

**DOES AN EMPLOYER TRAINING LEVY WORK? – THE INCIDENCE OF
AND RETURNS TO ADULT VOCATIONAL TRAINING IN FRANCE AND BRITAIN**

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Editor's Foreword

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Abstract

Vocational training of adult workers is vital for both upgrading the average level of skills and keeping workers abreast of technological change. We examine here the outcomes of two systems operating under very different policy regimes towards continuing vocational training for the adult workforce. Training policy in France has been interventionist, using an employer training levy since the early 1970s, whereas British policy has relied largely on individual initiatives for training investment by employers and workers; to date there have been few attempts to compare the outcomes of these contrasting policies.

The paper begins with a short review of the theory of vocational training, indicating why market failure and under-provision are the likely outcome of relying on markets, and signalling the types of corrective policy which might be adopted. We then set up several hypotheses about the likely impact of policy in France relative to Britain to provide a framework for evaluation. We conduct a survey of the outcomes of the two systems in terms of observed training incidence and the returns to training captured by workers and by employers. For this empirical comparison we draw on a wide range of econometric studies; however not all of our hypotheses can be tested as some topics have not been analysed due to a lack of suitable data. We conclude with an attempt to assess whether interventionist French policies have overcome training market failures and improved the incentives to train by eliminating externalities, credit or information constraints.

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In this paper we investigate the theory and practice of human capital investment in the form of vocational training for adult workers in two advanced economies, Britain and France. Many authors have argued that private markets can never be fully efficient in ensuring that the socially optimal amount of skill investment takes place. We summarise and augment the existing theory of market failure in training. In going beyond existing microeconomic analysis of training market failure we are also motivated by macroeconomic theory and evidence, which imply that growth, trade performance and unemployment history can be improved by policies to promote skill acquisition. We next analyse the incidence and the returns to training captured by workers and employers in two countries: these empirical studies relate to adult vocational skills and training in Britain and France. This contrast is illuminating because of the stark contrast between interventionist policy in France, accompanied by a considerable upward shift in the skill distribution, and an increasingly laissez-faire training policy in Britain, where a larger fraction of the workforce have remained unskilled. Finally we seek to assess how far French policies have improved the incentives to train and achieved skill supplies closer to the socially optimal level.

Our attention is focused on adult vocational training because there is evidence to show that Britain has a deficit of workforce skills compared to her main trading partners and this deficit is not yet being remedied by inflows of younger, more qualified workers. This throws into even sharper relief the need for successful adult training if Britain is to make up the deficit. A detailed comparative assessment of foundation skills by Murray and Steedman (1998), analyses principal education and initial training qualifications (see also Green and Steedman, 1997 and Steedman, 1999). Table 1 shows that, even by the mid 1990s, less than half of UK workers had reached the equivalent of National Vocational Qualification Level 2 (NVQ2), which is the lowest UK qualification included in level 3 of the International Standard Classification of Education (ISCED 3). In France the proportion qualified to ISCED 3 or above was approaching 60% and the major difference between the two countries was in the share of the workforce with intermediate qualifications, as the proportions of highly qualified workers are similar. Steedman (1999) argues that falling below the threshold of ISCED 3 constitutes a respectable proxy for low skills in the context of developed economies, and she also argues those who do not continue beyond level ISCED 2 are likely to be inadequately equipped with the skills needed for employment and lifelong learning. It appears that Britain has a larger problem of low skills in the population of working age, although in France the low-skilled are more concentrated below ISCED 2.

Table 1 Qualification levels of the population aged 16-64 (%)

United Kingdom	1985	1991	1996
ISCED 0/1	40.1	31.3	21.3
ISCED 2	24.9	28.7	30.6
ISCED 3	22.2	25.7	27.6
ISCED >3	12.8	14.4	20.4

France	1990	1996
ISCED 0/1	40.0	31.3
ISCED 2	11.4	11.5
ISCED 3	35.4	38.8
ISCED >3	13.1	18.4

Source: figures supplied to the author by H. Steedman.

UK data derived from the Labour Force Survey; French data derived from Enquete-Emploi.

Murray and Steedman (1998) also present evidence for younger workers, to see whether the inflows of new workers will significantly change the averages for stocks of workers. The differences between France and Britain are accentuated: even though in both countries younger workers are more likely to have some qualifications, the proportion failing to reach ISCED 3 (i.e. staying below NVQ level 2) in Britain remains around 50% for younger cohorts, but has fallen to close to 25% in France. What happens later in terms of workforce training is thus crucial to the acquisition of any useful skills for half of British workers and it is central to the upgrading of skills to meet the demands of changing technology for all workers. The Third Report of the (British) National Skills Task Force (Department for Education and Employment, 2000) acknowledges the legacy of low skills in the adult workforce. Even so, the detailed recommendations in that report do not include any moves to establish a statutory framework of tax incentives for adult training by employers, or penalties for failing to train; however it acknowledges a minority view of some members of the Skills Task Force that such moves are necessary.

The Microeconomic Theory of Vocational Training Investment

We begin with an examination of why an unfettered private market may under-invest in training. The narrow view of skills investment (typical of the labour economics literature) focuses on private benefits and opportunity costs, stressing that such investments use resources which could otherwise be used in production. Any employer-based training will be subject to the usual scrutiny of costs and returns; equally workers who invest time and effort in acquiring skills will expect to receive higher wages. This view seeks to retain the view of the acquisition of human capital as a private investment decision, where the main sources of market failure arise if the respective rewards and relative costs to workers and employers are not aligned.

Much economic theory of vocational training following Becker (1964) has relied on a slippery distinction between general and specific training, together with perfectly competitive labour markets, to assert that private markets can provide the socially optimal amount of worker training. Workers bear the cost of general training in the form of lower wages whilst training and reap all the returns via later productivity related wages. Employers finance specific training, paying above marginal product during training and below marginal product during the later work period. This private market solution will only work under certain very restrictive conditions: firstly that individuals have the necessary funds to finance their investments in general training

(and then reap all the rewards); secondly that employers provide firm-specific training to their workers, who have no opportunity or incentive to migrate to other firms after receiving this specific training; thirdly that there are no wider benefits to the economy from the existence of another skilled worker in the labour force.

Katz and Ziderman (1990) reformulated Becker's theory to allow for information asymmetry between firms about the value of general training. Their analysis showed that firms will share in the costs of general training, because the asymmetry imposes information costs on other potential employers. They argued that this can be of benefit for reaching socially optimal levels of general training if workers face financial constraints. The problem with this model is that it blurs the distinction between general and specific training without fully revising the original theory. Even so an important prediction of the model is that a more comprehensive system of training certification, such as that being introduced via the NVQ system in Britain, will make the value of training more transparent and thus reduce the incentive for firms to share in financing general training.

A more fundamental criticism of the Becker model arises from the rejection of the notion that training can adequately be divided into the two categories of general or specific. With the substitution of the concept of training which is 'transferable', having value to a number of employers but not to all, general and specific training can be characterised as the extremes of a spectrum, as they represent the cases of all employers valuing the training equally and only one employer valuing the training respectively. This approach is developed by Stevens (1994) who constructs a model of training investment in transferable skills in which the market for skilled labour is assumed to be imperfectly competitive. Because there are a limited number of firms which value the skills, a worker who moves to another firm may be paid less than the value of his marginal product. Thus whoever employs him after training stands to gain a poaching externality from the original training investment.

The second key feature of Stevens' analysis is the presence of uncertainty about the post training value (v) of the worker to each of the firms who might employ the worker: "The source of uncertainty...should be thought of as demand or technological uncertainty facing the firms, rather than uncertainty related to the worker's ability, since the important property is the variation (in v) between firms" which is not known at the start of the training period. Stevens shows that this

uncertainty gives rise to a beneficial externality, as there is a positive probability that other firms will benefit from the training. Due to the uncertainty there is no way in which the employer can construct a two period wage contract to ensure that the worker and the future employer pay for their respective benefits.

Stevens goes on to demonstrate that purely firm specific training reduces the probability of inter-firm mobility and so has a marginal private benefit greater than its social benefit, unlike transferable training for which the reverse is true. A further characteristic of specific training is that it carries increasing returns. Finally the model is used to investigate the effects of credit constraints which prevent the worker from contributing his share of the costs. With any of these features the market for transferable training is subject to market failure of two kinds: an overall under-investment in training and a bias in investment towards skills which are firm-specific.

The analysis of Acemoglu and Pishke (1999) similarly takes issue with the Becker approach. Their paper leads off from evidence of the financing of general training by firms, which belies the view of such training yielding investment returns that are captured by individual workers. Their analysis surveys a range of credit and labour market imperfections which may lead to underinvestment, paying particular attention to the sources of wage compression, which gives rise to labour market rents, based on transaction costs, asymmetric information about worker quality, and moral hazard. Their empirical analysis contrasts the interface between labour market regulation and training incentives in Germany and the US. In their conclusions they call for more research on the total returns to training revealed via productivity growth as, in the non-competitive model, workers' private returns via wage growth are only a part of the returns.

As well as demonstrating market failure, economic theory has been used to look at policy responses. Stevens (1999) investigates the role of training levies on firms. She first develops a model of transferable training which incorporates a number possible of sources of market failure, ranging from workers being credit constrained, or facing uninsurable risks from uncertainty about the future value of training, to poaching externalities arising from imperfect competition in the market for skilled workers. She demonstrates that any of these features can generate under-investment in skill formation and goes on to investigate some of the possible policy responses to these market failures. A first key result is that if firms are subjected to a training levy financed by taxing profits, this is beneficial to achieving a level of investment closer to optimum, regardless

of whether the causes of the under-investment were financial constraints on employees or externalities to new employers from poaching. A second important claim is that, if the training levy is financed by a tax on wages (e.g. by imposing spending as a proportion of the wage bill, which is shifted back onto employees) this can resolve the problem of credit constraints, but does not address the poaching externality.

However although these results are novel and policy relevant, this model has some limitations: in this two period model all firms which employ skilled labour are providing some training in the first period as well as hiring trained workers in the second. It seems possible that the wage levy may help to address the poaching externality if some firms are not training at all, but get all their trained labour from poaching; of course this would require that the burden of the new levy cannot be fully shifted onto the poaching firms' employees and so impinges on their profits. A further issue not explicitly addressed in the Stevens model is that of inter-employee inequity, if the levy is shifted partly or fully backwards onto wages. Suppose that training is being financed by a tax on wages which reduces the wage paid to all, but that only some workers receive employer-provided training. If these trained people later gain a wage rise, either in the same firm or by migration to a new employee, then all workers are paying towards the gains of the few trained workers. Here the poaching externality should be seen as a problem of trained workers exploiting other workers, rather than of non-training firms exploiting training firms.

Wider Externalities - Growth, Trade, Structural Change and Network Effects

In many of the above microeconomic labour market studies the wider externalities of skills training are neglected, (an exception is Blundell et al., 1999). Many investments in education and training have been financed by the state in a variety of countries; this would only be socially efficient if such investment produces public goods or at least merit goods. Analysts who focus on the public good nature of human capital argue that knowledge, whether obtained in education and vocational training, is never fully appropriable by the investing individuals or firms.

Workforce skills are generally accepted as being of major importance in generating strong macro-economic performance. The contribution of human capital accumulation and investment in skills to economic growth has been given increasing recognition by the new growth literature (Romer, 1990; Lucas, 1988). The perceived role of human capital in production varies: in some versions of growth theory it is seen as providing a flow of factor input services for immediate

production and is thus directly responsible for improvements in productivity and real incomes. In others, especially Romer (1990), the model outlines an explicit R&D process, which employs skilled workers to generate the stock of knowledge capital, which in turn governs the rates of product and process innovation and hence determines the rate of economic growth.

Human capital is also strongly featured in discussions of trade patterns and comparative advantage in the global economy (Finegold and Soskice, 1988; Ashton and Green, 1996; Redding, 1996; Green and Sakamoto, 2000). Countries with high skill endowments are able to produce products with higher value added while paying higher wages per worker. Additionally because human capital is employed intensively in R&D activity, it contributes to external trade competitiveness via its impact on technological competitiveness. Tests of an extended version of Heckscher-Ohlin trade theory, which includes human capital, have shown the role played by this factor in explaining trade patterns (Stern and Maskus, 1981; Deardorff, 1984). Further evidence of the role of skills in trade and growth performance can be found in endogenous growth literature dealing with conditional convergence, where human capital is seen as a key factor governing the rate of imitation and adoption of technology from the leading countries (Barro and Sala-i-Martin, 1995).

Growth and trade are inextricably linked to the changing structure of advanced industrial countries and de-industrialisation of employment. As labour saving technology has been implemented in manufacturing, there has been a continuous shift of employment to services (Rowthorn and Wells, 1987). Human capital stocks have thus required continuous re-investment, to update skills for those who remained in manufacturing and to retrain those whose skills have been depreciated to the point of redundancy by this process. For both mobile and non-mobile workers there is a need for lifetime learning, as the skills held on labour market entry are unlikely to remain appropriate to the production methods and products of the future.

One way of encompassing these divergent theories is to view skills investment as the creation of private capital embodied in a person, but which engenders widespread and enduring beneficial externalities. This recognises the benefits for all parties: the individual, the firm, the industry or economy in which the person (and new knowledge or technique) is employed. (In some instances there may also be benefits for the world economy, particularly where personnel or knowledge transfers occur between countries.) The key issue is to identify the flows of costs and benefits

together with the directions of flow of the externalities and adopt the correct system of joint financing and provision by both public and private players to avoid under-investment. This implies that an optimal supply structure is likely to involve all three parties, with funding by employers, workers and the state.

The state can usefully provide much more than funding for subsidy to training. A major problem facing all investors in human capital is that of predicting the value of skills in future periods, when the future structure and content of jobs is not known at the present time. In rapidly evolving markets with continuous upgrading of products and processes, uncertainty and asymmetric information will be endemic and private decisions about training can be improved by access to cheap and up to date information. A related problem is that of strategic complementarities, or 'network externalities' to use a term borrowed from recent literature on information technology. In many areas of work there are industry standards and metrics comprising a knowledge base, which is only of value if known to a large pool of interactive communicators. Often the future networks are barely established at the point of investment, necessitating continual upgrading of both information and skills. These investments enhance not only the human capital of the trainee, but also add to the pool of those 'speaking the same language' thus bringing about beneficial externalities. Economic theory has so far paid little attention to this phenomenon, nor to the related one of ensuring quality controls over training suppliers.

Where investors are seeking skills and knowledge to perform new labour tasks brought about by rapid technological change, older training packages will not satisfy them and suppliers with reputations based on such outdated skills may be encumbered rather than helped by their history. They will be likely to face competition from new entrants into the training supply market offering up-to-date training. The purchaser has the problem of avoiding 'cowboys' who offer inadequate quality training services at too high a price, but the assessment of training quality is often only possible some time after its purchase. The usual outcome of such a market is a collapsing price and the disappearance of high quality provision. These phenomena indicate important roles for government, both in predicting future skill needs and subsidising learning with network externalities, and in exercising quality control via the accreditation of training suppliers. These further interventions can be justified as helping to support macroeconomic objectives of growth and full employment.

Testing for Greater Training Market Failure in Britain than in France

The discussion above gives clear indications of why under-investment in vocational training of adults may occur in the absence of corrective policy. The training policy of successive British governments has placed a major emphasis on voluntary investment by firms and individual workers, with relatively little regulation or subsidy. In contrast the stance of the French administrations has been much more interventionist and this intervention could be expected to have resolved some aspects of training market failure in France. We have documented elsewhere (see Greenhalgh, 1999) the details of training policies in each country, including institutional features of training provision, the levels of public funding, information provision and forecasting, financial constraints on workers, training quality control and certification of skills. Even so our earlier study made no reference to multivariate regression analysis of the incidence of and returns to training in the two countries, and it is these studies which we now seek to explore. We shall examine whether they can provide evidence of greater persistence of under-investment in training in Britain and/or any bias of UK training to less transferable firm-specific skills. So, what conditions existing in one market but not in the other would constitute evidence of relatively greater market failure in the UK training market?

(i) Higher incidence in France than in UK? - Where individuals are credit constrained, and employers have to provide training whilst suffering losses due to worker mobility, we would expect individual access to training to be rationed by employers in the UK market, with some employers providing no training. As training costs are more equally shared by employers through the French levy system, then we expect to see training driven more by workers' demands in France, leading to higher training incidence. Contrary forces are that French workers are not expected to bear a significant share of training costs, so the cost burden on employers could be higher even with the broader base of employer funding. Also the need for adult vocational training will be linked to the basic skills and initial training experienced by young workers, so any greater amount of adult training in the UK may reflect youth training deficiencies.

(ii) Greater equality of training incidence in France? - Characteristics of trainees may differ between the employer-rationed UK and the demand-driven French systems, where the allocation

of training is more likely to be negotiated through collective bargaining, so that only able and well-positioned employees get training in the former, but the distribution of training is more equitable in the latter.

(iii) Longer courses and more certificates in France? - Given the poaching problem we might expect that training provided by employers in the UK will be most often oriented towards provision of short courses which are uncertificated, to avoid aggravating worker mobility. Meanwhile training in France may be more orientated to longer courses which lead to recognised and portable qualifications, as these are more attractive to workers.

(iv) Lower private rates of returns to French workers? - Private rates of return to training may be higher in the more heavily rationed British system than in France, because the former has fewer skilled workers. This argument presumes that demand for labour by skill is to some extent exogenous of the available supply. Another possibility within the framework of international trade is that each country's output supply patterns could adjust in the long run to its human capital endowments, and leave the same wage differentials and rewards to skills, as predicted by the well-known factor price equalisation theorem.

(v) Higher returns to French employers? - If the poaching problem has been solved by the training levy and the French economy is enjoying the network externalities which come with higher average levels of training we could anticipate better rates of return to training in France. These returns will be observed in a variety of forms, including higher labour productivity, lower quit rates, better quality of output, enhanced sales, and greater profitability.

We explore the evidence in each of these fields, beginning with the incidence of adult training.

(i) Evidence of Training Incidence

Comparisons between European labour markets have consistently characterised the UK economy as having under-invested in training and having failed to rectify this situation via recent policy moves (Finegold and Soskice, 1988; Prais, 1989, 1995; Green and Steedman, 1997; Murray and Steedman, 1998). The extensive NIESR research reported by Prais (1995) has shown consistently lower levels of vocational qualification among British workers and has documented the lower quality of attainment both at school and in work-based training. This low worker

quality has been linked to lower productivity of British workers compared to those in Europe in matched plant studies for a number of industrial sectors.

Nevertheless the incidence of adult vocational training rose sharply in the 1980s and continued to grow more slowly during the 90s (Department for Education and Employment, 2000). Greenhalgh and Mavrotas (1993) used data from the Labour Force Survey (LFS) to construct snapshots for 1979, 1984, 1986 and 1989. Despite some difficulties arising from the changes to the questionnaire and codings in the LFS, they were able to establish that the incidence of training rose quite sharply even over the recession of the early 1980s and continued to rise rapidly in the second half of the decade. Women experienced a faster rise in training than men and by 1989 the reported incidence of training for women workers was higher than for men.

Felstead and Green (1996) and official figures demonstrate that the incidence of training in the early 1990s recession was fairly well sustained, with around 14% of the workforce receiving training in any four week period as recorded by the LFS. Some part of this was due to technological change and competitive strategy, including the need to comply with regulations to meet quality standards, such as BS 5750. However in subsequent analysis, Felstead, Green and Mayhew (1997) have argued that rising incidence was accompanied by reduction in training durations per person and that, measured in person-hours, training has not risen.

A further reason to be sanguine about the extent to which adult vocational training in Britain can supply the basis for growth and competitiveness is the sector bias of training. Comparisons between traded and non-traded sectors showed a persistently higher training rate in the non-traded sector which is dominated by public service employment. Within the tradeable sector, training incidence was higher in high-technology manufacturing and private services than in other manufacturing activities, but none of these groups approached the training rates of the non-tradeable public sector (Greenhalgh and Mavrotas, 1996).

Comparative figures for Europe (European Commission, 1997) frequently put France at the top of the training league in training young people, although the incidence of training for adult workers is slightly lower than for Britain. However as discussed below, the higher durations of adult training spells more than offset this small differential - see also Greenhalgh, (1999). There is also considerable variation between French industrial sectors in the rate at which employees

are trained. Bollenot (1997) documents that the highest rates in the period to 1993 were in what she terms 'parapublic' sectors like energy and finance, together with leading technology sectors like electronics, electrical goods and chemicals. Low rates of training were experienced in traditional manufacturing and construction, including food, furniture and textiles.

(ii) Evidence of Training Equity

Given the broad similarity of training incidence noted above, is this training received by the same types of workers in each country? Table 2 summarises the results of a number of econometric studies of training incidence in France: it shows that the probability of training rises with the worker's initial educational attainment level, and with their position in the occupational hierarchy. These inequalities in the incidence of training by measured characteristics mirror studies of the distribution of training across British working adults in Table 3. This pattern of incidence suggests that adult vocational training in both countries is a force for increasing the inequality of wages, given that both qualifications and occupational rank are associated with higher wages in earnings analysis.

Goux and Maurin (1997b) document French training rates by occupational group over the period since the commencement of the employer training levy. The probability of training for those at the top of the occupational ladder (managers and technicians) during 1972-77 was around 3.5 times the rate for unskilled manual workers; this ratio remained unchanged as average training rates doubled for all groups in the next two decades, so that the absolute difference in propensity to train widened considerably.

Another approach to the issue of equity is to investigate how far those with low incomes are inhibited from obtaining skills and how far those who are keen to advance their careers are held back by lack of training opportunity. Evidence of the importance of finance and aspirations for individual investment in training can be found in a study using data arising from the Training in Britain survey (Greenhalgh and Mavrotas, 1994; data source: Rigg, 1989). As well as information about incomes, the survey documented individual attitudes to vocational training and career progress, permitting an investigation of the equity and efficiency of the training selection process. The study shows that low income workers are less likely to get training even when controlling for a range of personal characteristics, including attitudes to learning and work.

However there is also some evidence to support efficient selection in that those with strong career aspirations are more likely to gain access to training through their employer.

Studies which undertake the econometric investigation of the incidence of training using data lacking such direct measures of aspirations can also be used to generate evidence about the selection of workers for training via the statistical analysis of residuals. In a comparative analysis of employer-provided training Hocquet (1999) shows that unobserved characteristics are uncorrelated with the probability of selection for training in the UK, whilst in France those workers which have lower than average wages for their measured personal characteristics are more likely to be trained. This evidence suggests that the social objectives of the French program, to give workers a 'second chance' and avoid social exclusion are being met to a limited extent, although there is still an overwhelming tendency for selection to run positively with favourable measured characteristics, such as previous education and occupational attainment. However Goux and Maurin (2000) dispute this finding and demonstrate that workers who train are more likely to be employed in high wage firms, which they interpret as these workers belonging to higher average quality workforces.

The issue of the how far one of the original objectives of the French legislation, to ensure social justice in equality of access to training, have been achieved is examined more directly by Avenir and Hanchane (1997a,b). They find that the enterprises which offer training most frequently have the lowest inequality of access to training across socio-economic categories; this suggests that one possible route to greater equality is to persuade all firms to train more and they will spread the training further down the spectrum of jobs.

(iii) Training duration and certification

The duration of adult training in France is compared to six other European countries (not including the UK) in Avenir and Mobus (1996). The average length of French training per participant is second only to Belgium, but on average in these countries training courses typically involve only from 35 to 55 hours of training, or about 1 to 1.5 working weeks. This picture of broad access to short course training is also born out by British data where 40% of training courses last less than one week (see Labour Market and Skill Trends, 1997/8). Training for health and safety at work and induction training for the newly hired involve the largest proportion of employers; but in contrast only one sixth UK employers is committed to lengthy apprenticeship training.

For the UK there is certainly evidence that measures of the rise in the incidence of training overstate the rate of increase in total training investment, as it was achieved via a sharp increase in the proportion of short spells of training, which was particularly fast for people in professional and technical jobs (Felstead et al., 1997; Greenhalgh and Mavrotas, 1993). The Rigg (1989) survey data also provide some evidence to support the view that UK employers prefer not to promote transferability of skills as most training spells did not lead to any formal qualification. It is notable that a much larger proportion of worker-arranged training spells than employer arranged training lead to a recognised qualification (Greenhalgh and Mavrotas, 1994, Table A2).

Hocquet (1999) provides a comparison of the duration and certification of the most recently completed period of training for individuals in France and Britain in the early 1990s. Although her results confirm the view that the majority of training spells in both locations are rather short and do not lead to the acquisition of formal qualifications, there are still key differences by country. These data support the hypothesis of longer courses and more certificates in France, where 30% of men and 28% of women reported a last training spell of more than one month's duration against 12% of men and 15% of women in Britain. Although the proportions of trainees acquiring a recognised qualification from this training were similar in each country (15-6% of men and 13% women) there were more higher level certificates (Bac/A level or above) being obtained in France than in Britain. These results are telling because the sample of workers is older in the French data (all ages, average age 38) than in the British data (cohort observed at age 32) for whom we might expect to observe longer initial training spells and more certification.

Despite the fact that the majority of employer-provided training spells do not lead to certificated qualifications, in both countries there have been moves to change this pattern and also to provide routes to certificates which do not require lengthy participation in formal training, based on experience at work. Changes in the UK have occurred with the introduction of experience rating for components of NVQs and in France with VAP (validation des acquis professionnels; see Greenhalgh, 1999, and references therein for more details).

(iv) Private returns to training for workers

Table 4 summarises a range of econometric estimates from a number of studies of the returns to workers from employer-provided training in France. The main impact recorded is the expected

one of higher wages for those receiving training, with estimates of the short term wage impact ranging from 3% to 15% for workers who stayed with the same employer after a short spell of training. Larger returns are documented for longer training spells (Simmonet, 1996) and for workers who moved to another firm after training (Hocquet, 1999).

Some of these estimates could be criticised as being likely to overestimate the wage impact of training. This will happen if it is the case that only the more able workers, who are anyway on rising wage paths due to career advancement, are given training. Goux and Maurin (1997 and 2000) present small or zero returns to workers after correction for the two selection processes of getting training and moving employer. The problem with accepting their result of no returns is that their two selection bias variables are not statistically significant and without these variables they estimate wage effects of around 7%. Aside from Goux and Maurin's studies, the range of estimates for France is very similar to findings for the USA (for a summary of US estimates see Groot, 1997) and does not suggest that the returns to training for workers have as yet fallen to zero due to any over-investment in training in France.

However a note of caution is sounded by two other French studies in that the incidence of vertical mobility of workers (i.e. promotion within the firm) following an instance of training was falling quite fast in France from the late 1970s to the early 1980s (Verdier, 1994) and again from the early 1980s to the 1990s (Mehaut, 1996). This fall in the likelihood of occupational promotion was observed for both employer provided and individually initiated training. These trends suggest that as vocational skills have become more common, the occupational advancement which they used to entrain has become less available, but it is also likely that the increasing frequency of short training spells during careers could generate such patterns.

The estimates using British data presented in Table 5 indicate wage gains after training for workers of all ages in the range of 3% to 10% (studies 1 and 2), while for younger workers the gains are estimated from 11% to 21% (studies 3 and 4). Most find that these gains are higher for female than male workers (except for younger females who change employers after training). All these estimates incorporate statistical techniques designed to correct for both measured and unobserved differences in personal characteristics. These returns for workers are slightly below the earlier studies for France but comparable to the recent estimates with comparable estimation techniques.

The relationship between training and mobility and subsequent returns to mobile workers is investigated in detail in Hocquet (1999) for both men and women in Britain and France. There is an interesting contrast here: mobility in France to another employer in the same sector, or a move with no break in employment, yields higher private returns to the worker. In Britain workers who move get the same return as those who stay, with the exception of men who experience a break in employment (the British data do not permit analysis of sectoral changes). These results suggest that French employers do not pay full value of the worker's marginal product after training and that poaching is occurring to the benefit of the movers and their new employers. If so we would regard the estimates of returns to workers from training as underestimates of the real returns in France but closer to the actual return in Britain. If we take this view, the results indicate a higher level of total benefits to training in France than Britain, although we must be mindful that this should be expected, as we already know that expenditure on training is higher in France (Greenhalgh, 1999) and without precise cost statistics we can not calculate rates of return to training expenditure in each country.

Looking at the gains to trainees one might wonder whether employers get much of a return to training, but a first point to note is that the probability of quitting is generally reduced by the receipt of training, as shown by studies of labour mobility in both Britain (Dearden et al., 1997) and France (see Table 4). However this only moderates but does not eliminate the loss of investment for the training employer when trained workers leave. Evidence of the direct returns to training by firms must be sought in evidence of improved performance, to which we now turn.

(v) Returns to employers who train

Table 6 summarises firm-level econometric studies using French data, which have demonstrated that vocational training activity is associated with increased net output by firms, a higher rate of return on assets, payment of higher wages and a greater propensity to innovate. Although we have grouped these studies under the title of private returns to employers, these studies can be seen as conveying information about a range of economic returns: thus an increase in total rents (increase in value added) will be shared between shareholders and workers; an increase in profitability (rate of return on assets) is more closely linked to shareholder returns; a rise in the rate of product innovation may yield returns to the firm (in profits), to workers (in wages and job security) and to the society in economic growth.

The largest French study for 1986 to 1992 (Carriou and Jeger, 1997) estimates significant increases in net output (value added) from training expenditure using a variety of econometric models, with an estimated 2% gain in net output for a rise of 1% in the share of wages spent on training; these results imply an elasticity of output to the training cost share of wages of around 0.07. (However their method of analysis is repeated annual cross-sections and they do not employ panel data techniques for the whole data set.) When using a translog model, the authors estimate that training is a substitute for employing more workers and is complementary with capital use. They also find non-linear returns to training expenditure, which imply that the optimal rate of spending as a share of wages is around 4%, where net output is 13% above the level for no training. As a whole French firms were spending only about 3.3% by 1994, following a trend increase over twenty years from the initiation of the levy system in 1972. So again, as with the returns to workers above, there is no reason to believe that there is overspending on training in France.

Carriou and Jeger (1997) also found that training expenditure is subject to a rapid rate of depreciation, estimated at around 50% per annum (possibly linked to worker mobility as well as to changes in skill needs). Another study of a smaller panel of firms by Ballot et al. (1998) claims that training inputs for the last six years affect value added with no depreciation, but interacting training with other inputs shows some loss of overall productivity, suggesting that a model with depreciation would be superior. In a later work (Ballot et al. 2000) the same authors use worker separation rates to model the depreciation of employer-provided training.

Given the nature of scientific research and technology-based innovation, we might expect to see some interaction between training of skilled workers and rates of technological activity. Some of the studies differentiate between training given to different types of labour: Haloues (1997) finds that training engineers has a positive impact on the probability of innovation; Ballot et al. (1998 and 2000) finds that training managers and engineers improves the productivity of R&D spending.

Unfortunately no comparable studies to Table 6 using firm data are as yet to be found for Britain. This is because the available panel data for British firms does not document their vocational training expenditures through time, nor can we link details of the characteristics of British

workers found in individual sample surveys to the financial performance of the firms in which they are employed. There is an extensive literature originating from the NIESR 'matched plant' studies, which shows positive links between workforce skills and manufacturing productivity for particular plants in a number of industrial sectors (see Prais, 1995, Ch.3 or Mason et al. 1996).

One large scale study for Britain is that based on matching individual survey data on training to industrial aggregates of output (Dearden, Reed and Van Reenen, 2000), where the level of disaggregation is restricted to around 100 categories of the Standard Industrial Classification. The measure of training here is not expenditure or hours, as in the French studies, but rather the proportion of workers reporting training during the last four weeks. Dearden et al. relate industry value added per worker to these estimates of industry training incidence. Using panel techniques they find that a rise in the industry rate of training by 50% is associated with a 4% rise in productivity. Despite the methodological and database differences this amounts to an elasticity of 0.08, extremely close to the result of 0.07 found by Carriou and Jeger (1997) using firm data for France.

Dearden et al. also examined industry hourly wages and find that wages also vary with training incidence, although less than value added per worker, thus leaving a margin of extra profit. This parallels findings for French firms by Ballot and Taymaz (1996), who showed that both wages and rates of return on assets were increased by extra training expenditure. The message from these studies of firms and industries seems clear - that there are significant gains in output, wages, profits, and innovation from increasing training expenditure.

Difficulties still remaining for analysis

Despite our extensive survey there remain a number of issues which could not be assessed. The first of these is: how much does training really cost and who actually pays for employer provided training in the final analysis, is it workers or shareholders? This difficulty arises at the stage of nominal expenditures in Britain, where we have very few data on training costs. For France, the evidence reveals training expenses as a share of wages, but there is a serious difficulty of assessing the real incidence of these costs. If all firms were operating in perfectly competitive markets and if all training were adding general skills, then training levy expenses would be shifted backwards on to employees, so that all workers would be paying for the training of the selected few through lower wages. With imperfect competition, and with some training devoted

to firm specific skills, the final incidence of training costs is much harder to evaluate in both theory and practice. We would need data with many rapid and large changes in the level of training levy in France (which have not occurred) to derive evidence of the degree to which training costs are shifted backwards onto workers or impact on profits for shareholders. Without any firm evidence of the incidence of costs, traditional rate of return to investment calculations for training expenditures by workers and firms still elude us.

Cautionary tales about poaching externalities have often assumed that there is no backward shifting of training costs and also that mobile workers do not capture all the returns. Thus they have stressed the positive spillovers from training employers to other employers. To solve employer-employer externalities, the French training levy represents a useful policy, as it forces all employers to train or pay an equivalent tax. However for both countries the empirical studies suggest that a considerable part of the returns to employer provided training accrues to workers, especially mobile workers as in Hocquet (1999, 2000).

If in fact workers pay (via generally lower wages) then there is the possibility of worker to worker externalities, which raises questions about the ideal nature of the French levy system. Stevens (1999) argues that a training levy defined in relation to the wage bill will be shifted back to become a tax on workers, but this is a second best way to alleviate underinvestment in training where workers face credit constraints. But since most training is received by those in higher level occupations this raises a difficult issue of equity, as all workers are then being burdened with the costs of training for the better off.

On the other hand, if shareholders mainly pay for training, then the distribution of the financing burden may be thought equitable between richer owners of assets and poorer workers with only their labour income. However the market failure of employer (or shareholder) to worker externalities will persist and cause underinvestment, as long as there is no training tax or mobility tax on employees. This could explain why French employers are investing at less than the optimal rate to maximise returns to training, although many exceed the minimum required by the levy.

Then there is the issue of benefit or burden for small and medium sized enterprises. As noted above, the incidence of employer provided training increases with the size of the firm in both the

UK and France. The difference is that non-training French firms will be paying the levy whereas smaller British firms are able to avoid training costs, although both may have to partly recompense trained workers if they hire them. Bertin et al. (1991) reviewing the French system after 20 years concluded that for SMEs the legal obligation was perceived as a tax levy, because they previously conducted little continuing vocational training for mature workers, and they preferred to acquire skills by taking an apprentice rather than hiring externally.

There may also be wider ramifications of the levy policy than those which are captured in the studies reported here: the question arises whether the combination of the minimum wage, negotiated wage differentials for skilled workers, and a high supply of skills, has led to a lack of flexibility in wages in France, which has contributed in the past to the low rate of job creation, slow absorption rate of young people and a high unemployment rate. However one indicator of imminent social returns to the increase in the stock of skilled workers is perhaps the upsurge of inward foreign direct investment into France, which by the early 1990s exceeded the traditionally high levels of such flows into Britain (Barrell and Pain, 1997).

Conclusions

So to sum up - could an employer training levy work for Britain to revive our limited stock of skills? In both countries recognised qualifications are not often obtained via spells of employer financed training. The observed increase in the stock of qualified workers with certified skills in France is largely a consequence of the changing patterns of qualification of successive cohorts of new entrants. What employer-based training can provide is an injection of upgrading for existing skills. Given that Britain is so far behind Germany, France and Japan in both stock and entry flow measures of skills (Murray and Steedman, 1998; Green and Sakamoto, 2000), there is a need for a radical attempt to transform that stock via a sharp increase in employer-provided training for adult workers.

Even so, we have seen that inter-worker equity is only marginally better addressed by French system; the same bias of 'to them that hath shall be given' is apparent in the relation of training to observable worker characteristics. However France scores better than Britain in the allocation of employer provided training by other unobserved characteristics (which caused workers to be stuck in the lower end of the wage structure).

We are left with a tantalising set of contrasting factors on the final scoreboard: in favour of the training levy is the increase in training expenditure by French firms since the early 1970s together with a broader basis for offering workers a second chance; against the French system is the possibility that regulation has created an expensive system in which the main beneficiaries are trained mobile workers and the rapidly expanding training supply industry (Greenhalgh 1999). Larger British firms would be likely to benefit from the introduction of a levy system which imposed costs onto smaller non-training firms and the labour market could move to a permanently higher training equilibrium. However taking account of the current policy interest in helping small innovative firms to invest and grow, there could be drawbacks in a system which penalises smaller firms and which minimises training investment by individual workers, particularly when individual returns are so evident from the statistical studies.

Despite all the caveats, the best policy route for Britain may still be to embark on a compulsory training levy to finance subsidised or free provision of training by firms to their employees, rather than trying to achieve a rise in portable private investment by workers. British experience with Career Development Loans, which have had a very low rate of take-up, shows that inducing

a rise in personal investment in training is more complex than offering marginal reductions to the availability and costs of credit (see Greenhalgh, 1999). The message from economic theory (Stevens, 1999) and from the econometric evidence of returns in France, is that if Britain were to go down the levy route we should consider a levy which is related to profits and not simply to the wage bill. This could then be structured to avoid burdens on start-up and small companies.

Further amendments to a French-style training levy could address the inequity of receipt of training, by requiring firms to devote certain shares of their training expenditure to their less skilled workers, rather than allowing employers to have free choice in the selection of trainees from higher skilled occupations, as now occurs. It is also possible to address the mobile/immobile worker poaching problem: if the taxation of wages was sufficiently progressive, then those who are upwardly mobile due to the receipt of subsidised training or education would pay funds back into the public revenue system, which could in turn ring-fence some dedicated funds for public expenditure on education and training.

Any increase in training investments would only be a productive use of resources with adequate quality control of training providers and monitoring of the standards of attainment of trainees. This is possibly the most difficult problem facing any national system of skills investment within a changing pattern of jobs and rapid evolution of the tasks and skills needed for work.

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INCIDENCE OF TRAINING, FRANCE

Table 2A

Study	Author	Date	Source of Data	Sample Size	Type of Training	Method
1.	Paul and Bollenot	1993	FQP 1985 FQP 1977	2,947 (M ¹) 2,124 (M)	Employer provided training EPT)	Logit
2.	Goux and Maurin	1996	FQP 1993	11,060 (M+F)	Employer provided training	Probit
3.	Goux and Maurin	1997	FQP 1993	5,910 (M+F) who did not switch firms between 1988 and 1993	Employer provided training	Probit
4.	Bollenot	1997	FQP 1993 FQP 1985 FQP 1977	8,824 (M) 7,707 (M) 1,794 (M)	Employer provided training	Logit
5.	Hocquet	1999	FQP 1993	3,804 (M) 3,390 (F)	Employer provided training	Probit
6.	Goux and Maurin	2000	FQP 1993	4,333 (M+F) private sector	Employer provided training	Bivariate probite (training and job mobility)

¹ M= Males, F=Females

INCIDENCE OF TRAINING, FRANCE

Table 2B

Study	Gender	Race	Education	Age	Experience, Tenure	Occupation	Industry	Firm Size
1.			Rising (but not systematically) with qualifications		Experience 85: Positive 77: Negative		Compares three groups of sectors with differentiated training incidence: low (reference group) intermediate 85: +11%, 77: +9.7% high 85: +19%, 77: +23.3%	Positive
2.	F: -0.15	Non-French: -0.43	Rising (but not systematically) with qualifications	Reference those 50 - 64 yrs: Positive for young workers, Rising with age		Rising with the level of occupation Negative for unemployed		
3.			Rising (but not systematically) with qualifications		Experience: Positive Tenure: Positive	Ref: male unskilled manual workers: Positive and rising with level of occupation (except for managers) for men. Negative up to a certain level of occupation, then positive for women.		
4.		Non-French: - 5%	Rising (but not systematically) with qualifications in 93 (rose more smoothly 85 and 77)		Experience: Negative	Rising with level of occupation (except for managers 85 and 77)	EPT: three groups of sectors with differentiated training incidence: - low - intermediate - high	Positive except for firms of 10 to 19 workers, where probability is lower than firms of 1 to 9 workers
5.	F: -0.24		Positive for all qualifications below higher degrees; highest for those with only a Baccalaureat	Negative	Negative for part-time work	Positive with level of occupation	Industrial variation; very high in energy, finance and public sector	Positive for workforce >50
6.	F are below M		Positive all quals.; highest for Bac +2 vocational study years		Experience and job tenure: both positive, but non-linear with eventual fall in rates of training	Positive for all occupations above unskilled manual; highest for intermediate technical occupations and foremen	Industrial variation; highest in energy, insurance, banking and finance, (sample excludes public sector)	Increasing stepwise with firm size; rising with firm's average wages

INCIDENCE OF TRAINING: BRITAIN

TABLE 3A

Study	Author	Date	Source of Data	Sample Size	Type of training	Method
1.	Green	1993	GHS 1987	4125 (M ¹) 3844 (F)	On and off the job training	Logit
2.	Greenhalgh and Mavrotas	1996	LFS 1984 LFS 1989	28,587 (M) 21,510 (F) 29,519(M) 25,197(F)	Job-related training in the last four weeks	Logit
3.	Arulampulam	1998	BHPS 1991-5	2982 (M) 3117 (F) with repeated observations	Education or training schemes or courses as part of present job	Probit
4.	Blundell et al.	1996	NCDS wave 5 1991, persons aged 33	1601 (M) 1180 (F)	Employer provided training courses and also the subset of these courses leading to a recognised qualification	Probit
5.	Hocquet	1999	NCDS wave 5 1991 persons aged 33	2659 (M) 2121 (F)	Employer provided or employer funded training	Probit

¹ M= Males, F= Females

INCIDENCE OF TRAINING: BRITAIN
Table 3B

Study	Gender	Race	Qualifications	Age	Tenure, hours	Occupation	Industry/Sector	Firm Size
1.	M > F		Positive for all types of qualifications, but smaller coefficients for vocationally qualified entrants	Negative (M), constant (F), but rising for training off the job (F)	Negative for part time workers (F)	Positive for all skilled, including particularly managerial, professional and intermediate non-manual grades	Included industry dummy variables, but no details given except that public sector differential was not significant	Positive in firms employing over 100 (M)
2.	M = F		Positive for all types of qualifications (M and F)	Negative but levelling out with age (M and F)	Negative for part time workers (M and F)	Positive for all skilled, including particularly managerial, professional and intermediate non-manual grades; lowest for craft workers and operatives	Lowest in mature manufacturing, higher in high-tech manufacturing and financial services, highest in non-traded services including public sector.	Positive in firms employing over 50 (M and F)
3.	M > F	Positive for whites	Positive	Negative (M), constant (F)	Negative for both temporary and part-time workers	Positive for all skilled, including particularly managerial, professional and non-manual grades	Higher for public sector in the case of smaller establishments (<100 employees); other industry dummies included but results not given in detail	Rising with size of the workforce
4.	M > F		Positive	Negative		Positive for professional and intermediate non-manual grades (F); also positive for these M if gained a qualification by training	Lower if early work experience in private sector	
5.	M > F		Positive	Negative	Negative for part-time workers		Positive for public sector and some other small differences by industry; negative for construction and other manufacturing cp. to services	Positive if workforce was >100 (M) and if > 500 (F)

PRIVATE RETURNS FOR WORKERS – FRANCE
Table 4A

Study	Author	Date	Source Data	Sample Size	Type of Returns	Method
1.	Paul and Bollenot	1993	FQP 1985 FQP 1977	2,947 (M ¹) 2,124 (M)	Higher wage	OLS
2.	Simonnet	1996	Enquête Carrière et mobilité 1989, INSEE	1748 individuals between 30 and 35 years old in 1989. 1,061 M and 683 F	Higher wage	OLS with or without taking into account the mobility (within or between firms) of workers since they have entered the labour market
3.	Goux and Maurin	1997a	FQP 1993	Wages 5752 (M+F) 3263 (M) 2489 (F) Mobility 8,358 (M+F) Private Sector	High wage Increased tenure	Wages OLS; OLS+ firm fixed effects; Heckman (Selection into training) + firm fixed effects Mobility Probit; Probit (+selection into training)
4.	Bollenot	1997	FQP 1993 FQP 1985 FQP 1977	8,824 (M) 7,707 (F) 1,794 (M)	Higher wage	Heckman (selection into two groups of sectors differentiated by sectoral propensity to train)
5.	Hocquet	2000	FQP 1993	3,043 (M)	Higher wage	OLS conditional on employment since 1988, and taking into account mobility between firms
6.	Goux and Maurin	2000	FQP 1993	4333 (M+F) private sector	Higher wage Increased tenure	Wages: Heckman (selection into training and for mobility after training) Mobility: Bivariate probit for training and mobility

¹ M=Males, F=Females

PRIVATE RETURNS FOR WORKERS – FRANCE

Table 4B

Study	Wage Impact	Job Mobility	List of Main Control Variables
1.	EPT: 1985: 11.6% 1977: 9.5% Greater in the sector where EPT is less developed and in medium size firms. TDI ¹ : 1985: 2.9% 1977: 11.8%		Level of education, experience (+sq), firm size, industry
2.	Impact of one year training (only EPT significant) Complete sample: between 18.1% and 20.8% Male: between 19.1% and 24.5% Female: between 11.1% and 17.5%		Gender, region, nationality, years of education by qualification, experience, tenure, firm industry, probability to remain in the same firm, to find another job, preference for safe career, number of firms since entrance in the labour market.
3.	Complete sample: OLS 4% all, 4.5% (M), 3.4% (F) Sub-sample: workers who did not switch employers between 1988 and 1993: OLS: 5% OLS + firm fixed effects: 2% Heckman + firm fixed effects 0%	Complete Sample: Probit effect of training on mobility-1.1 Probit with selection control effect -1.0	Wage (the characteristics considered are those in 1988): gender, region, nationality, level of qualifications, experience (+sq), tenure (+sq), occupation, firm size, industry Training selection equation: nationality, town type of residence, number of children for women, gender and part-time job interactive with 1988 industry, occupation, level of qualifications, experience (+sq), firm size Mobility: Gender, nationality, no children, tenure in 1988 (+sq), firm size.
4.	Group of industries with a high incidence of EPT: 1993: 6.2% 1988: 7.2% 1977: 9.4% Group of industries with a low or intermediate incidence of EPT 1993: 138% 1988: 9.4% 1977: 11.6%		Wage equation: nationality, level of qualification, firm size. Sector selection equation: level of qualification, father's occupation, parents' residence town size, duration of unemployment between end of full-time study and first job.
5.	Impact of EPT by worker mobility 13-15% workers staying with firm or making direct move out of sector, 32% workers making direct move to similar firm in same sector, 0% to -6% for workers making indirect move via non-employment		Region, nationality, qualifications, experience, tenure, firm size, industry, marital status, children
6.	Impact of EPT 7% when selection effects not included 0% when selection effects for incidence of training and job mobility after training are included (but the selection variables are not statistically significant)	Job mobility is negatively related to training but the effect is not statistically significant	Wage equation: Experience, seniority, gender, industry, firm size, occupation, education, plus region, nationality. Training selection equation: as wages to education plus firm growth, average wages and profit per employee. Mobility selection equation: as training selection plus marital status plus spouse's education and occupation.

¹ TDI: Training Decided by Individuals

PRIVATE RETURNS FOR WORKERS – GREAT BRITAIN

Table 5B

Study	Occupational or Wage Impact	List of Main Control Variable
1.	Effect of recent four week training period on occupational attainment (measured by average occupational wage): M: Married 3.6%, Single 2.5% ¹ F: single 8%, Married 6.5%	Level of qualifications, type of school, unemployment and sickness history, experience, race, children, firm size.
2.	Training in curent job: M: on the job 3.6% off the job 6.6% F: on the job 4.8%, off the job 9.6% Training in a previous job: M: on the job 5.7%, off the job 5.4% F: on the job 4.6%, off the job 6.2%	Wage Changes: (by gender): region, employer size, union membership, occupation, the above for both 1981 and 1991; also highest school qualification, degree in 1981, further qualifications during 1981-91 Selection equation (training by gender): age, work history, social status and firm size in first job, level of school qualifications
3.	Young M: any training yields gain in earnings growth of 11% over ten years 1981-91 Effect falls after five years beyond training Employer provided training has higher payoff than other training Trained workers staying with employer fared better than those who moved to a new employer	Earnings growth: race, early educational scores, trade union membership, sector/firm type, martial status, regional unemployment rate, qualifications. Selection equation: (for probability of employment in both 1981 and 1991): race, father's occupation, school type, early education scores, disability, marital status, children, regional unemployment rate.
4.	Young M: any training 13% Young F: any training 21% Training probablity is exogenous for male wage equation, but is endogenous for females; access to training is more likely for females with inferior pay compared to measured characteristics Trained workers staying with employer fared better than those who moved to a new employer	Wage equations: experience, tenure, qualifications, martial status, children, part-time, responsible for other workers, industry, public sector, firm size, region Selection equations (for training by gender): experience, tenure, qualifications, marital status, children, part-time, industry, public sector, firm size

¹ M= Males, F= Females

PRIVATE RETURNS FOR EMPLOYERS – FRANCE

Table 6A

Study	Authors & Date	Source of Data	Sample Size	Training Indicator	Method
1.	Carriou and Jeger 1997 (See also Jeger 1997)	Panel of firms from: - firms fiscal annual declarations (n° 2483) - Benefices Industriels et Commerciaux - Enquête Annuelle d'Enterprises	10,00 firms work with more than 100 workers from 1986 to 1992 for basic and translog model 5,000 firms with more than 50 workers from 1988-1992 for model of training depreciation	Training effort measured as ratio of training expenses to wage bill (TE)	Production functions: - Cobb Douglas - Cobb Douglas with training accumulation and depreciation - Translog (allows substitutability and complementarity between factors)
2.	Ballot G., Taymaz. E, 1996	Panel of firms from 1981-89 with more than 300 workers; data from "Bilans Sociaux" matched with "DIANE" financial information.	Cross-section of 51 firms from the manufacturing and building sectors.	Training stock (TS) calculated as the sum, over the 8 previous years, of training expenses/wage bill, taken into account separations and depreciation Growth rate of training in 1989 (TG)	2LS and 3LS estimation of a model of 3 simultaneous equations explaining from 1989: 1. the training expenses 2. the rate of return on total assets 3. the average annual wage rate
3.	Haloues., S 1997	CEREQ survey 1987	638 firms	Sum of hours of training per employee from 1985 to (TH) Sum of training expenditure from 1984 to 1989 (TS) Percentage of general training in 1987. Hours of training per engineers, clerks, intermediate workers, blue collar workers in 1987. Share of engineers, clerks intermediate workers, blue collar workers trained in 1987.	Logit estimation of the innovation (new products or service) in 1987.
4.	Ballot et al. 1988 and 2000	Panel of firms from 1987-1993 employing more than 300 workers; data from "Bilans Sociaux" matched with "DIANE" financial information	Panel of 90 large firms from manufacturing, construction, energy, transport and telecoms.	Training stock(TS) for 1987-93, sum of training expenditures for previous six years. Number of hours of training paid by the enterprise(TH). TH disaggregated by worker skill level.	Value added production functions: both Cobb Douglas and Translog; also allow for heterogeneous work force in some models.

PRIVATE RETURNS FOR EMPLOYERS – FRANCE

Table 6B

Study	Variable Showing Returns to Training	List of Main Control Variables
1.	<p>Dependent Variable: Value Added (VAD) Cobb Douglas (simple): Effect on VAD of 1% rise in training as share of wages: 2% Cobb Douglas (with training accumulation and depreciation): long term effect on VAD of 1% rise remains at 2% training depreciation rate: 50% per year Translog: return on training non-linear, optimal ratio of training to wage bill 4% Complementarity capital-training Substitutability labour-training</p>	Number of workers (decomposed into 5 groups of skills), capital stock, firm size, industry
2.	<p>Dependent variable: rate of return on total assets TS coef: 5.95 TG coef: 10.39 TS*R&D expenditure coef: 0.12 (R&D expenditures: -0.51)</p> <p>Dependent variable: average annual wage TS coef: 0.175</p>	<p>Training expenditures equation: rate of return on total assets, R&D expenditures per employee, average annual wage, productivity, sector, share of the workforce on assembly line, managers average age, share of permanent workers.</p> <p>Rate of return equation: R&D expenditures, share of the workforce on assembly line, growth rate of sales.</p> <p>Wage equation: productivity, share of managerial staff.</p>
3.	<p>Dependent variable: Probability of Innovation TH coef: 0.01 TS coef: between 0.16 and 0.2, decreasing with firm size TH per engineer: 0.009 TH per clerk: -0.015 Share of engineers trained: 0.88 Share of clerks trained: -0.95</p>	R&D in 1987, size of the firm, industrial firm or not, up market good/service or not, employment structure.
4.	<p>Dependent Variable: Value Added (VAD) Elasticity of VAD with respect TS 11% Elasticity of VAD with respect to TH 6%</p>	Physical capital, labour input, R&D expenditure; Interactions of training and R&D also explored.