

# Firms' motivation to invest in training: the role of dependency, hostages and cooperation

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## I. Introduction

This paper aims at explaining the motivation of firms to investment in training of their workers although they cannot establish ownership in human resources. Becker (1975) has proposed a training model assuming perfectly symmetric information and perfect markets. The model concludes that firms invest in training if the skills are firm-specific. There is vast evidence, however, that firms also invest substantially in general skills. More recent training models explain training in general skills as a consequence of asymmetric information between training and non-training firms (Katz and Ziderman 1990; Acemoglu and Pischke 1998). These models imply that firms invest in general skills if the training is provided in unobservable and uncertified training forms. In many countries, however, firms invest significantly in general skills in a highly visible, formal and systematic form. Investment in general observable training can neither be explained by competitive nor non-competitive training models.

In part two of this paper, I develop three training models. Each model suggests a different mechanism of how the firm safeguards returns to its training investment. The first model proposes mutual dependency of human resources and the firm on continued association which results in *ex-ante* incentive alignment. The model explains investment in both firm-specific training as well as in general unobservable training. Training models proposed by Becker and those based on asymmetric information may be considered as special cases of the mutual dependency model.

The second and third model explains firms' investment in general observable training. Both models therefore assume symmetric information. The second model proposes hostages and institutions of private ordering to *ex-post* enforce training agreements which could not be enforced legally. Apprenticeship and

internal labor markets are discussed as two major institutions that enforce training agreements through hostages.

The third model proposes cooperation among firms to overcome the free-rider problem in general observable training and to ensure market supply. Institutions facilitate and enforce cooperation. Further, cooperation between firms and workers and institutional wage setting result in compressed wage structures allowing the firm to collect quasi-rents.

Part III of the paper presents evidence from Germany, Britain, France, Japan and the United States on the empirical relevance of each of the three training models. The country studies demonstrate that national training and labor market institutions determine each of the models' relevance in the country concerned.

## II. Training Models

Training is considered as an investment in human resources. Human capital theory argues that training results in an increase in the future productivity of human resources. In order to be motivated to invest in training, the firm must receive a share of the increased marginal product, that is, the worker accepts a wage below marginal product. We consider a simple model with two periods. In period zero, the firm finances training of the worker so that

$$(1) \quad W(0) > MP(0) - k$$

where  $W(0)$  denotes the wage paid by the firm,  $MP(0)$  the worker's marginal product during the training period and  $k$  refers to the firm's training expenditures. Training costs therefore are

$$(2) \quad c_{tr} = W(0) - MP(0) + k.$$

In period 1, the worker shares the increase in marginal product with the firm, so that

$$(3) \quad W(1) < MP(1)$$

where  $W(1)$  is the wage paid to the worker and  $MP(1)$  the worker's marginal product in period 1. The firm receives a quasi-rent. For simplicity, we assume period 1 to be the time span required by the firm to fully recover the training costs  $c_{tr}$ . (No discounting takes place).

$$(4) \quad MP(1) - W(1) = c_{tr}$$

This model suggests that the firm is willing to invest in training under two conditions. First, the human capital continuously to be deployed in the firm to the end of period 1. Second, the firm receives part of the

increase in marginal product, that is, a quasi-rent. In contrast to investment in physical capital, the firm cannot establish ownership in human capital.<sup>1</sup> Should the trained worker leave the firm before the end of period 1, or should the worker decide to no longer share the marginal product, the firm has not yet recovered all of its investment and makes a loss. Hence, the firm invests in training only if it can safeguard its investment.

This paper analyses different ways of how firms safeguard their invest in training by drawing on the model of the firm suggested by Alchian and Woodward (1987:111). They focus on the firm as a nexus of contracts between the owners of different resources. These resources cooperate in a team (the firm). A resource is defined as dependent when it loses value if separated from the team. The value of the resource is higher (or considered to be higher) in the current team than in alternative teams. Dependent resources receive a wage above their alternative opportunity cost, that is, they receive quasi-rents. The quasi-rent is dependent on the continued association of the resources with its current team (Alchian and Woodward 1987: 114).

A team is considered dependent if it would lose on the departing resource. A team's dependency arises from "uniqueness" of the resource, that is, the resource can only be substituted by an equivalent at costs. The team may have to incur high search costs or it must make the specific investment in the new resource again (Alchian and Woodward 1988: 67).

Dependent resources or dependent teams are vulnerable to *ex-post* opportunistic behavior and a hold-up on their asset value. Alchain and Woodward (1987:115) argue that vulnerability of a dependent resource or a dependent team to hold-up depends „...on the degree to which they [unique resources] can threaten to alter the flow of services". They define a resource as "potent" if the resource is able to control its flow of service as a means to exploit some of the quasi-rents of other dependent resources. Alchian and Woodward (1988:68) maintain that the owners of human resources tend to be highly potent compared to other resource owners. Human resources simply fail to show up for work and can cheaply withdraw their labor service. Hence, the owners of other resources face a relative high risk of a hold-up by a unique and potent human resources.

The team may decide to provide training to the human resource and pay for it. If replacement of the trained human resource by an equivalent is costly, the team has become dependent on continued association

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<sup>1</sup> This is not an inherent property of human resources. It is the result of institutions such as human rights conventions, conventions on child labor and laws on the freedom of work that rest on philosophical ideas of individual freedom and liberty. Only where such institutions are enforced, firms are unable to establish property rights in workers.

with the human resource. Once the human resource has received training it may expropriate the firm's quasi-rent by leaving the firm or by demanding its full share of increased product. Since human resources are highly "potent", the firm becomes very vulnerable and faces the risk of an hold-up on its asset value. The first two training models assume dependency of the team. In the first model the team safeguards its investment by ex-ante incentive alignment. In the second model, the team enforces training agreements ex-post through hostages.

The third training model assumes that training does not result in the team's dependency. Cooperation allows the firm to replace the trained human resource by an equivalent from the labor market at no costs. It therefore is not vulnerable to a hold-up by the trained human resource.

### **1. Ex-ante alignment of incentives: mutual dependency**

This training model suggests mutual dependency of the human resource and the team as the motivation for firms to invest in training. The model assumes that training increases the worker's marginal product in the training firm  $MP(1)$  while other firms expect a lower marginal product in their firm,  $MP'(1)$ , so that

$$(5) MP'(1) < MP(1).$$

Other firms offer a wage to the human resource equal to the marginal product

$$(6) MP'(1) = W'(1).$$

From (5) and (6) follows that the market wage  $W'(1)$  is below the marginal product in the current team,

$$(7) W'(1) < MP(1).$$

This allows the training firm to pay a wage below marginal product

$$(8) W(1) < MP(1),$$

and to collect a share of the worker's increased marginal product.

From (5) also follows that the human resource has become unique to the training firm. Workers trained within the firm are considered of higher value than workers trained in other firms. The firm therefore faces replacement costs and has become dependent on the human resource. The model suggests that the firm prevents a hold-up on its asset value by also creating dependency of the worker. From (7) follows that it can offer a wage  $W(1)$  above the market wage  $W'(1)$  so that

$$(9) W'(1) < W(1).$$

Consequently, the worker would lose if separated from the team. The model results in a wage structure

$$(10) W'(1) < W(1) < MP(1)$$

which ex-ante aligns incentives of the team and the human resource. The team will invest in training and the worker allows the firm to collect returns. It is mutual dependency which provides motivation for firms to invest in skills of their workers.

The result of the model rests on the assumption that the value of a worker trained within the firm is higher than the value of a worker trained elsewhere, that is,  $MP'(1) < MP(1)$ . The training literature provides two cases in which this condition is met. The first case is provided by Becker (1975) who distinguishes between firm-specific and general skills. In his neoclassical training model assuming perfect information and competitive labor and product markets, Becker (1975: 26) argues that firms pay only for training in firm-specific skills. By definition, these are skills which increase productivity in the training firm, but “has no effect on the productivity of trainees that would be useful in other firms”. Therefore, the marginal product in the training firm is higher than the marginal product in other firms. General skills, in contrast, are transferable and increase the worker’s productivity in other firms. The marginal product of a generally skilled human resource is equal in all firms so that  $MP'(1) = MP(1)$ . The firm does not invest in general skills.

The second case is provided by training models assuming imperfect and asymmetric information. Katz and Ziderman (1990) argue that training firms acquire substantial information on the worker’s skills and productivity. Recruiting firms have imperfect information about the generality, the exact quantity, content and quality of the training a worker has received. Acemoglu and Pischke (1998) claim that training firms obtain information on the worker’s ability and that high ability workers benefit more from training. Recruiting employers cannot obtain this information. Consequently, the expected marginal product  $MP'(1)$  in competing firms is below the observed marginal product in the training firm, that is,  $MP'(1) < MP(1)$ . Recruiting employers would not compensate the worker for general skills whose training cannot be observed or the quality of which they cannot evaluate. They offer a wage  $W'(1)$  below the worker’s actual marginal product  $MP(1)$ .

From the above discussion we derive the following conclusions. Mutual dependency provides incentives for the firm to invest in training. Under perfect and symmetric information specificity of skills is the only case where dependency can be created. Asymmetric information explains investment in general skills which are provided in an invisible form. Informal, unorganized and unsystematic on-the-job training contributes to low

transparency in terms of type and quality of training provided. Firms also avoid training leading to formal certification and refuse to give outside references. The higher the level of asymmetry in information between training and recruiting firms, the higher the investment in general skills. Efforts to increase transparency in training is expected to reduce firms' investment in general skills.

The mutual dependency training model cannot explain investment in general, but visible forms of training. The following two models propose motivations of firms to invest in general skills in observable, formal, systematic and organized forms of training.

## 2. Ex-post enforcement of agreements: hostages

This training model explains the motivation of firms to invest in general skills in an observable and visible form of training. The model therefore assumes symmetric information between training and competing firms on the type and quality of training. Hence, in contrast to the previous model, the value of a worker trained within the firm is regarded as high as of workers trained somewhere else. The worker's marginal product is equal in all firms.

$$(11) MP'(1) = MP(1).$$

The model assumes that the team and the human resource conclude a training contract. The firm promises to provide general training and to pay for the training, so that  $W(0) > MP(0) - k$ . The owner of the human resource, in turn, agrees to accept a wage below marginal product during period 1, so that the firm receives quasi-rents

$$(12) W(1) < MP(1).$$

In addition, the worker promises not to leave prematurely and to stay with the current team to the end of period 1. The respect of these indenture conditions allows the firm to fully recover the training costs.

From equation (11) and (12) follows a wage structure

$$(13) W(1) < W'(1) = MP'(1) = MP(1)$$

which implies that the worker accepts a wage below the market wage. Where institutions such as laws on the freedom of work prohibit bonding of workers the firm is unable to legally enforce the training agreement. This results in dependency of the team once it has invested in training. The firm could hire a substitute from the labor market only at the market wage  $W'(1)$  which is above the agreed indenture wage

W(1). The team will lose if the trained worker does not keep indenture promises. Hence, the team faces the threat of a hold-up on its quasi-rent. Once it has invested in general observable training, the worker may behave opportunistic and may claim a wage equal to the marginal product and the market wage.

This training model suggests that vulnerability of the dependent team to a hold-up is reduced by converting a „potent“ into an „impotent“ human resource. Hostages represent an effective means to reduce the potential of human resources to expropriate the team's quasi-rents. A hostage has value for the human resource owner because it credibly promises future benefits (Williamson 1985). The firm keeps the hostage while the contract is executed. It threatens to destroy the hostage in case of opportunistic behavior and the worker would suffer an irreversible loss of future benefits. Once the human resource has fulfilled its indenture promises and obligations, the firm will release the hostage and the workers will receive the benefits.

Williamson emphasizes that private ordering such as exchanging hostages to enforce contracts causes transaction costs. He argues that it is the function and effect of institutions to economize on these transaction costs (Williamson, 1985). Hostages enforce contracts and institutions allow firms to do so at low costs. In the following I discuss apprenticeship and internal labor markets as two major institutional arrangements in training systems that safeguard returns to training by hostages.

### **2.1. Apprenticeship and certificates**

In apprenticeship, the firm provides intensive training to the worker at the beginning of her or his working life. Apprenticeship may be based on informal or formal rules. Training is provided according to the skill requirements of a trade, craft or occupation. This implies that imparted skills are to a substantial degree transferable, increasing the worker's marginal product in all firms:  $MP(1)=MP'(1)$ . Further, training along the requirement of occupations implies that other firms are informed on the type of skills provided in training firms.

In period 0, the firm finances part of the general training by paying a wage above the worker's marginal product net of training costs so that  $W(0)>MP(0)-k$ . The worker had promised to accept indenture conditions during period 1 which allow the firm to recover the training costs. The worker, however, may behave opportunistically. Once productivity is above the agreed apprenticeship wage, he or she may want to claim a higher wage than agreed upon or leave the firm prematurely. Effective apprenticeship arrangements therefore, must give credible commitments to the firm that the agreement will be enforced. Final apprenticeship

certificates or letters of indentures issued at the end of the indenture period constitute an effective hostage. They enforce the training contract under the condition that they give privileged or exclusive access to employment in the trained trade or occupation. Recruiting employers only employ a trained worker and pay a skilled worker's wage if the worker has received his or her certificate. Opportunistic behavior would destroy the apprenticeship certificate. Workers would irreversibly lose future benefits derived from the certificate. Certificates enforce the training contract and insure firms' quasi-rent.

## **2.2. Internal labor market and seniority premium**

Internal labor markets are important institutions in safeguarding returns to investment in general training. Workers enter the firm at a low level in the job hierarchy. The worker receives limited task-related training to be able to perform the narrowly defined entry job. The worker advances by internal promotion. After each promotion she or he receives further skills required to perform the new task. Hence, the worker acquires the skills gradually while he makes a career up the job hierarchy. The firm bears part of the training costs.

The firm prevents a hold-up on its investment by a promotion policy which discriminates in favor of workers trained within the firm. They fill vacancies with their own employees rather than from the external labor market. Internal labor markets therefore offer a seniority premium since workers could not obtain a job and income at the comparable level in different firms (Sengenberger 1987: 150ff). The higher the worker's seniority in the firm, the higher the irreversible loss in future benefits in case he or she left the firm. The seniority premium therefore is an effective hostage and enforces training agreements.

At the lower levels of the job hierarchy, the seniority premium is still low and is not yet an effective hostage. The worker's promise to accept a wage  $W(1)$  below marginal product  $MP(1)$  could not be enforced. Consequently, at low levels of the job ladder, the firm will not invest in general skills in a visible form. Firms invest in specific skills or rely on unobservable and unorganized forms of training to keep a high level of asymmetry. With increasing seniority and career levels, the seniority premium becomes an effective hostage. This allows firms to invest more in general training, and to do so in an organized, formal and visible form. Workers promise to allow rent collection during the following period and the seniority premium prevents the owners of human resources to attempt a hold-up on the firm's quasi-rent.

### 3. Cooperation and institutional wage setting

The third training model I propose is based on the idea that training does not result in dependency of the investing team. In contrast to the mutual dependency model and the hostage model, the firm does not lose if the trained human resource is separating from the team before the end of period 1. The firm can replace a leaving worker by an equivalent without costs. The worker therefore is unable to make a hold-up on the firm's quasi-rent.

This training model explains training in general skills assuming symmetric information and that all firms pay the same wage for a generally trained worker during period 1. Becker (1975) has argued that under these conditions firms will not invest in training due to free-riding behavior of non-training firms and to the firm's inability to collect quasi-rents. Cooperation between firms however, overcomes the free-riding behavior and cooperation between firms and workers allow firms to receive a share of increased marginal product. As a consequence, the market will provide generally trained workers under symmetric information. Institutions play a central role in this cooperation-based training model.

#### 3.1. Cooperation among firms: Standardization and binary choice

The model assumes that firms cooperate in general training. Each firm provides general training in a highly visible form and bears the training costs. This implies that the marginal product of a trained worker is the same in all firms so that

$$(14) MP(1)=MP'(1)$$

Schelling (1978: 128) argues that institutions play an important role in enforcing cooperation. He argues that cooperation is facilitated when the choice is binary, that is, the decision is to join a coalition and its rules or not to join. The question then "is not how *much* anyone does but how *many* make the one choice or the other." An individual firm's decision rule is : „ I'll cooperate if you and everybody else will“ (Schelling 1978: 215). This implies that people need to know the choice of others before making their own choices. Schelling argues it is the role of institutional arrangements to make choices binary and to disseminate the relevant information.

Regulation and standardization of on-the-job training converts a training decision into a binary choice. The content of training and the costs of a given unit of general training are equal in all firms. The firm can choose to train according to the rules and regulations and to the set standards, or not to train. It is the role of

institutions to collect and disseminate the information on other firms' training decision in order to motivate firms to cooperate. In addition, firms must be convinced that other firms are training according to the rules and standards. Hence, institutions also play a central role in monitoring training in firms, and in creating and disseminating information on the type and quality of training. Exams, tests, grading and probation periods collect the information on a worker's skills and abilities, while diploma, certificates, licenses and references allow employers to share this information at low cost.

We conclude that institutions facilitate cooperation which results in market supply of generally skilled workers and a high level of symmetry in information. As a result firms can replace a leaving trained worker by an equivalent at low costs.

### **3.2. Cooperation between firms and workers and institutional wage setting**

In order to invest in training, firms also have to be able to collect a share of the worker's increased marginal product. This model assumes that employers and workers cooperate in wage setting. They agree on a wage below marginal product during period 1, so that

$$(15) W(1) < MP(1).$$

Further, the model assumes institutional wage setting so that human resources trained in a given set of general skills receive equal wages in all firms.

$$(16) W(1) = W'(1).$$

Freeman and Medoff (1984) argue that it is one effect of unions to compress the structure of wages, that is, with increasing skills levels, wages increase less than productivity growth. Compressed wage structures result in wages below the worker's marginal product at higher skill levels. Further, labor market institutions such as central bargaining between workers' and employers' organizations result in industry-wide wage setting. This results in a rather low variation of wages between firms for a given set of skills.

From (14), (15) and (16) follows a wage structure

$$(17) W(1) = W'(1) < MP(1) = MP'(1)$$

which implies that the team receives a share of increased marginal product and that the firm has not become dependent on the human resource. The trained human resource is "potent", but not unique to the firm, and therefore unable to make a hold-up on the team's asset value.

## 4. Summary

The first part of this paper has proposed three models which provide different mechanisms of how firms ensure returns to their training investment. Table 1 shows that the models differ in the structure of wages and marginal products as well as in the type of training they explain.

**Table 1: Properties of proposed training models**

| Motivation                       | wage structure            | type of training                       |
|----------------------------------|---------------------------|--|
| Ex-ante alignment of incentives  | $W'(1)=MP'(1)<W(1)<MP(1)$ | specific / general invisible training  |
| Ex-post enforcement of agreement | $W(1)<W'(1)=MP'(1)=MP(1)$ | general visible training               |
| Cooperation                      | $W(1)=W'(1)<MP(1)=MP'(1)$ | general visible, standardized training |

In all three models the wage  $W(1)$  is below marginal product  $MP(1)$ . The difference corresponds to the team's share of the human resource's increased marginal product. Deployment of the skills in the training firm is ensured by two ways. The first two models have a mechanism to convert "potent" into "impotent" human resources and to reduce mobility of the trained individual. The third model suggests that the firm can substitute a leaving worker by an equivalent from the labor market at no cost. The human resource is not unique to the team. Hence, the firm may not employ the individual it has trained but it employs the same human capital in which it has invested.

## III. Country studies

In the following, country studies from Germany, Britain, France, Japan and USA demonstrate vast differences between national training arrangements. We show that each of the three training models has empirical relevance. The country studies also show that changes in the institutional arrangement result in changes in motivation to invest in training. The section starts with apprenticeship which has been the traditional training arrangement of the medieval guilds in Europe.

### 1. Apprenticeship: Medieval Guilds, Germany, Britain

Throughout history, countries have established, adapted and destroyed institutions in their training system and labor markets. This gave rise to weak as well as complex institutional arrangement, to different

national training systems and to different forms and quality of training. Vocational training in pre-industrial countries of Europe was almost entirely provided in apprenticeship which was governed, supervised and regulated by the guilds. The guilds were a privileged circle which had the almost exclusive right to organize vocational training and to offer access to a manual craft. Nobody was allowed to perform a craft or trade unless he or she had been trained according to the strict rules of the guild and has become a member of the guild. Entry into the guild required the successful completion of an apprenticeship term of several years (Nübler 1990). The guilds thereby established effective hostages which *ex-post* enforced the fulfillment of the training agreement. This institutional arrangement resulted in high training investment, both in quantity and quality.

From the beginning of the 18<sup>th</sup> century, the apprenticeship system of the guilds was considered ineffective under the new manufacture production mode. Further, due to the spread of an ideology of personal liberty and freedom of work, the system of the guilds was considered to be too restrictive. In 1731, German states began to reduce the guild's privileges, in 1789, the French Revolution and in 1814, Britain abolished the privileges of the guilds. In contrast to other countries, in 1791, France even banned the guilds as an organization after the proclamation of freedom of work.

Training became a private matter between an employee and an employer. By depriving the guilds of their right to control training and access to skilled employment, the apprenticeship system lost its institutional arrangement to enforce indenture. Consequently, employers shifted from training in a broad set of occupation-relevant and transferable skills to training in narrow and specific skills. Systematic vocational training was lost (Nübler 1991). Training was organized at the firm level and the type and quality of training become unobservable for competing firms. Training was solely motivated by mutual dependency of the firm and the human resource. Both the quality and quantity of training declined.

In Germany, under the influence of the guilds ("Freie Innung") the apprenticeship system was gradually reinstalled at the turn to the 20<sup>th</sup> century. The employers' associations and the newly created chambers formally regained the right for self-determination in training and issuing the apprenticeship letters and certificates (Nübler 1991). This certificate has a high value to the worker and functions as an effective hostage. It gives the formal status of skilled worker. Skilled workers receive wages about twice as high as those of unskilled workers

at the beginning of their working career, and about 20 percent higher after 30 years of experience (Pfeiffer 1997). Workers can derive additional benefits from their certificate.<sup>2</sup>

**Table 2: Net costs of training per apprentice per year for selected occupations**

| Craft sector               |          | Industry and trade sector        |                |
|----------------------------|----------|----------------------------------|----------------|
| % of craft apprentices     | Net cost | % of industry/ trade apprentices | Net cost<br>DM |
| Electrician (11.4)         | 827      | Construction mechanic (1.2)      | 21,852         |
| Carpenter/Joiner (6.8)     | -325     | Industrial mechanic (3.8)        | 22,567         |
| Hairdresser (6.3)          | -469     | Bank clerk (6.6)                 | 13,388         |
| Car mechanic (12.2)        | -1,070   | Whole sale manager/clerk (6.5)   | 3,082          |
| Office clerk (10.6)        | -1,703   | Retail manager/clerk (9.4)       | 2,141          |
| Sales person in food (4.2) | -5,882   | Industrial manager/clerk (7.4)   | 2,052          |

Source: Bardeleben et al. 1995, p. 148; own calculations.

Data for the years 1979-1989 show that on average 85 percent of those who had concluded an apprenticeship contract finished their apprenticeship term of 3 years (BMBW 1991). Furthermore, table 2 shows that in most training occupations, the firm's share of the marginal product is high enough to largely recover costs during the apprenticeship period. In some occupations firms make a net profit, in others, however, firms bear net costs by the time the worker has finished apprenticeship. The latter result will be explained in section 4.

In Britain, the apprenticeship practice has survived on informal and formal grounds amidst competitive labor markets. Elbaum (1989) argues following the customs and traditions that derived from medieval guild practices, British firms "preferred to employ journeymen whose craft proficiency was certified by completion of apprenticeship indenture." In the 1920s, more than 60 percent of apprenticeship was informal and not based on a written contract. These indenture agreements therefore could not be enforced legally. However, less than 10 percent of apprentices failed to complete their indenture of 5 to 7 years. The indenture was enforced because

<sup>2</sup> These are occupational disability insurance, benefits in case of unemployment, access to training and retraining programs (Blossfeld and Stockmann, 1998: 10).

training firms kept the letters as a hostage. The letter gave access to skilled employment and to the “high-paid elite of British workforce” (Elbaum 1989: 344).

## **2. Internal labor market: France and Japan**

In France, the apprenticeship system had almost disappeared by the turn of the century. The ban of the guilds as a professional association contributed largely to the decline of the craft sector, its customs, and traditions. Systematic vocational training shifted from firms to the formal school system. Apprenticeship training which is provided in some firms has low reputations and is attracting mainly school drop-outs (Nübler 1990). Firms in France developed the institution of internal labor markets. Workers are promoted internally and each promotion is related to further job-related training on the job. Workers turn into skilled workers while they make a “career” within the internal labor market. It is experience and seniority and not intensive initial training that gives the status of skilled worker (Caillods 1994).

At higher levels on the career ladder, the firm offers a seniority premium. The firm holds this premium as a hostage which is destroyed in case the worker attempts a hold-up on the firm’s quasi-rent from investment in training. This allows the firm to invest in general as well as in visible, organized and systematic training. Evidence from firm studies show that internal promotion at higher career levels tends to be accompanied by formal training. On average, about one third of the French labor force participates in continuous training activities. Firms finance continuous training mainly at the professional and technician/supervisory level. Much training takes place in organized forms in institutions operated by employers’ associations, chambers or private profit-making ( CEDEFOP 1987).

Firms tend to be very reluctant, however, to invest in skills of young workers (Caspar 1988: 469). The reason is that, at the beginning of the worker’s career, the seniority premium does not yet function as an effective hostage. Consequently, the firm will only impart skills to the extent that it can create dependency of the worker by asymmetric information. As a consequence, the transition from school to work tends to be difficult and France faces a high youth unemployment of around 25 percent.

Baret and Dupray (1998: 41) conclude that “years of service with the firm and the fact of having benefited from internal mobility prior to [formal] training carry considerable weight in France ...”. Training efforts tend to be concentrated on a core workforce which has proven competence and commitment to the firm.

In Japan, large firms rely on internal labor markets and life-time employment has a long tradition. Performance in the formal school system determines the level of entry into firms and there is high competition for the best firms (Rosenbaum and Kariya, 1989). Firms promise internal promotion and training and the worker promises life-long loyalty to the firm. Life-time employment implies that most companies hire only graduates as regular staff. Therefore, it is extremely difficult to leave a company and receive a comparable or even better job in another company (Inoue 1985:42). Hence, in contrast to France, the seniority premium acts as an effective hostage from the beginning of employment. This allows the firm to invest substantially in newly recruited graduates. Once employed, large firms invest in a wide range of general and firm-specific skills in an organized form. While workers move up the internal career ladder, they receive further training at each stage of their working career until they retire. This results in a life-time training system. The institution of life-time employment, internal promotion and seniority premium results in highly “impotent” human resources which allows Japanese firms to invest substantially in specific as well as general training (Caillods 1994: 243).

Data from 1979 shows that more than 90 percent of large companies invest in systematic and organized training of their employees at all levels. Training takes place on the job, in internal and external training institutions, by working temporarily in other companies, by attending formal schools such as universities and special training schools (Inoue 1985: 35).

### **3. Mutual dependency: United States**

British America imported the European guild-based apprenticeship system. However, even before the Revolution in 1776, guilds had difficulties enforcing indenture obligations. Training contracts could not be enforced legally because geographic mobility of apprentices made it difficult for masters to take them to court. The ideology of individual liberty and a discussion on white servitude made enforcement of indenture even more difficult (Elbaum 1989:339). Neither guilds nor unions were able to restrict occupational entry to those who had served the full apprenticeship. Therefore, firms held no hostages to insure their investment. By the end of the 19<sup>th</sup> century, apprenticeship practices had fallen largely into disuse. Vocational training shifted to the formal school system (Gray 1988). Today, the United States lack effective arrangements and institutions that allow firms to enforce training contracts. Consequently, the role of employers in financing general training is limited (Winkelmann 1997).

The mutual dependency model provides a good description of the training practices in many US firms. Firms train in firm-specific skills or they create asymmetric information on the worker's skills. Loewenstein and Spletzer (1998:143) find that firms invest in general skills where the firm and the worker have agreed upon wage guarantees prior to training. The authors provide empirical evidence from the 1990's. They find that the wage of trained workers in their training firm is lower than the wage of those who have changed employers. This allows the training firm to collect returns. Loewenstein and Spletzer, however, do not explain how firms prevented workers to leave the firm in order to receive the higher market wage. We suppose that those workers who stayed in their training firm have received general training in more invisible and unsystematic forms so that other firms faced a low level of information on this training. They therefore did not offer higher wages to these workers. Another study by Katz and Ziderman (1990:17) shows that 40 percent of companies surveyed have a formal, written policy not to provide outside references.

#### **4. Cooperation and central bargaining: Germany once more**

In contrast to institutions such as internal labor markets and life-time employment, apprenticeship ties the worker to the firm only for a limited indenture period. Table 2 has shown that in a range of occupations German firms are not able to fully recover training costs by the end of apprenticeship. In particular large firms bear substantial net costs of training in almost exclusively general skills. We propose the cooperative training model to explain firm's motivation to finance this expensive general skills training. Finally, we argue that central bargaining in German labor markets results in low variation of occupational wages between firms and in a compressed wage structure ensuring firms the collection of their quasi-rent.

##### **4.1.Cooperation**

In Germany, the process of training is governed by strict rules set by the chambers and by some 380 training ordinances defining skills to be imparted<sup>3</sup>. Apprentices for a particular occupation receive a common wage which is negotiated between unions and employers. Regulation and standardization of training convert training decisions into a binary choice and firms cooperate because they can easily find information on the training activities of competing firms. Chambers play a critical role in this information process. Firms provide

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<sup>3</sup> Herget et al. (1988) find the skills workers acquire during apprenticeship are largely transferable between firms within a particular occupation.

relevant data on a regular basis to the Chambers which are published and disseminated by the chambers so that each firm can obtain it at low costs<sup>4</sup>. In addition, culture may be considered as a focal point. Having a common culture and long traditions in training establishes a set of beliefs that other companies will invest in training. Knowing about one another's intentions gives an impetus to maintain investment in general training and cooperation. Table 3 provides evidence that a high percentage of firms invest in standardized apprenticeship training. As a consequence, about 75 percent of all school graduates receive apprenticeship training.

**Table 3: Proportion of firms providing training**

| Firms size          | Year |      |      |      |
|---------------------|------|------|------|------|
|                     | 1987 | 1990 | 1994 | 1995 |
| Number of employees |      |      |      |      |
| Small (< 50)        | 30.0 | 26.3 | 21.6 | 21.8 |
| Medium (50 – 499)   | 77.0 | 73.6 | 68.2 | 67.6 |
| Large (> 500)       | 96.0 | 94.0 | 93.9 | 93.8 |

Source: labor statistics, Bundesanstalt für Arbeit

## 4.2. Symmetric information

Recruiting firms acquire substantial information on a worker's human capital at low cost. Chambers organize standardized apprenticeship exams which test both theoretical and practical skills of apprentices. They also grade the tests and issue the apprenticeship certificate. Furthermore, information is provided by the vocational school issuing a certificate on the apprentice's performance in school (each apprentice is obliged to attend the vocational school for one or two days a week). Finally, the employer is obliged to certify the apprentice's professional and personal performance in the firm including his attitudes towards work, his motivation etc. These extensive certifications provide substantial information at low costs and firms can easily replace a quitting apprentice from the labor market.

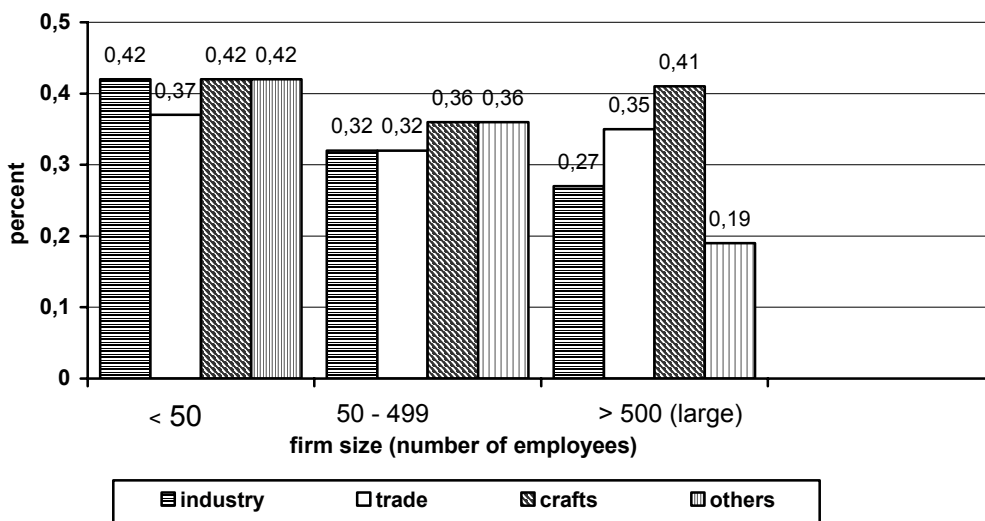
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<sup>4</sup> German enterprises have to be members of the chambers and the chambers are under the collective control of companies in the same sector or region. This creates a high-trust-relationship (Soskice, 1994)

### 4.3. High mobility of workers

Workers have to be mobile in order to generate a sufficient supply on the occupational labor market. The apprenticeship contract is not an employment contract but a fixed-term training contract. At the end of the contract neither the firm nor the worker have any further obligations. Data provides evidence for a high mobility rate of workers who have recently finished their apprenticeship. Figure 1 shows within one year after the termination of apprenticeship around 40 percent of apprentices in small firms and one third in medium-sized firms have left their firm. Even large firms in the industry and trade sector report a mobility rate of one quarter and one third, respectively. Within 5 years about half of the apprentices have left their training firms. Harhoff and Kane (1997: 179) conclude from their study that “high turnover at the conclusion of apprenticeship training has been a long-term feature of the German system.” These figures are confirmed by recent Data from the GSOEP (Clark 2001).

**Figure 1. Mobility of workers within the first year after apprenticeship**



Source: Harhoff and Kane, 1997

### 4.4. Central bargaining and compressed wage structure

In Germany, wages are centrally negotiated between unions and employer organizations. Wage setting takes place at the industry level. There is evidence that German labor markets are characterized by compressed wage structures. The OECD (1993) finds that the log difference of ninetieth and tenth percentile wages is significantly lower than those in the US, in UK and in France. Abraham and Houseman (1993) show that in

Germany during the 1970's and 1980's wage differentials across education groups have remained relatively constant although skill differentials have risen. Pischke (1996) finds that further training of workers in Germany resulted in zero or very little increase in wages.

We conclude that cooperation of firms in general training and mobility of workers result in the labor market supply of generally skilled workers. The training firm can replace a quitting apprentice by an equivalent and ensure deployment. Compressed wage structures allow the firm to collect rents and to recover also those training costs which were not covered by the indenture period of apprenticeship. We consider this to be the mechanism that explains why German firms bear high net costs of training at the end of apprenticeship.

#### **IV. Conclusions**

The paper provides several conclusions. First, the standard training model of Becker describes a special case of a more general model of training with mutual dependency as the motivation to invest in training. Under the restrictive assumptions of perfect symmetric information between all agents, behavioral certainty, potent human resources and the absence of institutions, there only remains specificity of skills that provides incentives to firms to invest in training.

Second, mutual dependency explains investment in specific as well as general unobservable training. This model does not explain training investment in general skills which are provided in observable and visible forms.

Third, firms are motivated to invest in general observable training if they can use institutions that allow the enforcement of indenture agreements or of cooperation at low costs.

Forth, institutional differences in national training and labor markets and the resulting different motivations for firms to invest in training explain the significant and persistent cross-country differences in the type of skills, the quantity and the form of training financed by firms.

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