



# The economics of apprenticeship training

## Seven lessons learned from cost-benefit surveys and simulations

Samuel Mühlemann and Stefan C. Wolter

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## Preface

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Many countries face shortages of skilled workers and high youth unemployment. In the process of reforming their vocational education systems, a significant number of these countries have turned their attention to the potential offered by dual apprenticeships. The basic principle behind this approach is that young people receive in-company training and a school-based education at the same time. Any reform to implement this type of apprenticeship depends heavily on the willingness of companies to provide training. But which conditions make it economically worthwhile for companies to engage in apprenticeship training? This question is arising in countries that are considering introducing an apprenticeship training model, and also in those with existing dual apprenticeship systems.

In recent years, the education economists Prof. Dr. Stefan C. Wolter and Prof. Dr. Samuel Mühlemann have conducted several country studies examining how the costs and benefits of training vary from the point of view of companies under different policy contexts. In these studies, they analyse the effects of various aspects of dual apprenticeship systems, such as the duration of training, the remuneration of apprentices or the relationship between theory and practice on costs and benefits. The constant challenge is to guarantee high-quality training and to make training attractive from a company perspective.

In this report, Stefan Wolter and Samuel Mühlemann have articulated general conclusions drawing from the cross-country comparisons. General conclusions are not to be applied as a blueprint for every country. However, they provide important and generalizable information for the design of apprenticeship training models. And they can serve as a stimulus to initiate cost-benefit studies for further countries.

We are convinced that apprenticeship training offers an immense amount of value, and not just for companies – for young people’s prospects and the economy as a whole. We would therefore like to thank Stefan Wolter and Samuel Mühlemann for deriving these concise lessons learned. We hope that this will help steer policymakers and employers into more evidence-based directions and to promote the dissemination of dual apprenticeship training models.



**Hang Ho**  
Head of Philanthropy for Europe,  
Middle East, Africa and Latin America  
J.P. Morgan



**Clemens Wieland**  
Senior Expert, Learning for Life Program  
Bertelsmann Stiftung



## Introduction

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This text summarises the seven most important findings that have been gleaned using detailed cost-benefit surveys of apprenticeship training programmes in various countries and subsequent cost-benefit simulations for other countries over the last 20 years. The costs incurred by the firms providing training were measured, as were the benefits they can generate in the short term through the apprentices' work in the company and the medium-term benefits obtained because apprenticeship programs help companies avoid costly recruitment from the labour market.

These surveys and simulations mainly concern European countries. However, they have also been applied to non-European countries.<sup>1</sup> Specifically, the following statements refer to cost-benefit surveys from Switzerland, Germany and Austria and cost-benefit simulations run for England, Italy and Spain. The cost-benefit measurements in the three German-speaking countries were also used for comparative studies, i.e. studies that investigated the causes and effects of the differences in the costs and benefits of apprenticeship training in the three countries (see point 2). The findings we draw from the cost-benefit measurements and the corresponding simulations are summarized in seven lessons:

- 1) Ratio of costs and benefits influences firms' willingness of providing apprenticeship training
- 2) Similar apprenticeship training systems do not necessarily produce similar outcomes
- 3) Returns on apprenticeships after training are maybe more important than during
- 4) Flexible but coherent training parameters are key for a functioning apprenticeship training system
- 5) Variable apprentices' salaries prevent distortions in the apprenticeship market
- 6) Apprentices' benefits are a relevant factor that must also be considered for a functioning apprenticeship system
- 7) Training quality and scope may reduce net costs and increase the returns on education

The first three lessons refer almost exclusively to the actual measurements of the costs and benefits of apprentice training, while the lessons 4-7 can be derived mainly from findings from the simulations.

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<sup>1</sup> The cost-benefit survey instrument from Switzerland was also used to measure the costs and benefits of the SkillsFuture Earn and Learn Programme (ELP) in Singapore (see Renold et al. 2018).

# 1 | Ratio of costs and benefits influences firms' willingness of providing apprenticeship training

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The fact that firms weigh the costs and benefits of training based on economic calculations and only offer training places if the result is positive for them is an idea that has a robust position in economic theory. However, in the discussions about why certain firms had active apprenticeship programs and others did not, economic arguments were not only missing for a long time, but their importance in training decisions was categorically negated by practitioners, some academic disciplines and sometimes even politicians. Yet, economists would not claim that economic advantages are the only motive for training decisions, nor would they claim that it is the most important argument for or against training. Economists only offered a *ceteris paribus*: if everything else is equal, and two firms are identical in everything but the costs and benefits of training, a firm for which the benefits of training outweigh the costs would train and a firm for which the benefits are smaller than the costs would forego it. The forms of benefit that can arise from training did not play a role in this theoretical argument for the time being.

In order for this idea to not just remain theoretical, but to empirically prove its relevance in practice, it was necessary to measure the costs and benefits of apprenticeship training for as many firms as possible, since not only the firms differ, but one can also assume that training in a specific apprenticeship occupation – regardless of the firm – cannot be compared with the costs and benefits of an apprenticeship in another occupation. Cost-benefit analysis therefore had to be carried out across the board for a huge number of firms and occupations in order to obtain conclusive findings. However, measurements including the benefits had only been conceived in Germany towards the end of the 1980s, prior to that only costs were measured. Furthermore, the simultaneous measurement of the cost-benefit for 2000 firms without apprenticeships in Germany and Switzerland were surveyed for the first time.<sup>2</sup> Only the latter made it possible to say anything at all about the significance of costs and benefits for the firms providing apprenticeships. If one merely observed companies with apprenticeship programs, one could not know which factors were actually decisive without the contrasting image of non-training firms.

For the first time, these data now made it possible to show that firms training apprentices had a much better average cost-benefit ratio, i.e. an average net benefit after training that was higher than the estimated average cost-benefit ratio of a non-training firm (Wolter et al. 2006). Furthermore, it could be shown that the cost-benefit ratio of training is decisive not only if a firm trains apprentices or not, but for how many apprentices a firm trains

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<sup>2</sup> Mühlemann and Wolter (2014) provide an overview of cost-benefit measurements and selected findings across OECD countries and Wolter and Ryan (2011) provide an extensive overview of the theoretical and empirical literature in economics on apprenticeship training.

(Mühlemann et al. 2007). However, the data not only enabled static comparisons to be made between enterprises that provide vocational training and those that do not. In addition, it was possible to test whether firms offer more training places or fewer, depending on the changing market conditions that influence the costs and benefits. These analyses primarily used geographical variations in the number of competitors in their own local labour market as influencing factors. If the number of competitors decreases, then not only will the number of firms that could poach self-trained skilled workers at the end of their training decline (Mühlemann and Wolter 2011), but in extreme cases, if you are essentially the only employer in a particular occupation (Monopsony), you can also reduce costs during the apprenticeship because you can reduce the apprentice's wages (Mühlemann et al. 2013). These analyses show that if the conditions on the local labour market allow a firm to achieve a more favourable cost-benefit ratio, the willingness of the firms to train also increases. As previously claimed, if these factors are not decisive for the training decision, no differences in the willingness to train could be expected with different cost-benefit ratios. This view was refuted.

Interestingly, the fact that the importance of economic factors for training decisions was downplayed both in science and some commercial sectors did not prevent politicians or entrepreneurs from demanding state funding to support firms' willingness to train. In many countries, firms with apprenticeships are supported by subsidies, either financed directly by taxpayers' or collected from all firms through fees. The latter is also justified by the fact that it enables (economic) solidarity between firms that offer apprenticeships and firms that do not train apprentices themselves. In addition to subsidies, there are other ways of positively influencing firms in their training decisions, for example by awarding public contracts to firms with apprenticeships. This, too, is an economic incentive designed to encourage firms to invest more in training, because without apprenticeships they would lose public contracts and lose money. In an analysis of the effect of such an incentive, Strupler and Wolter (2017) were able to show that it is possible to persuade small firms in particular to provide training, which shows that firms are guided by economic considerations when considering whether or not to offer training places.

**FIRST LESSON** The existing empirical evidence clearly shows that the ratio of costs and benefits of apprenticeship training both positively and negatively influences the willingness of firms to train.

Again – as is usual with economic arguments – this is a *ceteris paribus* argument, i.e. economic facts are not posited as the only or even the most important reason for or against apprenticeships, if everything else is the same, then the cost-benefit ratio of training is decisive for whether a firm offers apprenticeships or not.



## 2 | Similar apprenticeship training systems do not necessarily produce similar outcomes

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The comparisons of the costs and benefits of companies in Germany, Austria and Switzerland were somewhat surprising. From external perspective, the assumption had been that these vocational training systems were so similar that the cost-benefit ratios of apprenticeship training would have to be similar in the three countries. Initial comparisons between Switzerland and Germany (see Dionisius et al. 2009; Mühlemann et al. 2010) showed that comparable Swiss firms achieved on average a net benefit at the end of training, while German firms had to reckon with net costs. These differences indicated that German firms could expect a benefit after the end of training on apprentices they had trained themselves, which the Swiss firms could not hope for, otherwise German firms would not have provided training under these conditions. The next question that arose was why Swiss firms using a similar vocational training system were able to achieve a net benefit and German firms were not. A detailed examination of the individual components of the costs and benefits of apprenticeship training revealed that the time spent by apprentices in productive activities reveals this difference. Unlike in Switzerland, in Germany companies employed apprentices in tasks that were – from the point of view of the firm – economically unproductive in the short term. Interestingly enough, when it comes to quality of training outcomes from the surveyed businesses' perspective, employment in demanding productive activities imparts more competences than merely practicing activities (see also lesson 3).

Finally, the comparison with Austria showed that Austrian firms, like German firms, ended the training period with net costs. But it is a mistake to assume that the reasons for the net costs compared with the Swiss companies could also be attributed to factors similar to the German-Swiss comparison. In contrast to Swiss firms, the net costs of Austrian firms are explained almost exclusively by significantly higher wages for apprentices in relationship to the wages of skilled workers (see Moretti et al. 2019). First, the relatively high apprenticeship wages can be explained by the fact that the competition between apprenticeships in firms and full-time school-based vocational training is immensely stronger in Austria than in Switzerland. In Austria only a minority of students in vocational education and training are in apprenticeships, in Switzerland the situation is exactly the opposite. In order to attract young learners, firms with apprenticeship programs try to create an incentive with high wages that Swiss firms do not need. Secondly, the payment of higher wages is encouraged by the state subsidies for apprentices' wages, which also compensates for part of the short-term costs incurred by the firm.

**SECOND LESSON Countries whose vocational training system look similar at a systemic level do not necessarily produce similar results in economic reality.**

The consequences of this are twofold: First, in order to understand the actions of firms, one must not only consider the vocational training system, but also other parts of the political environment in the country like the educational system, labour market regulations, social partnership regulations and the willingness of the state to intervene in the training market by offering subsidies. Secondly, the large differences between the German-speaking countries also mean that when a vocational training system is transferred to another country (e.g. for the simulations that have been made), the outcome may be quite different, depending on the country chosen as a model.

### 3 | Returns on apprenticeships after training are maybe more important than during

Firms that train apprentices can economically justify these investments either because the apprentice's work during the apprenticeship training already covers these investments, i.e. there are no net costs at the end of the apprenticeship training, or, if there are uncovered investments, there is a benefit after the apprenticeship training that justifies these net costs. For both Austrian and German firms offering apprenticeship programs, net costs are incurred on average at the end of the training period (see lesson 2). Additionally, the cost-benefit surveys in Switzerland showed that although the majority of firms with apprentices broke even at the end of training, one third of the firms with apprenticeship programs still have net costs, i.e. they depend on a benefit after the apprenticeship training to cover these costs. In contrast to the detailed data on the costs and benefits of apprenticeship training during the apprenticeship training, for a long time there was blind spot with regard to any post-apprenticeship benefits that may accrue. In addition, not all firms can rely on such a benefit; otherwise all firms would be prepared to incur net costs during the apprenticeship training. In other words, there must be some firms that can still achieve very great benefits with their apprenticeship training after the apprenticeship, so they accept net costs, while there are other firms that do not expect such additional benefits so they are therefore not prepared to provide apprenticeship training that incurs net costs.

Although the benefits of apprenticeship training can take many forms, the most striking benefit is that when a firm trains apprentices itself, it can avoid subsequent recruitment and onboarding costs. Firms that do not train apprentices must meet their skilled labour needs by recruiting skilled workers who have already been trained, and this can result in high recruitment and induction costs that could be avoided by training apprentices. Assuming that the firms with apprenticeship programs can retain all or at least some of

their apprentices, a question arises for firms: Can the avoidable recruitment and induction costs be high enough to justify substantial net training costs?

Our studies of these hiring costs for skilled workers show (see Blatter et al. 2016) that both an increase in these avoidable hiring costs and an increase in the net costs of training have an influence on firms' willingness to provide apprenticeship training. Hiring costs increase the willingness to provide apprenticeship training and training costs reduce the willingness to provide apprenticeship training. This would be true if the net costs of training and the hiring costs that were saved develop independently of one another. In reality, this is not the case because firms that cannot expect large savings in recruitment can only train if they can achieve a net benefit during training and vice versa, firms that save recruitment investments are more willing to invest on training. Basically, one can imagine four types of firms with different training behaviour outcomes:

- (1) Firms with net benefits and low hiring costs train because with a net benefit there is no need to look for benefit after the apprenticeship training.
- (2) Firms with net benefits and high hiring costs train apprentices anyway, since they can potentially benefit twice.
- (3) For firms with net costs during training and high recruitment costs the situation is different: Here, firms train apprentices despite the net costs if hiring costs surpass training costs, but they may refrain from training if the training costs exceed hiring costs.
- (4) Firms with net costs during training but low recruitment costs will forego training in all cases.

**FIGURE 1** Propensity to train apprentices depending on the combination of net costs (benefits) and hiring costs of skilled workers of firms

	hiring costs low	hiring costs high
net costs	very low	not clear
net benefit	high	very high

Whereas some factors explaining why some firms can expect high savings in recruitment and induction costs and others cannot are related to either the business cycle or the industry-specific situation on the labour market (see Mühlemann and Strupler 2018), institutional arrangements, like labour market regulations are also important when explaining differences between countries. Highly regulated labour markets, where firms cannot easily dismiss workers also limit the possibilities for apprentices to find jobs elsewhere after the training. This in turn protects the investments of the firms with apprenticeship programs because they can keep wages below the marginal productivity of workers and thereby create a post-apprenticeship benefit without exposing their trained workers to the risk of being poached by competitors. The significance of such labour market

regulations for the cost-benefit situation during training could be analysed based on the Hartz reforms in Germany (see Jansen et al. 2015). The results show that German firms with apprenticeship programs reacted to liberalisation by adopting training policies that came closer to the Swiss variant, i.e. they significantly reduced the net costs of training. They did this by making apprentices work more, spending less time with unproductive exercises. In the eyes of the German firms with apprenticeship programs, this change from exercises to real work was also associated with an increase in the productivity of the learners; in other words, the apprentices seemed to learn more by working than they did doing exercises.

**THIRD LESSON** **The long-term economic benefits that firms can derive from apprentices after they become employees may be more important for the decision to train apprentices than the short-term consideration of the cost-benefit ratio at the end of training.**

However, certain conditions must be met so that firms can rely on the benefits after the apprenticeship so they are prepared to accept net costs during the apprenticeship. This includes protection of training investments against competitors, which can either be legal (labour market regulations, social partnership agreements) or economic, e.g. protection against the closest competitor through geographical distance. This also means that the firms with apprenticeship programs must also be large enough to be able to offer their apprentices attractive opportunities for further employment in an internal labour market. All this suggests that small and very small firms must be able to rely on a net benefit during the apprenticeship so that they can afford training programs. Additionally, a country must be prepared to accept the sometimes negative side effects of labour market regulations and associated conflicts if it cannot offer a sufficiently large number of companies the opportunity to break even during the apprenticeship.

## 4 | Flexible but coherent training parameters are key for a functioning apprenticeship training system

From the observations made so far, it can be construed that firms are prepared to provide apprenticeship positions under various conditions and that there is not simply a single possible model of apprenticeship training. However, this does not mean that apprenticeship training is worthwhile for firms in every constellation of factors and parameters. The importance of the coherence or consistency of the combination of parameters of the training models can be best illustrated with some examples from our simulation studies. In

all cost-benefit simulations, the Swiss training model was transferred to other countries by transferring the training choices made by Swiss firms in the occupation under consideration (e. g. the number of teaching hours in the firm and the development of the productivity of apprentices relative to skilled workers) to the realities of the labour market of the country for which the simulations were carried out (represented by absolute and relative wages in the various occupational categories). Only the recruitment costs could not be simulated, these had to be determined directly by interviewing firms in the country concerned. The advantage of simulations lies in the fact that various parameters of the training model can be changed and one can thus estimate – given certain assumptions – the effects of these parameters on the cost-benefit ratios of the potential training firms. The two selected examples come from the cost-benefit simulations for Spain (Wolter and Mühlemann 2015; Mühlemann and Wolter 2017).

The first example concerns the duration of training. In most systems, the duration of training is determined by the state and can rarely be determined individually by the firms. In some countries the state decides after consultation with the employers, in others the state decrees the duration without consulting the employers and, depending on the system, the state has a uniform duration for all training or allows different lengths of training depending on the occupation. Even if it is common in the general education systems for educational courses to have standardized lengths (bachelor's or master's degrees) regardless of the field of study, this policy cannot simply be transferred to vocational training, where individual occupations require very different amounts of time for an apprentice to become productive and where companies invest very different amounts of time and money for an apprentice to reach a certain level of competence. The only standard

**TABLE 1 Net-cost simulations for Spain; three different training models and two different scenarios for apprentices' salaries**

Occupation	€300			€530			HC
	M1	M2	M3	M1	M2	M3	
Laboratory technician	5,672	6,619	-285	13,952	12,139	7,995	
Plant technician (chemical in.)	-6,742	-2,483	-12,319	1,538	3,037	-4,039	
Automobile expert	32	1,492	-5,380	8,312	7,012	2,900	
Electromechanical technician	3,735	5,064	779	12,015	10,584	9,059	
Bank clerk	-370	4,112	-4,165	7,910	9,632	4,115	
Store clerk	-3,258	-332	-8,388	5,022	5,188	-108	
Retail sales expert	-2,501	-132	-7,597	5,779	5,388	683	
Technician in food industry	-5,752	-502	-9,842	2,528	5,018	-1,562	
Hotel management specialist	-7,956	-2,689	-13,047	324	2,831	-4,767	
Cook in hotels and restaurants	-2,392	871	-6,173	5,888	6,391	2,107	

Source: Wolter and Mühlemann, 2015 (Table 12, p. 75): M1, M2 and M3 denote the different training models for which simulations were made and HC stands for the hiring costs saved on the external labour market. M1 resembles the Swiss training model for youth leaving lower-secondary education and lasts 3 years; M2 is a two-year training program for youth with an upper-secondary qualification and M3 is an extension of M2 by one additional year of training.

is the relative productivity that an apprentice must have attained at the end of training relative to a skilled worker in the relevant occupation. This should be the same everywhere, so that a transition into the occupation is guaranteed. On the other hand, the time and investment necessary to reach this point can vary greatly from one occupation to another. However, if the state sets uniform lengths for all apprenticeships, these may be set too long in individual occupations, i.e. apprentices would learn the necessary skills more quickly and in other cases they are set too short, i.e. apprentices find it difficult to learn the required skills in the time available. In the first case, firms with apprenticeship programs can now achieve a high net benefit because they can employ the apprentices „too long“ as trainees at a low apprentice’s wage while they are already very productive. In the second case, the apprentice would be of little use because of his low productivity and the company would have to invest a lot of time and money in the training in order to achieve the required level of competence in the short time required, so that the training can only be completed with very high net costs.

This can be very nicely illustrated in the case of the simulations for Spain. In Spain, the government has set a uniform length of 2 years for all apprenticeships. This corresponds to the results for model 2 in Table 1. If one simulates the net costs for a Spanish firm under the assumption that it would train apprentices in a similar way to a Swiss firm, then even in the scenario with low apprentice wages (300 euros per month) for three occupations quite high net costs would be incurred by the end of the apprenticeship (laboratory technician, electromechanical technician and bank clerk; results highlighted in red), while in the other occupations the two-year apprenticeship would be sufficient for an average firm to break even. If these apprenticeships were extended to three years (model 3), it would be possible to break even in all occupations paying a low apprentice’s wage and in those occupations that already reached break-even after two years, it would also be possible to pay an apprentice’s wage of 530 euros instead of 300 euros. This would lead to a trade-off of a longer apprenticeship period with a higher apprentice wage or a shorter apprenticeship period with a lower apprentice wage (see lesson 6). In other words, in a scenario with low apprenticeship wages, the simulation results argue against dictating uniform apprenticeship durations, since these are too short for certain occupations in the case of two years (as defined in Spain) and would be too long for many occupations in the case of a three-year duration for all occupations.

The second example concerns the interaction between net costs during training and the savings in recruitment costs after apprenticeship (see lesson 3). As already explained, not all firms or occupations have to be able to show a net benefit at the end of the apprenticeship to justify training costs, since there may be a benefit after the apprenticeship. This potential benefit after the apprenticeship is illustrated in Table 1 in the column (HC). Red was used for occupations in which the labour market in Spain at the time of the simulations was described by the companies as ‘a firm could find skilled workers who had already been trained on the external labour market with relatively little effort’. Light green was used for those occupations for which the firms indicated that it was not only costly to find trained skilled workers, but that skilled workers already trained by other firms with relatively high adjustment costs for the activities in their company still had to be qualified. The two situations must now be interpreted in such a way that in the

red cases, where no major additional benefit was to be expected due to low recruitment costs, the firms would have to be able to achieve a net benefit during the apprenticeship to make the training worthwhile, while in the green cases certain net costs during the apprenticeship could be justified by a benefit after the apprenticeship. The comparison of the simulated net costs with the recruitment costs (HC) expected by the firms now shows that 9 out of 10 simulated occupations resulted in a coherent combination of net costs and recruitment costs. Cases with high net costs, e. g. the laboratory technician, showed high returns due to saved recruitment costs and cases where no great benefit was to be expected after the apprenticeship, e. g. in the case of the hotel management specialist, most cost-benefit simulations during the apprenticeship lead to a net benefit, i.e. these firms are not dependent on a benefit after the apprenticeship. In one case, however, the situation of the net costs during the apprenticeship and the potential additional benefits to be expected after the apprenticeship do not fit together. In the case of the bank clerks, only one net cost simulation leads to a net benefit during the apprenticeship and at the same time the labour market situation seems to be such that the banks do not expect a large additional benefit after the apprenticeship. Thus, the firms are in the uncomfortable situation that training is not worthwhile even in the long run, which is why they prefer to hope that other firms or the state (universities) will conduct training and that these specialists can then be hired. In view of this situation, banks would need training parameters, such as even lower apprentice salaries or an even longer training period, so that the costs would work out for the employers in the long term.

**FOURTH LESSON Different combinations of the parameters relevant for the cost-benefit ratio are possible and flexibility is key to adapt to the different economic realities of firms. However, this should not be confused with the idea that every combination of parameters leads to a favourable outcome.**

All parameters, such as duration of training, apprentices' wages (see lesson 5), expectations of apprentices' competences and many more that have an influence on the costs and benefits of training from the firms' point of view, must first be handled as flexibly as possible because the economic reality is not the same for every firm. However, the combination of the individual parameters must be coherent. In other words, although there is no such thing as a one-size-fits-all model of apprenticeship training that meets the needs of all companies actively involved in training in a wide variety of occupations, this does not mean that individual parameters of training can be determined and changed at will, because they must be coherent in both their entirety and interaction in order to guarantee cost-effective training. There is neither a one-size-fits-all nor an everything goes solution.

## 5 | Variable apprentices' salaries prevent distortions in the apprenticeship market

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If one looks at the main determinants of the costs of apprenticeship training, then apprenticeship wages are the largest single cost. In Switzerland, apprenticeship wages generally account for between 40 and 50 % of the gross costs of apprenticeship training. It is not surprising that wages are one of the most important questions when analysing the costs and benefits of apprenticeship training. Considering the question of determining the wage level from the firms' perspective, one would assume that apprenticeship wages are set as a function of the remaining costs and benefits. Thus, the wage used would either guarantee that a firm's apprentice program breaks even at the end of the apprenticeship or that the firm incurs a justifiable level of net costs, which it hopes to compensate through benefits garnered after the apprenticeship. This wage would be the wage offer and whether the firm will get apprentices with this wage or not would depend on the labour market for apprentices, because if there were other firms paying a higher wage, the firm might not find any apprentices at all. If the quality of the training were consistent, the competition between firms over wages would also lead to the apprentices being trained in firms where they would provide the greatest economic benefit. In reality, in many countries the variable apprenticeship wage is not determined according to market considerations, but by a fixed wage, which is decided either by the state (e. g. minimum wages for young people) or negotiated between the social partners. Consequently, neither the company's initial situation nor whether the apprentice's salary is justified by the apprentice's contribution are considered. This exogenously fixed wage can therefore be far too low, which allows the firms providing apprenticeships to achieve large net benefits or – and this is the more frequent case – too high, which discourages too many firms from providing training.

In the case of fixed apprenticeship wages, a further distinction can be made between two forms of wage levels, namely an absolute wage level and setting a relative value to a comparative wage, usually the wage earned by a trained skilled worker in the occupation to be trained. The second version, namely the relative level based on a reference wage, can also be oriented either on the real wage paid by the training company to its skilled workers or – much more frequently – on an average wage paid for this category of skilled workers across the entire sector. While the determination of wages as an absolute value takes no wage differences between sectors, occupations, regions or company sizes into account, the relative apprentice wage at least has the advantage that it considers the huge differences in the wages of skilled workers between individual occupations, which can be observed in all countries.

In all simulations we did, for the countries England, Italy and Spain, ex ante fixed wages had to be used, since in all three countries either minimum youth wages or fixed wages for apprenticeship training had to be taken into account (Wolter and Joho 2018; Mühlemann, Wolter and Joho 2018; Wolter and Mühlemann 2015). Therefore, we included wages as fixed

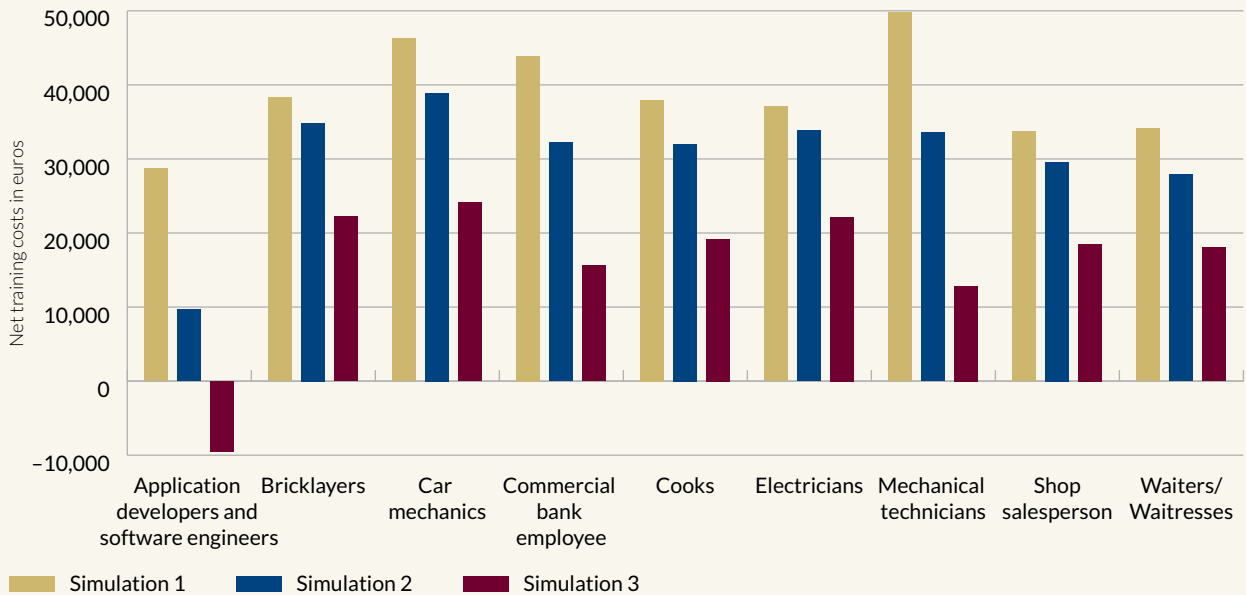


variables in the simulations and, depending on these wages, calculated the net costs or net benefits of apprenticeship training for the selected occupations in all cases. However, as a complement, we also estimated the apprentice wages as the outcome of the net cost calculations, i.e. what wages the firms would be able to pay if their goal was to have no net costs at the end of the training period. These wages could then be compared with those previously set. In those cases where these wages were above the minimum wages, the potential scope of increasing salaries in order to attract potential apprentices was becoming evident, and in the other cases where the break-even compatible apprentice wage was lower than the prescribed minimum wage, it was possible to estimate how far wages would have to be lowered in order to attract a sufficient number of firms to conduct training.

If the apprenticeship wages cannot be determined by the firms themselves, but are given exogenously as absolute or relative wages, then the firms only have the possibility to decide whether they train or not depending on these wages. If there is only this possibility to react, the consequences for a vocational training system would be quantitative, namely how many companies are willing to train or not, and depending on the determination of wage levels there would still be a distribution effect, because certain regions, branches or companies could live better on those wages than others. All in all, the consequences would be manageable. Unfortunately, in most cases there may be other consequences, particularly if the expected quality of training is difficult to monitor. This would provide firms with the opportunity to influence the net costs of training by changing other cost parameters as a function of apprentice wages. In plain language, if the quality of training can only be observed approximately and poor quality of training is only inadequately punished, firms willing to provide training will react to exogenously excessively high apprentice salaries by reducing the other cost blocks. Since the other costs, the wages for the trainers, the expenses for training material, the time for training activities, etc., all have a negative influence on the quality of training; the danger is that apprentices will unintentionally exchange high apprentice salaries for low training quality.

In a simulation using Italian data, we examined by how much the net costs of firms with apprenticeship programs could be reduced if they were to respond to the high prescribed apprentice wages by reducing their training inputs (see Table 2). These simulations took into account the fact that if firms were to reduce their investment in training, the productivity of apprentices would also suffer, i.e. not only the costs, but also the benefits of training might be reduced. Despite the effect of reduced investment in training on the benefit of training, it was shown that substantial savings in net costs could be achieved for all occupations, and in one case net benefits could even be generated. This does not mean that all firms react this way to excessively high apprenticeship wages – as mentioned above, many firms are more likely to simply forego training altogether – but the simulations show that excessively high apprenticeship wages can be an incentive for individual firms to reduce the quality of training and that the quality and attractiveness of the entire system can thus be jeopardised.

FIGURE 2 Net costs simulations for different scenarios of training intensity in the firm for Italy<sup>3</sup>



Source: Muehleemann et al., 2018 (Figure 10, page 46)

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**FIFTH LESSON Fixing apprentice wages, in absolute or relative terms, i. e. not determining wages by evaluating the influence of market forces, will almost always lead to distortions in the apprenticeship market.**

Such distortions can affect the willingness to train in general, but they can also hinder training in individual sectors, for certain occupations, for individual types of firms (e. g. SMEs) or entire regions. If the quality of training is ensured, there are no obvious reasons to deviate from the determination of wages by companies (individually or collectively). If, on the other hand, there is no functioning guarantee of training quality, then wages fixed by the state or social partners will not help either; on the contrary, they can lead to even worse training quality.

3 Simulation 1 corresponds to the baseline simulation with ex ante fixed apprentices' salaries. Simulation 2 is a scenario in which firms would react to the high net costs by deciding not to provide training at the workplace and therefore also dispense with any training time. However, due to reducing the training at the workplace, we have to further assume that the relative productivity of apprentices is 50 % of the relative productivity used in Simulation 1. Simulation 3 additionally assumes that while at the workplace, apprentices spend all their time doing simple tasks that are usually allocated to unskilled employees. The firms realize that the progress and the levels of productivity of the apprentices (assumptions in Simulation 2) are too low to generate a satisfactory added value when doing skilled work, and therefore decide to only use the apprentices to substitute for unskilled labour.

## 6 | Apprentices' benefits are a relevant factor that must also be considered for a functioning apprenticeship system

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So far, the focus has exclusively been on the net cost consideration from the firms' point of view. This limited perspective can be explained by the fact that there can be no apprenticeship training unless firms offer apprenticeships. In other words, it is of no use for the other parties involved, the students and the state (or society) to optimise the conditions first if no firms are willing to train under these conditions afterwards. However, at the end of the day, the firms cannot train if they cannot find any apprentices or only insufficiently talented young people are willing to do an apprenticeship, which means that apprenticeship wages and training offers that would give the firms a net benefit, but which are not attractive enough to the young people, do not lead to a functioning apprenticeship market.

In the end, the training must be equally attractive for both the firms and the young people. So, in the simulations for England, we simulated not only the net costs for the firms but also the returns on education for the young people. In the case of the latter, it was assumed that they would start their training at the earliest possible age, after successful completion they would earn the average salary of a qualified skilled worker in the occupation they had learnt, as currently paid on the English labour market, and finally that they would receive an apprentice's wage during their apprenticeship that was calculated to guarantee that firms with apprenticeship programs can break even at the end of the training period. Table 3 shows the simulated returns on education for young people. Returns below 5 %, i.e. below the normal time preference for people, can be described as insufficient. This means in these cases not enough young people can be expected to apply for an apprenticeship, or that those who would apply would be unsuitable candidates in terms of talent and motivation. As a result of unsuitable candidates, the calculated net costs for the companies would increase (because of the lower productivity of these apprentices and the higher number of training hours needed), which in turn would result in lower apprentice salaries and thus lower returns on education. A vicious circle.

As can be seen from Table 3, there are some occupations for which very high returns on education have been calculated, i.e. apprenticeship training that promises positive returns for both firms and apprentices and represents a win-win situation. However, there are also occupations with very low returns on education and even two occupations (retail cashiers and waitresses and waiters) for which no training model could be simulated that would generate an acceptable average return on education for the apprentices, assuming that at the end of the training period the firms would have covered their investments with a benefit. One way out (see lesson 7) of such a situation would only offer a higher skill premium in those occupations with such low returns on education.

**TABLE 2 Rates of return on education, assuming break-even apprentices' salaries; England**

Occupations	Model 1	Model 2	Model 3
Bricklayers	19%	11%	9%
Car mechanics	13%	9%	7%
Care workers	8%	4%	3%
Commercial bank employees	18%	11%	10%
Cooks	7%	4%	3%
Electricians	7%	4%	3%
Financial analysts and advisors	12%	8%	7%
IT/software developer	17%	11%	10%
Retail cashiers	4%	2%	1%
Waitress and waiters	5%	2%	2%

Source: Wolter and Joho, 2018 (Table 3, page 44); M1, M2 and M3 denote the different training models for which simulations were made. They are as in Table 1: M1 resembles the Swiss training model for youth who have attained lower-secondary education and lasts 3 years; M2 is a two-year training program for youth with an upper-secondary qualification and M3 is an extension of M2 by one additional year of training.

**SIXTH LESSON** Although the firms offer apprenticeships in which the cost-benefit ratio is right for them, there will still be no functioning apprenticeship system if the cost-benefit ratio (the return on education) for the students is not right as well.

In consequence, in order to achieve a win-win situation for firms and apprentices, it must be possible to guarantee more than just an absence of net costs for the firms with apprenticeship programs.

## 7 | Training quality and scope may reduce net-costs and increase returns on education

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It has become clear from the previous consideration of the returns on education for apprentices that such returns are not necessarily given in all cases in which the firms could carry out the training on a cost-neutral basis. In those cases, where the returns on education for apprentices are low, the reason almost always lies in the fact that skills premium, i.e. the additional income that can be expected thanks to training, is only slightly above the wage of an unskilled worker. There can be two reasons for this: On the one hand, it may be that these activities, although they require training, simply do not produce goods and services that generate profitability that allows higher wages. On the other hand, training may not be good enough for workers to produce goods and services so efficiently that a higher wage would be possible. For example, serving staff who are so poorly trained that they are so inefficient; the restaurant needs far too many staff for the customers, or staff whose services are so poor that the customers' willingness to pay for these services is minimized.

The strategies to deal with these challenges depend on the two reasons for the insufficient skill premium mentioned above. In the first case, where it is an occupation that never generates enough added value for a necessary skill premium to be created, it is not suitable to be trained with much effort. That doesn't mean that one should not train this profession any more. However, it means that this profession should be either only the preliminary stage to a more demanding occupation, which you can only learn if you have learned the basic occupation first, or that you change the vocational concept so that the training already prepares apprentices for additional activities that generate a higher added value. If, for example, sales personnel are only trained for simple sales, then it will not be worthwhile for either the firm or the apprentice to spend a long time in training. However, if this training is the basis for a position in the middle management of a shopping centre, then it can be worthwhile for both. The apprentice can significantly increase his wage prospects and the training firm can find candidates for middle management who they could not recruit on the external labour market, or only at higher costs. For the firms with apprenticeship programs, the possible net costs of training are justified by substantially increased savings in recruiting – not of salespeople, but of people qualified for middle management.

If, on the other hand, the lack of skills premium is simply a consequence of poor training, then a potential training firm must consider whether and to what extent better training could increase the productivity of employees or the willingness of customers to pay. In other words: the firm must find out if a price increase is possible without having to fear that customers would defect to their competitors. If this additional investment in training is worthwhile, it does not always automatically have a positive effect on the net costs of training. Of course, better training can only be guaranteed by better training personnel, which is more expensive, and in addition, the training periods are likely to be longer, which

in turn reduces the time during which the apprentice works productively. However, these increased costs and declining earnings are potentially offset by a significant increase in benefits, which compensate for the additional investment during the apprenticeship. Apprentices who are better trained will already show a higher labour productivity during the apprenticeship and in addition one must consider that they now take the place of skilled workers who would get a higher wage because of their better training, i.e. the apprentices substitute more expensive skilled workers and thus create more benefits for the firm. Finally, it can even be assumed that a training firm that can reliably prove that it offers good training quality will find better apprenticeship candidates at the same or even lower wages. The reason for this is that talented potential apprentices realize that, while they suffer a short-term loss of income compared to a poor-quality apprenticeship with a higher apprentice wage, they have greatly improved prospects of a better wage during the rest of their working life, which more than compensates for this loss of income.

**SEVENTH LESSON** **The definition of the scope of training and the training quality are key for creating a win-win situation for firms and apprentices in most cases.**

Improvements in training quality and enlargements of the scope of training are often only seen as increasing the net costs of training in the short run, and as difficult to compensate for in the long run. However, there are good arguments within the existing context of the cost and benefit calculation models that show that these measures may not necessarily lead to higher net training costs during the apprenticeship. High-quality training that prepares apprentices not only for the occupation, but for higher level jobs leads to a more balanced combination of lower net training costs, higher saved hiring costs and higher rates of return on education for apprentices. Especially when compared to a combination of lower – but still net costs of training, low to non-existent savings in hiring costs together with low returns on education for apprentices.

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## About the authors

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**Prof. Dr. Stefan C. Wolter** studied economics and psychology at the University of Berne, where he heads the Centre for Research in Economics of Education. Since 1999, Prof. Wolter serves as Managing Director of the Swiss Coordination Center for Research in Education. In addition, since 2011, he chairs the OECD expert group on Vocational Education and Training, and has been since 1999 a member of the OECD Governing Board of the Centre for Educational Research and Innovation (CERI) and member of the OECD Education Policy Committee since 2000.

Prof. Wolter's main areas of research include labor economics and economics of education.



**Prof. Dr. Samuel Mühlemann** studied economics at the University of British Columbia and at the University of Bern, where he worked as deputy head of the Centre for Research in Economics of Education from 2011 until March 2014. Since April 2014, he holds a professor post at the Institute for Human Resource Education and Management at the Ludwig-Maximilians-Universität München. He has been a visiting scholar at, among others, the University of California in Berkeley and King's College in London.

Prof. Mühlemann's main areas of research include economics of education, labor economics, industrial relations, personnel economics and regional economics.



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Contact person:

**Hanka Boldemann** | Philanthropy Manager | J.P. Morgan Global Philanthropy  
hanka.boldemann@jpmorgan.com

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Bertelsmann Stiftung  
Carl-Bertelsmann-Straße 256  
33311 Gütersloh  
Germany  
Phone +49 5241 81-0  
[www.bertelsmann-stiftung.de/en](http://www.bertelsmann-stiftung.de/en)

## Executive Editors

Dr. Marcus Eckelt  
Naemi Härle

## Authors

Prof. Dr. Samuel Mühlemann  
Prof. Dr. Stefan C. Wolter

## Editing

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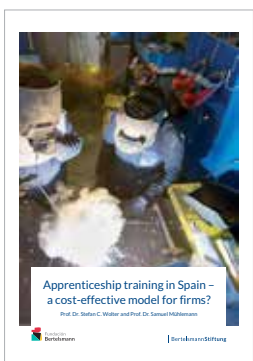
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## **Address | Contact**

Bertelsmann Stiftung  
Carl-Bertelsmann-Straße 256  
33311 Gütersloh  
Phone +49 5241 81-0

**Dr. Marcus Eckelt**  
Project Manager  
Learning for Life Program  
Phone +49 5241 81-81393  
marcus.eckelt@bertelsmann-stiftung.de

**Clemens Wieland**  
Senior Expert  
Learning for Life Program  
Phone +49 5241 81-81352  
clemens.wieland@bertelsmann-stiftung.de

[www.bertelsmann-stiftung.de/en](http://www.bertelsmann-stiftung.de/en)