Endogeneity of Advance Notice and Fear of Destructive Attrition", *Review of Economics and Statistics*, **76**, 378-384.

Freeman, R. (1980), "The Exit-voice Tradeoff in the Labor Market: Unionism, Job Tenure, Quits and Separations", *Quarterly Journal of Economics*, **94**, 643-674.

Green, F., Felstead, A., Mayhew, K. and Pack, A. (2000), "The Impact of Training on Labour Mobility: Individual and Firm-Level Evidence from Britain", *British Journal of Industrial Relations*, **38**, 261-275.

Grout, P. (1984), "Investments and Wages in the Absence of Binding Contracts: A Nash Bargaining Approach", *Econometrica*, **52**, 449-460.

Gustman, A., Mitchell, O. and Steinmeier, T. (1994), "The Role of Pensions in the Labor Market: A Survey of the Literature", *Industrial and Labor Relations Review*, **47**, 417-438.

Gustman, A. and Steinmeier, T. (1993), "Pension Portability and Labor Mobility: Evidence from the Survey of Income and Program Participation", *Journal of Public Economics*, **50**, 299-323.

Hall, R. and Lazear, E. (1984), "The Excess Sensitivity of Layoffs and Quits to Demand", *Journal of Labor Economics*, **2**, 233-257.

HEFCE (1999), "RAE 2001: Guidance on Submissions", Briefing Note 2/99.

Holtz-Eakin, D. (1994), "Health Insurance Provision and Labor Market Efficiency in the United States and Germany", in R. Blank (ed) *Social Protection versus Economic Flexibility: Is there a Trade-off?*, NBER Comparative Labor Market Series, Chicago: The University of Chicago Press.

Johnson, R. (1996), "The Impact of Human Capital Investments on Pension Benefits", *Journal of Labor Economics*, **14**, 520-554.

Kapur, K. (1998), "The Impact of Health on Job Mobility: A Measure of Job Lock", *Industrial and Labor Relations Review*, **51**, 282-298.

Loewenstein, M. and Spletzer, J. (1997), "Delayed Formal On-the-Job Training", *Industrial and Labor Relations Review*, **51**, 82-99.

Madrian, B. (1994), "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job-Lock?", *Quarterly Journal of Economics*, **109**, 27-54.

MacLeod, B. and Malcomson, J. (1993), "Specific Investments and Wage Profiles in Labour Markets", *European Economic Review*, **37**, 343-354.

Malcomson, J. (1997), "Contracts, Hold-up, and Labor Markets", *Journal of Economic Literature*, **35**, 1916-1957.

McCormick, B. and Hughes, G. (1984), "The Influence of Pensions on Job Mobility", *Journal of Public Economics*, **23**, 183-206.

Mitchell, O. (1982), "Fringe Benefits and Labor Mobility", *Journal of Human Resources*, **17**, 286-298.

Mitchell, O. (1983), "Fringe Benefits and the Cost of Changing Jobs", *Industrial and Labor Relations Review*, **37**, 70-78.

Monheit, A. and Cooper, P. (1994), "Health Insurance and Job Mobility: Theory and Evidence", *Industrial and Labor Relations Review*, **48**, 68-85.

Morita, H. (2001), "Choice of Technology and Labour Market Consequences: An Explanation of US-Japanese Differences", *Economic Journal*, **111**, 29-50.

Muhl, C. (2001), "The Employment–At-Will Doctrine: Three Major Exceptions", *Monthly Labor Review*, **124 (1)**, 3-15.

Neumark, D. and Wascher, W. (2001), "Minimum Wages and Training Revisited", *Journal of Labor Economics*, **19**, 563-595.

OECD Employment Outlook (1991), Paris: OECD.

OECD Employment Outlook (1993), Paris: OECD.

OECD Employment Outlook (1999), Paris: OECD.

Rosen, S. and Sanderson, A. (2001), "Labour Markets in Professional Sports", *Economic Journal*, **111**, F47-68.

Schnabel, C. and Wagner, J. (2001), "A Note on Pensions and Firm Performance: First Evidence from German Micro Data", *Journal of Labor Research*, **22**, 207-211.

Shaked, A. and Sutton, J. (1984), "Involuntary Unemployment as a Perfect Equilibrium Bargaining Model", *Econometrica*, **52**, 1351-1364.

Simmons, R. (1997), "Implications of the Bosman Ruling for Football Transfer Markets", *Institute of Economic Affairs*, **17**, 13-18.

Stevens, M. (1994), "A Theoretical Model of On-the-job Training with Imperfect Competition", *Oxford Economic Papers*, **46**, 537-562.

Stevens, M. (2001), "Should Firms be Required to Pay for Vocational Training?", *Economic Journal*, **111**, 485-505.

Veterans Benefits Administration (2001), "The Montgomery GI Bill – Active Duty", VA Pamphlet 22-90-2, Washington DC.