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" Becker's analytical approach "Training and mobility of employees in labor markets"

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***Abstract**: With regard to the microeconomic analysis, the solution provided by Becker on the training and mobility of employees is in terms of the methods of financing training. However, it first distinguishes general training, which can be fully transferred to the market, from specific training, which can be partially exploited in competing firms. The costs of general training must be fully borne by the individual and the costs of specific training must be shared between employer and employee. Then, starting from the training financing conditions, Becker offers a rich analysis of the individual effects of continuing training in terms of salary incidence but also in terms of mobility. Then, it defines the determinants of participation in training.*
In addition, Becker's model allows us to understand the microeconomic mechanisms of vocational training. The problem of poaching is central in his analysis and leads to several implications for the contexts and effects of continuing vocational training.

Keywords : Becker, training, employee mobility

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I. Introduction

The theoretical reference model for the microeconomic analysis of continuing education is the neoclassical model of Becker (1964). We are going to study this model in order to know the mechanisms of continuing education. Becker's model is part of pure and perfect competition. It develops its model on the basis of the risk of poaching when the firm invests in the training of its employees. Indeed, the trained individuals can after the training leave for a competing firm and the training company then loses all the returns on its investment.

The objective of this section is to assess to what extent Becker's model can be an adequate microeconomic model to account for the mechanisms of continuing education. Then in a second paragraph we expose Becker's model of cost and benefit sharing.

1-1 The assumptions of Becker's model

Becker describes his first hypothesis of his model, proposing that for a given period, wages equal marginal productivities. The second hypothesis of the model is to consider that employees are perfectly mobile on the labor market.

1-2 The equality relationship between wages and marginal productivity

Becker's model fits into the framework of pure and perfect competition analysis. It starts from the maximization of the profit of firms and its condition of equilibrium. The first hypothesis of his model is therefore to assume that for a given period, wages equal marginal productivities:

$$MP = W \quad (1)$$

With MP representing the marginal productivities, that is to say the firm's receipts R, and W the wages, that is to say the expenses D. Then, Becker takes into account in his analysis in-house training. According to human capital theory, workers can increase their future productivity through in-company training. As wages equalize marginal productivities, then training can increase the wages of individuals. Training does come at a cost, however. Indeed, the time spent in training and the resulting effort, the mobilization of materials and trainers but also more generally everything that will be invested in training instead of production, constitutes a cost and thus constrains investment in continuing education. As a result, marginal productivity is initially reduced at the start of training and then increases following training. Becker then underlines that it is not necessary that the equality relation between the receipts R equalize the expenses D at each period, but that it is possible to consider a condition of intertemporal maximization of the profit of the firm. In other words, it is sufficient that the present values of present and future revenues equal the present values of present and future expenses. The discount rate is r. There are T periods.

$$\sum_{t=0}^{T-1} \frac{R_t}{(1+r)^t} = \sum_{t=0}^{T-1} \frac{E_t}{(1+r)^t}$$

(2)

Suppose that the training takes place at the initial period 0. The receipts are the sum of the initial marginal productivities MP_0 and the discounted future marginal productivities following the training. $\sum_{t=0}^{T-1} \frac{MP_t}{(1+r)^t}$. Expenses consist of initial salaries W_0, discounted salaries $\sum_{t=0}^{T-1} \frac{W_t}{(1+r)^t}$, and direct upfront costs related to training k. Thus, the equilibrium condition of the intertemporal maximization of the profit of the firm (2) becomes:

$$MP_0 + \sum_{t=0}^{T-1} \frac{MP_t}{(1+r)^t} = W_0 + k + \sum_{t=0}^{T-1} \frac{W_t}{(1+r)^t}$$

(3)

This expression is simplified by considering the difference between discounted future marginal productivities and discounted future wages, G which thus represents the gross returns to training

$$G=\sum_{t=0}^{T-1} \frac{MP_{t-} W_t}{(1+r)^t}$$

(4)

The equilibrium equation (3) can be rewritten as follows

$$MP_0 + G = W_0 + k$$

(5)

Note that the term k does not represent the total cost of the training but only the initial direct cost. Indeed, there are also opportunity costs of training, as the time spent on training can be seen as a loss of production. The total cost of training is defined by C. It includes the initial cost of training k and all of the opportunity costs. The opportunity costs are the difference between the marginal productivities obtained in the absence of training MP'_0, and the marginal productivities obtained with training MP_0. So,

$$C = MP'_0 - MP_0 + k \quad (6)$$

The equilibrium equation (5) becomes:

$$MP_0 + G = W_0 + C \quad (7)$$

The investment in training therefore takes place when equality (7) is respected. In fact, as long as the firm's revenues exceed the expenses, the investment in training takes place. If, on the other hand, the firm's revenues are lower than the expenses, there is no more investment. So the firm's investment in training is optimal when the firm's revenues and expenses equalize.

1-3 Perfect worker mobility

The second hypothesis of the model is to consider that employees are perfectly mobile on the labor market.

Becker then highlights the problem of poaching, ie the existence of an externality of training. Indeed, knowing that individuals are paid at their marginal productivity and that employees are mobile on the labor market, that is to say under the two assumptions of the model, a worker who has received training can go to a firm. competitor and receive the returns from her training. If the employer funded the training, then they lose the full return on their investment. So the firm is not encouraged to invest in training because of poaching.

On the basis of the two hypotheses of his model which involves the problem of poaching, the solution provided by Becker is to distinguish the analysis of general training, which is entirely transferable on the market, from specific training, which is only partially transferable. . Becker says, however, that market conditions can influence the specific or general nature of the training investment. In fact, when a company is monopolistic, it is then almost completely protected from competition from other firms and thus all of its investments in training can be considered specific.

Depending on the general or specific nature of the training, Becker will then determine the conditions for financing the training. Then, his model predicts the effects of investment in training on the wages and mobility of individuals. Finally, it determines who, between the employer and the individual, can take the initiative for the training.

1-4 Predictions of Becker's model

General training has the particularity of increasing the productivity of the individual by the same amount within the training firm and in all the other firms on the market. The risk of poaching is therefore very high in the case of general training. Indeed, Becker describes the methods of financing training as follows:

suppose that the employer finances general training, he is called upon to receive all of the returns from training according to the equilibrium condition (7). Trained employees therefore do not have a salary increase following the training. They obtain a salary lower than their marginal productivity in the training firm. However, the trainees can be remunerated at their marginal productivity in competing firms, because the training is entirely transferable. So individuals go to competing firms because they are better paid. Employers thus lose their entire investment in training. On the other hand, employers from competing firms were able to hire a trained employee without bearing the cost of the training. Faced with this risk of poaching, companies are forced to pay trainees a salary equal to their marginal productivity.

$$G = \sum_{t=0}^{T-1} \frac{MP_t - W_{Pt}}{(1+r)^t} \quad (8)$$

The equilibrium condition (5) implies that the individual will bear all of the direct costs of training.

$W_0 = MP_0 - k$: (9)

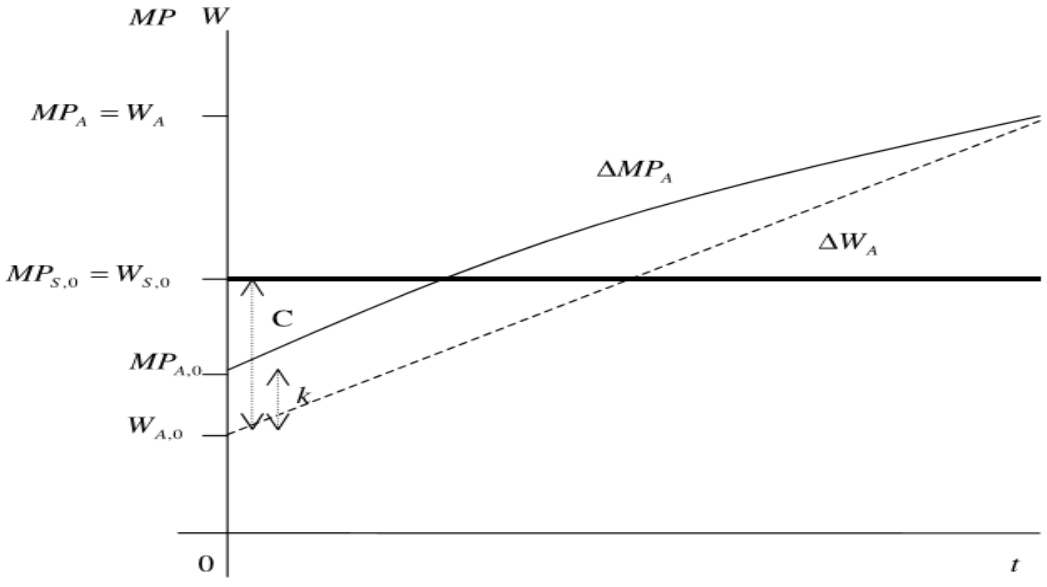
In addition, we have also expressed the initial salary of individuals by considering the difference between the situation with or without training (7). The initial salary of the individual thus corresponds to the marginal productivity that he would have obtained if he had not followed the training minus the direct costs of the training k, minus the indirect costs relating to the decline in his productivity during the training $MP'_0 - MP_0$

$W_0 = MP'_0 - C$: (10)

So in the case of general training, individuals bear the full costs of the training and receive all of the returns.

Therefore, to study the wage level of trained workers before and after training, we represent the evolution of the marginal productivity and the salary of a trained individual A (with training) in comparison with the situation where it is not trained S (without training). Wage and marginal productivity in the absence of training are constant over time t and are represented by the bold line. The marginal productivity of those trained at the start of the training is $MP_{A,o}$ (A, o), and their salary is $W_{A,O}$. The difference between the marginal productivity of those trained at the start of the training $MP_{A,o}$ and the initial salary $W_{A,O}$ is the direct cost of the training k. The difference between the marginal productivity in the absence of training $MP_{S,o}$ and the initial wage $W_{A,O}$ is the total cost of training C.

Graph 1: The evolution of marginal productivity and wages with training General



The marginal productivity of those trained increases during the training period until reaching the MP_A level. It is represented by the thin line. The wage also increases but faster than the marginal productivity to equalize MP_A at the end of the training period $W_A = MP$. Salary growth is represented by the dotted line.

After having defined the methods of financing general training and its salary impact, we are studying its effects on employee mobility.

II. The effects of training on employee mobility

Becker's model concludes that participation in general training does not affect the mobility of the worker, because the individual can value his training in any firm on the market. Indeed, it is remunerated throughout the market at its marginal productivity. Continuing education does not change his behavior.

2-1 The general education initiative

Finally, we will research the determinants of investment in training. For the periods following the training, the individual will be able to obtain a higher salary for the same effort, because he is now more productive. So the individual will be encouraged to train and it is he who will take the initiative for the training. Thus, all of the individual characteristics that affect the cost and benefit of training for the individual can influence the decision whether or not to take training. Conversely, from the employer's point of view, he gains the increase in productivity of the trained employee, but at the same time he must pay him a higher salary so he does not derive any benefit from the training. In addition, investment in general education will be affected by market failures. Indeed, if individuals are forced into the credit market or if there is a statutory minimum wage, individuals may not be able to finance the costs of training directly or through lower wages. Investment in general education will therefore be suboptimal.

Regarding specific training, it is defined as the training that most increases the productivity of the individual in the training firm. Extreme specific training is training which has no effect on the marginal productivity of the individual in other firms. If the training is not completely specific, it can be seen as the sum of general and specific training.

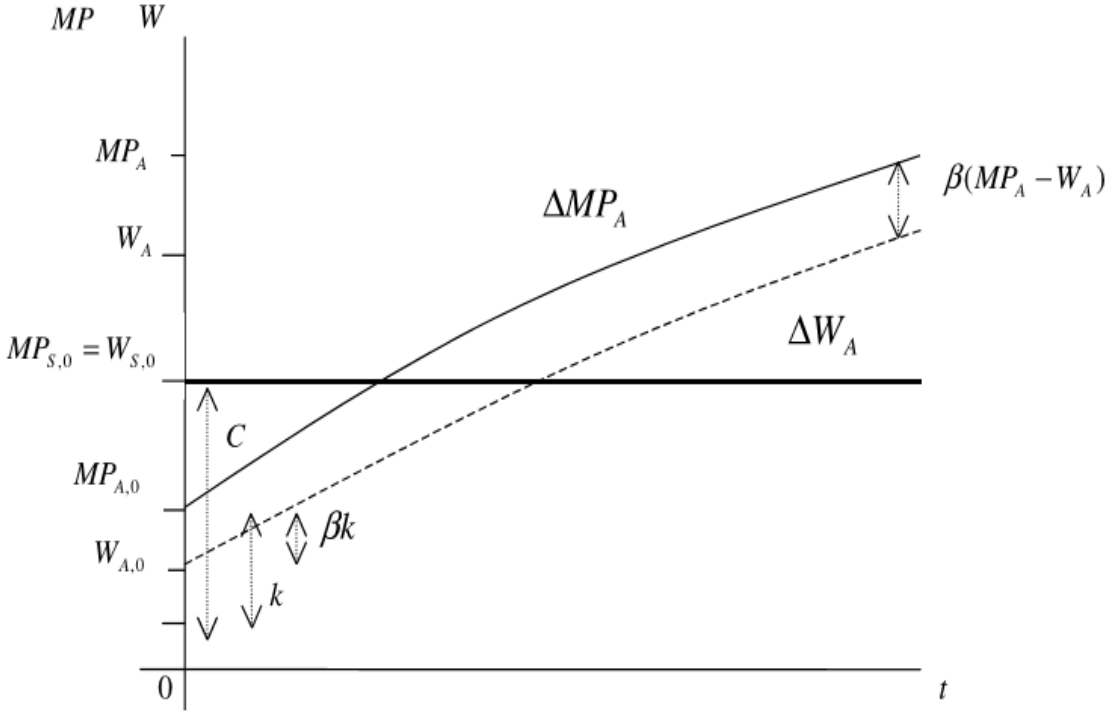
Consider the case of completely specific training: as the employee cannot value his training in competing firms, the firm is not obliged to increase the salaries of those trained. Two cases are studied to determine the methods of financing specific training.

Consider a first case where the firm receives all the returns from training, that is, it does not increase the wages of individuals after training. Firms will then have to pay the full cost of the training, because employees will not fund training that does not bring them any profit. However, knowing that employees are perfectly mobile, the employee may leave the firm for exogenous reasons. The employer who has borne the cost of the training will therefore not be able to recover the costs of his investment. The employer therefore has no interest in bearing all of the training costs.

Consider a second case where the individual finances the training and thus wishes to receive the full return. The individual runs a risk because he can be made redundant by the firm, and since his training is not transferable to other firms, he will not derive any benefit from his investment in training. The individual is therefore not encouraged to fully fund the training.

Becker points out that the involvement of the firm or the worker in the financing of training depends on the level of turnover in the labor market, ie the resignation rate and the dismissal rate. For the employer, the higher the mobility rate, the less willing he is to finance training, and conversely, the lower the mobility rate and the more he is encouraged to invest. Nevertheless, Becker recalls that the rate of employee mobility is not random and varies according to the salary paid to individuals. Thus, the more the employer offers a high salary to individuals, the more the risk of departure of the trained employee is reduced. The solution proposed by Becker is to share between employer and employee the costs and benefits of training as we have already seen a little above. However, the determination of wages in the case of specific training is illustrated by the following graph:

Graph 2: The evolution of marginal productivity and wages with training specific



The wages and marginal productivity of the untrained are constant over time and are represented by the bold line. The marginal productivity of those trained at the start of the training is $MP_{A,o}$,, and their salary is $W_{A,o}$.. The difference between the marginal productivity of those trained at the start of training $MP_{A,o}$ and the initial salary $W_{A,o}$ is the share of the direct costs of training k borne by the individual. The marginal productivity of the trainees increases during the training period until reaching the level MP_A, and is represented by the thin line. The salary also increases but will be lower than the productivity at the end of the training period, it is represented by the dotted line. This difference between end-of-period marginal productivity and salary represents the sharing of returns to training between the individual and the employer β ($MP_{A,o} - W_A$).

III. Some studies dealing with the role of continuing training on the performance of firms

Previous research is generally based on cross-sectional data. We will briefly present some of these studies. First, the study carried out by Bartel (1994), on a sample of 155 American companies in the manufacturing sector from 1983 and 1986, found no significant impact of training on productivity during the year. implementation of the program.

To overcome this problem Bartel suggests taking into account the long-term effect of training. To this end, she estimated a model in which changes in labor productivity between 1983 and 1986 were regressed on changes in training programs after 1983. These new specifications made it possible to show that firms that were not very productive in 1983 and who implemented training programs after 1983 saw their productivity gap narrow, compared to comparable organizations in 1986. Therefore, it is possible that the effect of training is not immediate but that it be postponed a few years later.

Black and Lynch (1996) also estimated the impact of investments in human capital on the productivity of American firms, this time including the non-manufacturing sector. Their results show, once again, that the number of employees trained does not have a significant impact on productivity. On the other hand, just like the study carried out by Ng and Siu (2004) among Chinese manufacturing companies, Black and Lynch show that the type of training could have an influence on productivity.

For their part, Barron, Berger and Black (1997) estimate that a 10% increase in the proportion of employees who have received training results in a 3.7% increase in productivity. They also suggest that the type of training (formal or informal) may have a different impact on productivity.

Along the same lines, Turcotte and Rennison (2004) investigated whether the effect of training content could influence the productivity of Canadian firms. Their estimation results, on a sample matching the data of locations and employees of the EMTE for the year 1999, tend to indicate that the content of training programs, particularly those of a technological nature, has a greater influence on productivity than the effect of an intensity variable such as the proportion of employees trained. In this regard, it appeared that training in computer

hardware or in software (therefore technological training) had a positive and significant impact on the company's productivity gains. In other words, their results show that a 10 percentage point increase in the proportion of employees who received technology training is associated with 4.5% higher productivity.
Two criticisms can however be leveled at these studies.

On the one hand, it is possible that the companies that have offered training to their employees would have experienced the same evolution in their performance anyway, without having had recourse to training to increase organizational performance in this case. , their productivity. In other words, the increase in productivity may have been attributable to idiosyncratic characteristics of the firm that the model would not have taken into account. This potential bias, called unobserved heterogeneity, appears when certain variables of interest believed to influence the performance of training within organizations, are not observed, such as the introduction of new technologies or organizational changes.

So in technical terms, we are talking about fixed effects. In the second case, as we have already mentioned in the introductory part, when we speak of endogeneity, we refer to the values of an independent variable which are explained in part by the dependent variable.

Moreover, several observers have noted that the effects of training on productivity may be conditional on a set of characteristics or the environment of the firm (Ichniowski et al., 1997). Among the twenty-nine studies identified, sixteen studies deal with the possible effects of the combination of HRM practices on organizational performance, half of which offer a longitudinal research estimate. Although the complementarity hypothesis is far from being empirically verified even today, there are nevertheless more and more studies which consider training within companies as one of the constituent elements of a coherent system of practices (Whitfield, 2000).

For example, Arthur's (1994) study of 30 small American steel mills showed that the stronger the internal and external consistency, the more companies improved their performance. The notions of internal coherence and external coherence make it possible to justify the choice of resources in order to obtain a competitive advantage (Delery and Doty, 1996). According to supporters of the configuration approach, internal (or horizontal) consistency is based on the idea that it is the strategies and behaviors internal to the organization that are the source of a competitive advantage (Schuler et al. Jackson, 1987). On the other hand, the principle of external coherence shows that the organization is an integral part of its environment and cannot act in a vacuum. Thus, a company must align its HRM system with organizational, human and operational factors, which supposes a synergy between a set of factors (Arthur, 1994)

Mac Duffie (1995) for his part, also confirms the meaning of this relationship, since his estimation results clearly show that systems based on innovative complementary practices make it possible to achieve a higher level of performance than a more traditional system.

Similarly, Ichniowski et al. (1997) have shown, following a study carried out on 36 American production lines between 1983 and 1992, that the system of innovative practices makes it possible to achieve better product quality: 3% higher than the traditional system, as well as 5% increase in productivity compared to other more traditional practice systems. In addition, Turcotte and Rennison (2004), based on a sample representing 5,200 Canadian organizations, note that skills development practices related to the use of technology are associated with increased productivity and higher wages.

In addition to this, it is worth noting that training increases productivity beyond previously set targets in the majority (13 of 16 studies) of recent longitudinal studies reviewed.

In what follows, we will present a selection of longitudinal studies showing the possible contribution of training to business productivity.

Other studies have dealt mainly with the impact of training on productivity in the manufacturing sector. Thus, Barrett and O'Connell (2001) are interested in the impact of the type of training on the productivity of firms in Ireland, for the period from 1993 to 1995. To carry out their research, they used a sample of 215 organizations. manufacturing, construction and service sectors. Basing their estimates on Bartel's (1994) methodology, they confirmed that general training has a positive and significant impact on the productivity growth of firms, while specific training, defined as training that is directly linked to firm operations, does not seem to provide any significant return within the organizations that sponsor this type of training. General type training also varies positively with the level of capital investments made. The fact that general training has a significant impact may suggest that this type of training captures the effects of omitted variables (such as size, high performance management practices, innovation or even organizational changes) that would have an impact. on productivity growth.

In Portugal, the study by Almeida and Carneiro (2006) on a sample of 1,500 firms with 100 or more employees, in the manufacturing sector between 1995 and 1999, confirmed the relationship between training and productivity. The authors observed that an increase of 10 hours of training per employee results in a 0.6% to 1.3% increase in hourly productivity. For firms that offer training, the results also show that the average return on investment is positive and very high, representing 24%, compared to a low and negative return of 7% for

companies that do not offer training. training within their workplaces. This study therefore shows that training within companies is a good investment for many firms and possibly leads to higher returns than investments in physical capital. Still according to the authors, data on the amounts invested in training remain essential to obtain precise estimates on the returns of this type of investment. Finally, they suggest that the variation in returns from training between companies may be attributable in particular to the lack of coordination between the needs of employers and those of employees as well as to the uncertainty related to the returns on investments in training for the company. employer.

Along the same lines, a recent study by Ballot et al. (2006) shows that training returns can be shared between a firm and its employees, but that they remain higher for the organization. Dearden et al. (2006), for their part, show that the choice of wages, as a measure of productivity, can lead to an underestimation of training returns for organizations, compared to the use of value added per employee. They show, by estimating a Cobb-Douglas production function on a panel of 94 British industries between 1983 and 1996, that an increase of 10 percentage points in the proportion of trained employees leads to an increase in wages. hours of 3.0% and an increase in value added per employee of 6.0%. In addition, industries that make use of higher skill levels seem more likely to train their workers. The results obtained by Aubert et al. (2009) on a panel of 1,605 French firms, also show that most of the return on investment in training is retained by the firm, since the wage gains of employees are of the order of 32% to 54%, according to the specification used. Aubert et al. (2009) also show that by offering an average of 100 hours of training per year to each employee, a company in the sample can increase the hourly productivity of its workers by 6.9%.

On the other hand, the estimation of a model of the impact of training on the performance of firms, in a longitudinal context, is hampered by the technical problems raised in studies of a transversal nature. The first is unobserved individual heterogeneity and the second relates to the usual question of jointly determining the effects of human capital (via training) with the production variable.

In this regard, the estimations carried out by Zwick (2002, 2006) with the method of instrumental variables, on a sample composed of 2090 observations for the years from 1998 to 2001 found that by controlling for the different sources of bias, that a 1 percentage point increase in the proportion of employees trained in 1997 would have resulted in an average productivity increase of 0.76 percentage points for the period 1998 to 2001. Most recently, a study by Colombo and Stanca (2008) 21 as well as those by Dearden et al. (2006), Zwick (2006) and Kayahan (2006) suggest that the failure to take into account the heterogeneity of firms overestimates the impact of training on productivity, while the failure to take into account its endogenous character underestimates the effect on productivity. To this end, Colombo and Stanca (2008) estimate that an increase of 1 percentage point in the proportion of employees trained leads to an increase in productivity ranging from 0.05%, without correction for the heterogeneity of firms, to 0.03% after correction. Also, Colombo and Stanca (2008) show that by taking into account the longitudinal dimension of the data, by instrumenting their measurement of training intensity by lagged values, that productivity goes from 0.03% to 0.07% for a 1 percentage point increase in the proportion of employees trained.

In addition, Dostie and Pelletier (2007) suggest that we must also take into account the productivity shocks external to the firm which can have an impact on the performance of the organization. Finally, some recent publications (Dearden et al., 2006; Kayahan, 2006) include lagged values for the dependent variable in their estimates.

On the other hand, another proposition to be taken into consideration in the study of the possible effects of training on the productivity of companies, is to know when we should expect to see or even find the effects of investments. Training. Some studies seem to show that the impact of training can appear after a while.

The results of Black and Lynch (2001) on American data, Colombo and Stanca (2008) on Italian data, D'Arcimoles (1997) based on French data and Garcia (2005) on Spanish data suggest that the effects of training materialize after one or two years. These delayed effects were also confirmed in the study by Zwick (2002) showing that the increase in the proportion of employees participating in a training activity during the first half of a year had a positive and significant impact on the company's productivity in the same year and for the following year. Beyond previous studies, the results of Zwick (2002) also show that for a total of three years of delay, the impact of training remains positive but not significant. Also, the results obtained by Zwick (2002) show that training increases productivity in the current year and subsequent years, but that its intensity decreases over time. Finally, the estimates made by Dostie and Pelletier (2007) have shown, for both formal and informal training, that the impact of training decreases over time.

In our opinion, all of these results suggest that the impact of training should be measured after a minimum of one year from the date of the investment and possibly over a longer period of time, to document it. all the possible returns, suggesting, in our opinion, the interest of using a recursive model to measure the returns on training investments.

In another vein, just like the literature concerning the impact of training on productivity using a transversal research design, some empirical research (Ketchen et al., 1997; Miller, 1987), which addresses the

question of the complementarity of practices, suggest that a longitudinal research design should make it possible to obtain less biased estimation results, since the units under study are observed over a longer period, which would reduce the possible sources of error and would also capture subsequent effects on performance.

However, compared to cross-sectional estimates, longitudinal research cannot unanimously confirm the possible interaction between different factors. In this regard, the estimates made by Black and Lynch (2001) on a balanced panel made up of 638 American firms in the manufacturing sector, for the period 1987 to 1993, did not show that the firms that opt for High performance practice systems, including the proportion of employees trained, are the most productive. The results obtained by Zwick (2006) point in the same direction, since no complementarity was observed within the establishments studied between training and other HRM practices. However, this author notes that there is a strong correlation between investments in training, participatory management measures and investments in technology in organizations with an already well-established system of practices.

3-1 Methods of financing training

Several studies evaluate the methods of financing training, by testing three predictions of Becker's model: the drop in the wages of individuals at the start of training. The pay cut is greater in the case of general training, the sharing of training returns between the employer and the employee in the case of specific training, the direct costs of the training are fully borne by the individual in the case of general training, and are shared with the employer in the case of specific training.

3-2 Lower starting salary

In agreement with Becker, Sicilian (2001) finds that all training reduces the starting salary and even more when the training is general. Similarly, when the training is supposed to be more general (the training is not financed by the firm, the training takes place outside the company), Veum (1999) finds that the impact of training on the salary of departure is negative and significant at the 10% level. However, for the majority of studies, training does not significantly reduce the initial salary of trainees (Barron, Black and Loewenstein (1989), Holzer (1990), Veum (1999), Parent (1999), Booth and Bryan (2005)). In addition, in the study by Barron, Berger and Black (1999), training outside the company, considered more general, has no effect on the starting salary of individuals, while training on place, assumed to be more specific, has a negative and significant effect. This result is contrary to Becker's idea that the drop in starting salary is more important for general education.

3-3 Sharing of training returns

Studies by Barron, Black and Loewenstein (1989), and Barron, Berger and Black (1999) find that the effects of training are significantly weaker on wages than those on productivity. The returns to training therefore seem to be shared between employer and employee. However, the authors specify that this sharing exists when the training is assumed to be general by the authors, which is contrary to Becker's model.

3-4 Direct costs of training

Most training is funded by the employer (Barron, Berger and Black (1999), Booth and Bryan (2005), Veum (1999), Loewenstein and Spletzer (1998)) although it is considered general. Indeed, Booth and Bryan (2005), point out that the employer finances a very large majority of training at 85% general. Loewenstein and Spletzer (1998) find that training is 91% funded at least partially by the employer and that it appears to have a strong general component. In conclusion, this empirical work highlights that training is overwhelmingly funded by the employer. In addition, there are not necessarily differences in the methods of financing training depending on its nature, as Becker assumes. This result suggests that companies are not afraid of poaching. Indeed, according to the equilibrium condition of the Becker model, if firms finance training, they receive all of the returns to training. The trained employees could therefore go to another firm to be better paid.

- **The effects of training on productivity and wages**

Becker's model proposes the following effects of vocational training on the productivity and wages of individuals: Training increases the productivity and wages of individuals in the training firm. The salary increase in the training firm is greater in the case of general training than in the case of specific training. Training increases the productivity and wages of individuals in competing firms. The salary increase in competing firms is greater in the case of general training than in the case of specific training.

- **Productivity and salary of individuals in the training firm**

All the studies confirm that training increases the productivity of individuals (Barron, Berger and Loewenstein (1989), Barron, Berger and Black (1999), Holzer (1990), Bartel (1995)). The effect of training on wages, on the

other hand, is more controversial. The OECD (1999) underlines that training has a positive and significant impact on wages in all countries except France and Italy. French studies (Goux and Maurin (1997), Fougère, Goux and Maurin (2001)) do indeed confirm the absence of salary impact of training. Finally, Barron, Berger and Black (1999), and Veum (1999) specify that the impact of training on wages is relatively weak in the American and British cases.

- **The effects of general and specific training in the training firm**

By distinguishing the effects of training according to its nature on the wages of individuals, Becker's predictions are questionable. In line with Becker's model, general training, measured by certified training or training that takes place outside the company, has stronger effects on salary.
individuals in the study of Booth (1993) and Booth and Bryan (2005). However, the study by Loewenstein and Spletzer (1998) highlights that there are no significant differences between the returns to training considered by the employer and by the employee as general or specific. It also appears that the returns to training are higher when the training is assumed to be specific, i.e. when it is financed by the employer for Veum (1999) and Booth and Bryan (2005), or when it is takes place during working time according to Parent (1999).

- **Productivity and wages in competing firms**

The results of the studies confirm that the trainings are transferable. Indeed, the returns to training obtained with previous employers are identical to the returns to training received with the current employer, for Parent (1999), and are even higher for Booth and Bryan (2005) and Loewenstein and Spletzer (1998). . Likewise, Fougère, Goux and Maurin (2001) show that the salaries of trainees who have changed companies are significantly higher than those of existing employees. The returns to training are therefore apparently stronger outside than in the training firm. This result is nevertheless unexplained in Becker's model.

- **The effects of general and specific training in competing firms**

By breaking down the training obtained with previous employers according to their nature, the training financed by the employer seems the most transferable in the study of Veum (1999), and of Booth and Bryan (2005). This result is again contrary to the predictions of Becker, who assumes that the employer finances training only when it is not valuable in the market.

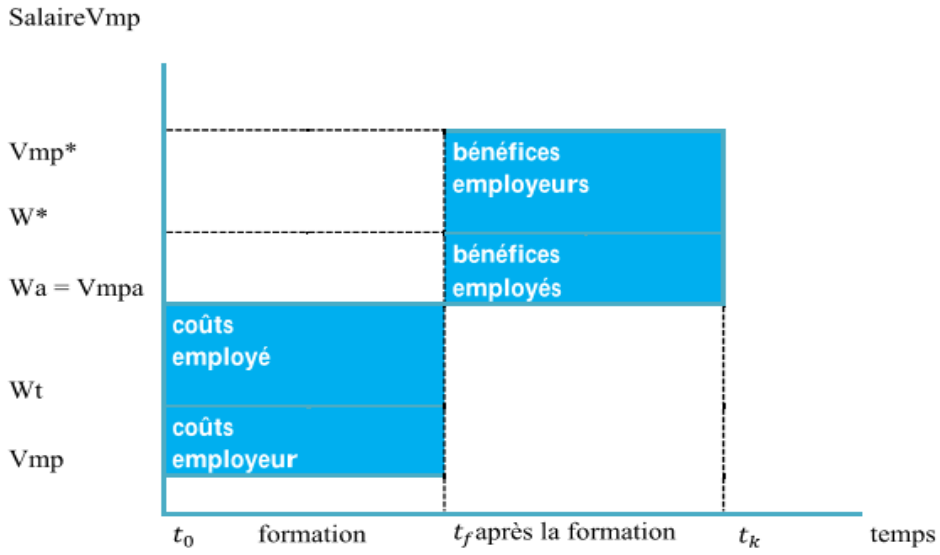
IV. Cost and benefit sharing model

In this sub-section, we will use the model of sharing the costs and benefits of company training to explain between employee and employer who benefits from the returns from training. Thus, taking up the words of Purcell (1999), we believe that the challenge for the organization is to succeed in developing a model that can take into account all the variables and take into account their interrelationships. We have seen that when a company invests in training, it hopes to obtain gains in terms of improving the productivity of its workforce. Thus, based on Becker's cost-sharing model as a shared investment, additional training for workers is a means of potentially increasing the productivity of the firm, by the value of marginal productivity after the period. training ($V_{pm*} > V_{pmt}$) as well as the monetary gains of the employees themselves ($W^* > W_t$).. According to Becker's (1964) model, wage differentials are explained by differences in productivity. These are explained, in turn, by the inequality of the human capital accumulated by individuals, particularly during continuous training within companies. This theory assumes that an added value of training corresponds to marginal productivity for the worker.

To understand the trade-off that the employee and the employer must make in order to determine their level of investment in specific training within the company, let's take a simple example in which an employee and an employer share the costs and the benefits. investment in specific training. Time is defined for the purposes of explanation in two periods, namely: on the one hand, the acquisition of new skills and knowledge or the training period (de t_0 à t_f) et and the period after the training (from (de t_f à t_k),, on the other hand.

For a rational employer, the expected returns from investments in training will be calculated from two variable factors, namely: the value of marginal productivity (i.e. the monetary value of the employee's productivity) which is explained by the employee's marginal productivity value during the training period (V_{pmt}) and the expected marginal productivity value after the training period V_{pm*} and the salary paid to the 'employed during the training period W_t and after (W^*). For an investment in training to be profitable for an employer, the costs must be lower than the expected benefits. As a result, during the training period (t_0 à t_f),, the employee's productivity is lower than that of an employee who does not acquire additional skills $V_{pmt} < V_{pma}$. So, it can be expected that if the productivity of an employee in a training period is lower than another worker, all other things being equal, the employer will pay a lower wage to the worker in training reflecting his productivity during that period of time. 'learning ($W_t < W_a$). This salary will be readjusted upwards after the

apprenticeship period (W*).. For the employee, the interest in sharing the costs (W_a –W_t) of additional training is linked in particular to obtaining a better salary after the apprenticeship period (W*).



Graph 3: Diagram inspired by Cousineau (2005)

In other words, we can write that the specific training will be considered as an investment for the employer and the worker if the costs of acquiring additional training are lower than the expected benefits:

	Coûts		Bénéfices
Pour l’employeur	$W_t - V_{pmt}$	<	$V_{pm*} - W*$
Pour le travailleur	$W_a - W_t$	<	$W* - W_a$

In other words, we can write that the specific training will be considered as an investment for the employer and the worker if the costs of acquiring additional training are lower than the expected benefits:

4-1 Other results

Another important aspect that emerges from these studies is the relative heterogeneity of the returns to training according to individual characteristics. First, the returns to training appear lower for women (Veum (1999), Booth (1993)), although Duncan and Hoffman (1979) do not find any differences. Next, several studies show that the effects of training on wages are very heterogeneous depending on the level of education of individuals.

The OECD survey (1999) finds a higher incidence of earnings for individuals with low educ Bational attainment in France, Italy, the Netherlands and Great Britain. In general, the OECD (1999) underlines that the wage "advantage" linked to training varies according to the level of education and the sex in all countries, the most frequent situation being a higher earnings advantage for workers. having the lowest level of studies ”. Goux and Maurin (1997) confirm this result, while Fougère, Goux and Maurin (2001) moderate this conclusion by showing that these differences in performance are only significant when the individual changes companies. Finally, training seems to have effects that are not linked to productivity but rather linked to aspects

institutional (Holzer (1990)). Trained workers would thus have higher wages for reasons other than an increase in productivity. Goux and Maurin (1997) confirm this idea. Indeed, they underline an indirect effect of training through seniority.

Using panel data on French companies, Carriou and Jeger (1997) assess the impact of training spending on added value. Their estimates show that a 1% increase in the share of wages devoted to training spending leads to a 2% increase in the value added of the firm. This result confirms the net positive effect of training on company performance. Ballot et al (1998) carry out a comparative study between France and Sweden using panel data covering the period 1987-1993. They show that continuing education funded by companies and

research and development (R&D) have a positive and significant effect on overall factor productivity in Sweden, while in France, R&D only positively affects productivity when it is associated with training.

Other work in France, however, has made it possible to discern disparities in the performance of training linked to the types of employees who receive this training. Thus, research shows that the productivity gains associated with training engineers (Haloues, 1997) or managers and engineers (Ballot et al, 2001) are higher. This work confirms the assertion that companies are more likely to offer continuing education to qualified personnel.

Dearden et al. (2006) use panel data (1983-1996) on British companies to estimate the impact of continuing training (the proportion of workers having received training in the last four months) on productivity companies and workers' wages. Their results show that a 1% increase in training leads to an increase of around 0.6% in value added per hour of work and 0.3% in wages.

Based on a review of the literature on the impact of training on workers and companies in France and Great Britain, Greenhalgh (2002) presents the differences between the training systems in these two countries. She argues that the system of contributions for training made by companies in France explains the increase in the stock of skilled workers and the upgrading of existing knowledge compared to Great Britain. She concludes that the French system can be exported to Great Britain taking into account the environment.

Some authors have also looked at continuing training in African companies. Biggs (1995) examines the impact of training and investment in technology on the performance of firms in three African countries: Zimbabwe, Kenya, Ghana. Analysis based on data from the World Bank's Regional Enterprise Development Program (RPED) in the mid-1990s, shows that skills building mechanisms are poorly developed in Africa compared to developed countries.

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This study reveals that, like companies in developed countries, African companies offer continuous training especially to qualified personnel. In addition, the likelihood of a company offering training to its staff is strongly related to the size of the company. Training increases the added value of the company by more than 49%, while firms that invest in technology have an added value that is nearly 25% higher than that of others.

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Along the same lines as Biggs (1995), Biggs et al. (1995), using the same database for the same countries, show that a 1% increase in the number of workers who have received training increases the value added of companies by around 60%. This study highlights the primacy of internal or specific training over general training received outside the company.

The RPED data on Côte d'Ivoire (1995, 1996) allowed various researchers to focus on companies and workers working in this country, in particular on the relationship between the size and growth of companies in Côte d'Ivoire. Ivoire (Sleuwaegen and Goedhuys, 1996), to the effect of tax incentives on investments (Zeufac et al. 1996) and to the determinants of entrepreneurship and business growth in Côte d'Ivoire (Sleuwaegen and Goedhuys, 1998).

Previous work highlights the relevance of the role of continuing education, whether specific or general, in the performance of companies and hence in the growth and development of countries. These studies

present the conditions for making a profitable investment in staff training and highlight the productivity gains associated with this investment.

V. Conclusion

The presentation of the growth models and their empirical evaluations is rich in lessons because it recalls the link between human capital and the economic growth of a country and thus the challenges that continuing vocational training can represent. This justifies, among other things, our interest in this issue. In addition, two mechanisms have been highlighted at the macroeconomic level, to clarify the link between human capital and economic growth.

It appears that initially, human capital can indirectly act on economic growth through technical progress. More precisely, human capital can, on the one hand, increase the innovation capacities of a country and, on the other hand, promote technological catch-up.

These results seem to confirm the role played by continuing vocational training on economic growth, because continuing vocational training can precisely enable workers to adapt to new technologies and increase the competitiveness of companies. Indeed, although initial education contributes to these effects, its influence may be limited compared to continuing vocational training for two reasons: firstly, the knowledge imparted during initial training does not always fully correspond to the skills. necessary in the job because the job matching of individuals is not always perfect. Secondly, education only takes place at the start of an individual's life, while continuing vocational training constitutes lifelong learning.

Knowing that technologies are constantly being renewed, it is necessary to regularly update the knowledge of individuals. Thus, while initial education is a first device making it possible to constitute a base of knowledge at the start of working life, continuing vocational training is a second essential device to enable individuals to adapt to their jobs and train them to face developments in their work. In addition, the knowledge learned during continuing professional training can be disseminated among employees.

Finally, the economic literature on the effects of continuing training in companies shows that training increases the rate of economic growth and employee productivity. These results do not accurately show the direct contribution to returns on training investments for employers.

From the point of view of microeconomic analysis, the solution provided by Becker lies in terms of financing methods for training. However, it first distinguishes general training, which can be fully transferred to the market, from specific training, which can be partially exploited in competing firms. The costs of general training must be fully borne by the individual and the costs of specific training must be shared between employer and employee. Then, starting from the training financing conditions, Becker offers a rich analysis of the individual effects of continuing training in terms of salary incidence but also in terms of mobility. Then, it defines the determinants of participation in training.

In addition, Becker's model allows us to understand the microeconomic mechanisms of vocational training. The problem of poaching is central in his analysis and leads to several implications for the contexts and effects of continuing vocational training.

At the same time, empirical work, testing Becker's predictions, shows that this model only partially accounts for the mechanisms of training. Three essential contradictions with Becker's model emerge from this review of the empirical literature: first, the firm finances most training, whatever its nature. Next, the distinction between general and specific training, as to their effects on wages, does not seem at all justified. Finally, the firm's involvement in the training investment decision seems disproportionate knowing that training is supposed to be primarily on the initiative of the individual for Becker.

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