THE SIMPLE ECONOMICS OF APPRENTICESHIP

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SECTION 1 INTRODUCTION

An apprenticeship is a contract between an employer and a young person. It combines a structured programme of on-the-job training and productive work with part-time, formal technical education. Apprenticeship training is usually formally certificated. It equips people with intermediate-level skills of the kind required by people who fill roles typically described as 'Skilled Trades' and 'Technicians/ Associate Professionals and Technical Occupations.' Apprenticeship should be viewed primarily as a model of learning or education designed to train people for particular occupations, rather than as an instrument of government policy. Accordingly, it may – but need not – take place as part of a government-supported training programme. The combination of formal education and workplace learning provided by an apprenticeship promises distinct educational benefits:

- by demonstrating the practical relevance of technical knowledge, it can encourage young people to learn, especially those unhappy with full-time schooling,
- and by introducing young people to the practices and disciplines of actual workplaces, using what is usually better equipment than is found in schools and colleges, it promises to bolster the quality of what they learn.

Moreover, as apprentices see their skills and knowledge develop and become recognised in the work-place, they acquire a sense of self-worth and professional/ occupational identity. Hence, apprenticeship promises to ease young people's transition from the world of school to that of full-time work. Its beneficial effects are seen at the individual level, in the form of improved access to employment and higher rates of pay. There are also benefits at the aggregate or macroeconomic level, in the form of lower youth unemployment (McIntosh 2007; Wolter and Ryan 2010: 551-53).

This paper outlines the principal theoretical framework used to analyse both employers' and employees' decisions about whether or not to participate in apprenticeship training, and also the case for government intervention designed to encourage involvement in apprenticeships. The framework is provided by economics and, in particular, human capital theory.

Section 2 summarises the theory of human capital as it applies to the employer's decision about whether or not to train apprentices (Section 2.1) and to the trainee's decisions about whether or not to become an apprentice (Section 2.2). Section 2.3 considers the temptation to offer only low-quality training. Section 3 discusses the case for government intervention to support apprenticeships. Section 4 summarises and draws conclusions.

SECTION 2 EMPLOYERS' AND EMPLOYEES' DECISIONS ABOUT WHETHER TO INVEST IN SKILLS: A THEORETICAL PERSPECTIVE

In this section, a broad theoretical framework will be outlined that will highlight issues relevant to firms' and individuals' decisions about whether to engage in training. The framework is drawn from economics and, in particular, human capital theory. This approach views employers' and employees' decisions to become involved in training as an investment decision, whereby people forgo current benefits (profits, in the case of firms, and wages and/or leisure, in the case of workers) in order to invest in an asset (in this case, skills). That asset will, it is hoped, yield a return in the future which is more than sufficient to offset the initial cost of the investment required to generate it. Human capital theory therefore treats apprenticeship as an investment in skills that requires a sacrifice of current income in return for greater skills, greater productivity, and a higher income in the future.

2.1 THE EMPLOYER'S DECISION

Contemporary economics tends to view employers' decisions about the provision of training through the lens provided by the theory of human capital under imperfect competition. This portrays employers as inhabiting a labour market in which competition for workers is insufficiently fierce to drive up wages until they are equal to the value of extra output produced by the worker in question (i.e., the worker's marginal product). This may be because:

- workers' skills are only transferable, in the sense of being valuable, to some but not to all firms;
- employers are uncertain about workers' skills;
- it is costly for workers to search for a new job.

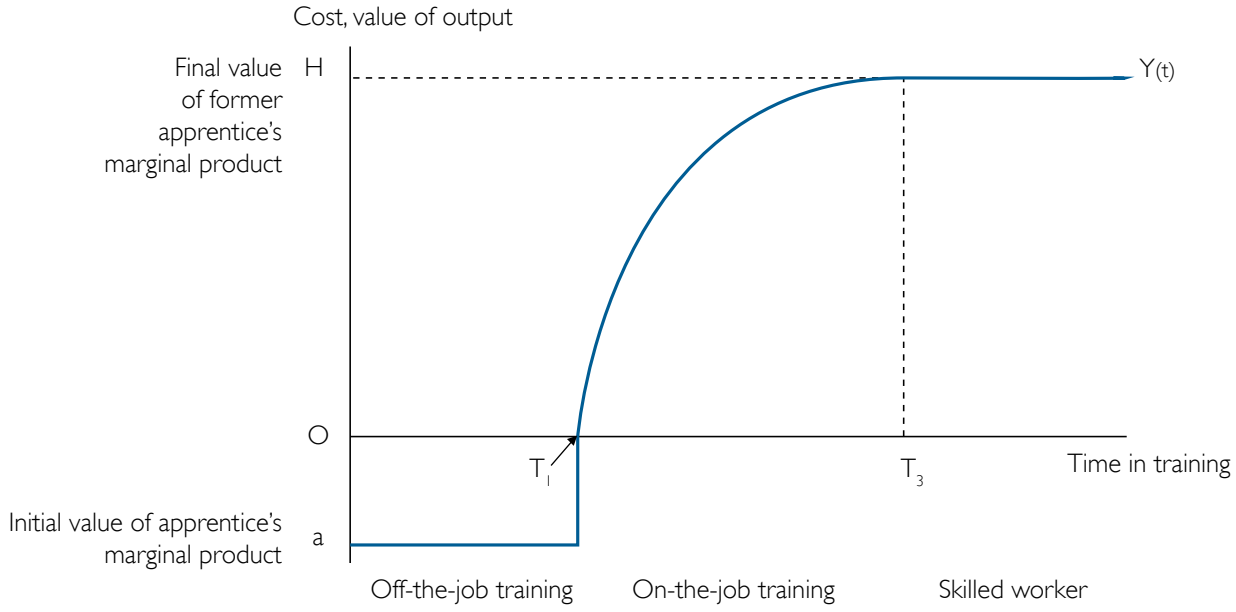
Employers therefore enjoy a degree of market power and are able to pay skilled workers a wage that is less than their marginal product without losing them to rival firms.

There are several reasons why competition for the services of skilled workers might be so limited. First, the training received by the workers may have been rather narrow and firm-specific, so that is it valuable only to a relatively small number of firms. This reduces the number of employers willing to bid for those workers' services (Stevens 1994: 537-41). Second, the workers' skills might be uncertificated, or only certificated to opaque and/or unreliable standards. Consequently, employers will be uncertain how skilled the workers really are, and will therefore be reluctant to compete fiercely for their services (Katz and Zidderman 1990). Third, it might be simply that it is costly for workers to search for a new job, so they do not offer their services to other firms (Stevens 1996: 28).

Such limitations on competition for skilled workers mean that employers enjoy some market power and can pay workers less than their marginal product without losing them to rival firms. This gives employers an incentive to bear some of the costs of training. Employers do have to pay newly trained workers a higher wage to retain them, but the increase in the wage will be less than the rise in the workers' marginal

product. Therefore employers obtain a positive share of the returns from training (Stevens 1994; Acemoglu and Pischke 2000; Wolter and Ryan 2010: 524-38).[1] [2]

Figure 1a: The graph shows how the value of what an apprentice produces (the 'marginal product') increases over time ***(based on Ryan 1980: Figure 1).***



The time-path of the value of the trainee's marginal product – that is, the value of what (s)he produces less the value of the raw materials (s)he uses and the output that his/her instructors and assessors could have produced had they not been working with him/her – is given by the blue curve Y(t). The Y(t) curve is drawn in Figure 1a for the following case:

- first, trainees spend an initial period of time (OT_1) either in a company training school or on block release at a further education college; followed by
- a spell of on-the-job training in the workplace (T_1 to T_3); after which
- apprentices become fully productive (skilled) workers (time T_3 onwards).

The blue Y(t) curve lies below the horizontal axis initially, during the period when the trainee's marginal product is negative. There are two reasons for this. First, the apprentice is in a training school or at college, rather than on the shop floor, so his/her gross output will be zero. Second, the firm employing the apprentice incurs

1 Empirical evidence in support of the conjecture that training will increase wages by less than it does productivity can be found in Dearden et al. (2000, 2005).

2 Were the market for skilled workers perfectly competitive, by contrast, as would be the case if skills were completely general – in the sense of being just as valuable to (many) other employers as to the one in which they were learned – then employers would have no incentive to invest in training. The reason is straightforward. Any employer that made a financial contribution to equipping workers with general skills and then attempted to recoup its investment by paying workers less than their post-training marginal product would soon find those workers being lured away ('poached') by rival firms. (Since the skills in which the firm invests are embodied in people, the firm cannot acquire a property right over them and so cannot prevent the loss of the asset in which it has invested.) Other firms, which have not incurred any of the costs of training the workers in question, and knowing that their skills are just as valuable to them as to their current employer, would be willing to pay them a slightly higher wage than the firm that trained them. Therefore, in order to retain workers whose training it financed, an employer would have to pay them a wage equal to their post-training marginal product. This would prevent it from earning a positive return on its initial investment in training, and would deter it from making such an investment in the first place. In this scenario, the entire cost of training in general skills will be borne by workers, for example through their being paid a training wage that is less than their marginal product (Becker 1993: 33-40).

the cost of the raw materials used in training, and loses the value of the output that would have been produced by its instructors and NVQ assessors had they been working on the shop floor rather than with the apprentice. Once those two costs are taken into account, the apprentice's marginal product is negative. Over time, however, as the apprentice becomes more skilled – and, therefore, more productive – the value of his/her marginal product will rise, as shown by the upward-sloping portion of the Y(t) curve.

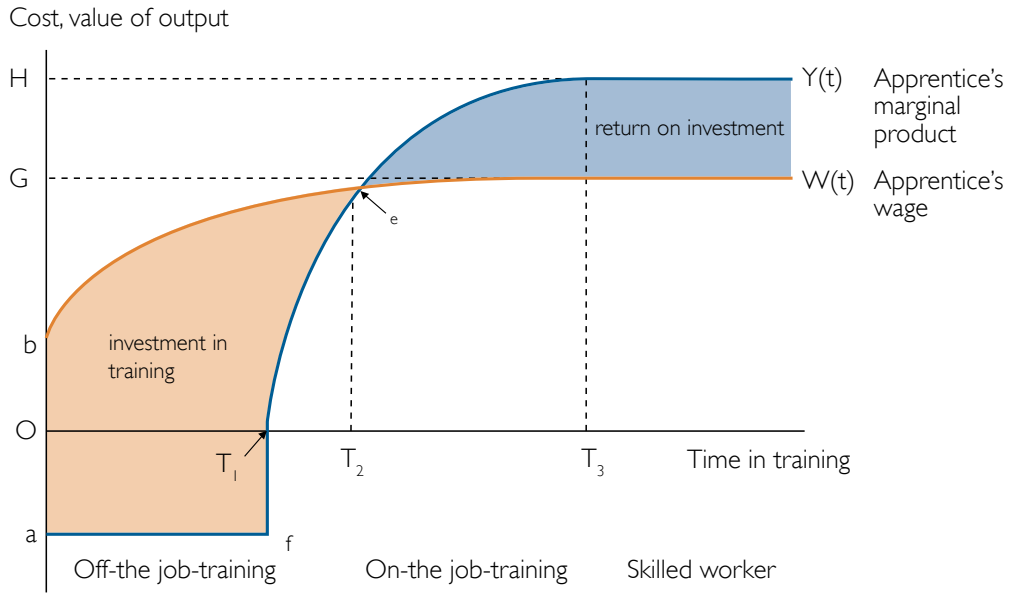
More specifically, the Y(t) curve:

- rises above the horizontal axis after time T_1 (indicating that the apprentice's marginal product is positive from T_1 onwards); and
- reaches a (rough) plateau at time T_3, at which point the trainee has become a skilled worker. The skilled worker's marginal product is given in Figure 1a by the vertical distance OH.

Empirical studies indicate that net costs vary considerably between training frameworks. Unsurprisingly, given the significant amount of off-the-job training required, the net costs of (level 3) apprenticeships in STEM subjects such as engineering tend to be relatively high, with relatively recent estimates suggesting net costs of a little under £30,000. In stark contrast, the net costs of level 3 apprenticeships in subjects such as Business Administration appear to be much lower (in the region of £4000). However, employers who take engineering apprentices are likely to recoup the costs of their investment within two to three years of the end of the training programme (Gambin *et al*, 2010; also see Hogarth and Hasluck 2003: ix-x, 12-13, 36, 42).

We can develop this analysis by adding to Figure 1a the curve W(t) which shows how the apprentice's wage varies over time. The resulting diagram is shown in Figure 1b. The apprentice's initial wage is given by the vertical distance Ob. Over time, as the apprentice completes more and more of the training programme, his/her wage increases. This is shown in the diagram by the fact that the wage curve W(t) slopes upwards from left to right. Once the apprentice has completed the training programme – at time T_3 – he or she earns the skilled worker wage. The value of this is given in the diagram by the vertical distance OG.

Figure 1b: The time paths of marginal product and wages for apprentices



Note the following:

- the Y(t) curve lies below the W(t) curve before time T_2, showing that prior to T_2 the value of the apprentice's marginal product is less than the value of his/her wage;
- at T_2, the value of the apprentice's marginal product just equals the value of his/her wage, and the two curves intersect (at point e); and
- from time T_2 onwards, the Y(t) curve lies above the W(t) curve, indicating that from T_2 onwards the trainee's marginal product exceeds his/her wages, so that the employer begins to recoup its investment in the worker's skills.[3]
- The skilled worker's marginal product (OH) continues to exceed his/her wage (OG). Therefore, the employer continues to earn a positive rate of return on its investment in the worker's skills for as long as he or she remains with them.[4]

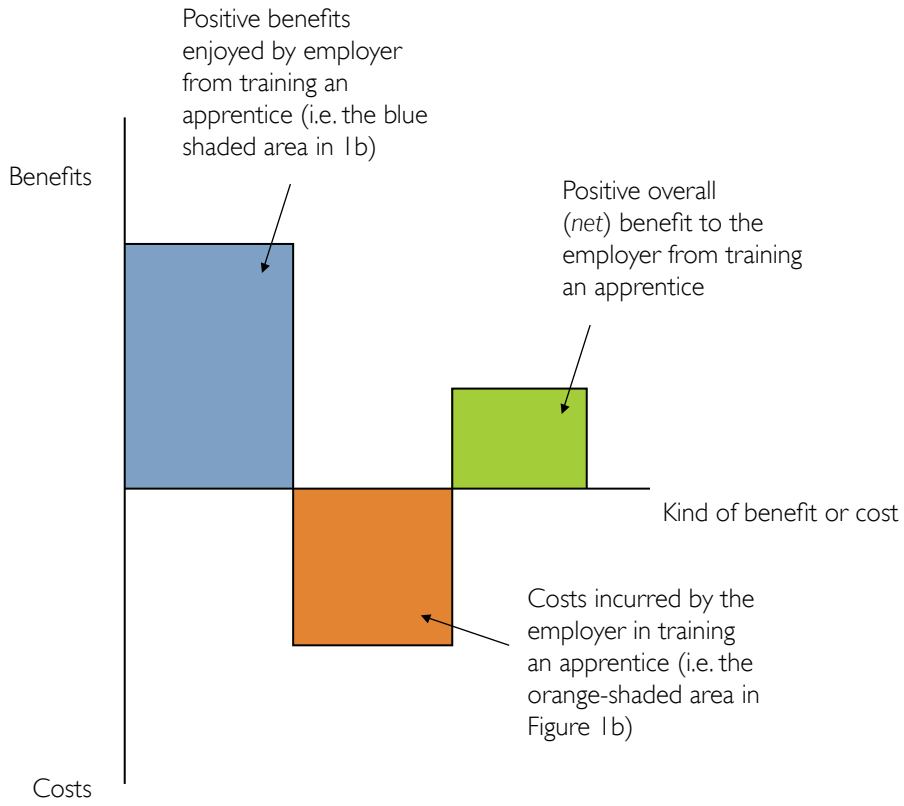
The cost of providing training is borne by the employer to the extent that it pays the trainee a wage exceeding the value of his or her marginal product. The fact that the trainee's wage exceeds the value of his or her net contribution to output between time T = 0 and time T_2 implies that the employer makes an investment in training whose value is represented by the orange-shaded area *abef*. This is an investment which, as noted above, the employer hopes to recoup because, after time T_2, the apprentice's marginal product (as shown by the Y(t) curve) exceeds his/her wage (as given by the W(t) line). More specifically, because the value of the skilled worker's output is greater than his/her wage after T_2, then from that time the employer will earn a positive return on its investment, the value of which is represented in Figure 1b by the size of the blue-shaded area lying between the W(t) and Y(t) curves to the right of point e.

Provided that the former apprentice remains with the firm for long enough after time T_2 (i.e. provided that the size of the blue-shaded area in Figure 1b exceeds

3 The net output [Y(t)] and wage [W(t)] curves in Figure 1b show that employers can start to recoup their costs and begin to earn a positive return on their investment in training while training is ongoing, rather than simply once it is over. This is borne out by empirical studies of the costs and benefits of training apprentices (see, for example, Jones 1986: 347-48 and Hogarth and Hasluck 2003: 12, 18).

4 Empirical evidence suggests that employers do indeed obtain this excess of productivity over wages (see, e.g., Booth and Bryan 2005, and Bassanini and Brunello 2008).

Figure 1c: An apprenticeship that yields a positive overall net benefit to the employer because the apprentice then stays with the firm.



the size of the black-shaded area *abef*), the firm will benefit sufficiently from the (ex-)apprentice's higher productivity to earn a positive rate of return overall on its investment in the worker's skills. A rough, schematic illustration of this case is provided by Figure 1c.

The size of the positive returns enjoyed by the employer from its investment in the apprentice from T_2 onwards (i.e. the blue-shaded area in Figure 1b) is given by the first column in Figure 1c.

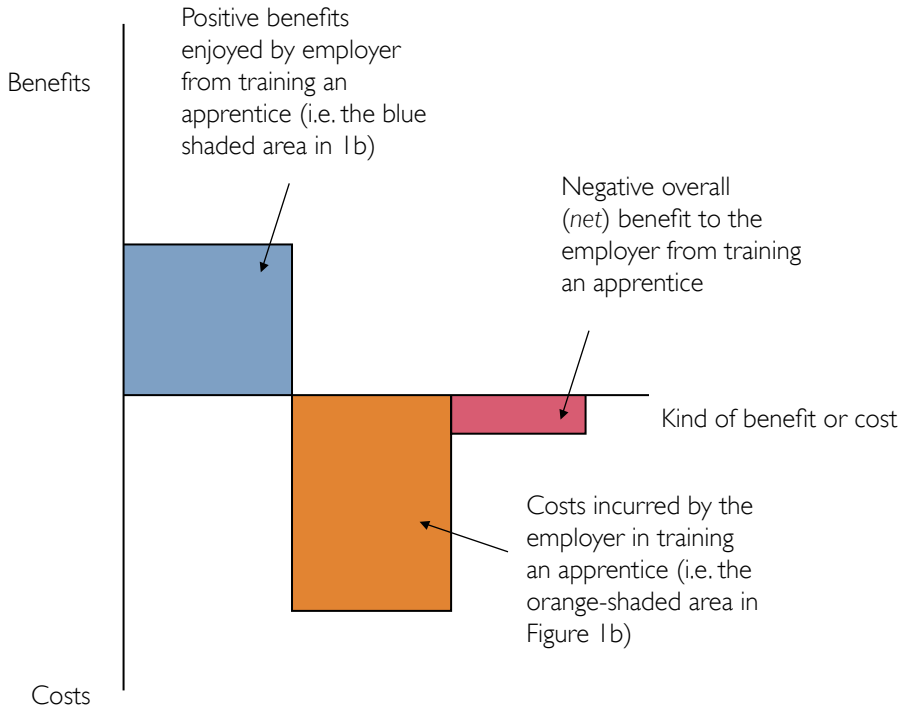
The cost of the employer's investment in the apprentice between $T = 0$ and T_2 (i.e. the orange-shaded area in Figure 1b) is given by the second column in Figure 1c.

The employer's net gain (which is the sum of the previous two items) is given by the third column.

The positive returns earned by the employer after T_2 in Figure 1b are greater than the costs it incurs before T_2. Therefore the third (green-shaded) column in Figure 1c lies above the horizontal axis. This represents the overall net benefit enjoyed by the employer from its investment in apprenticeship training. In this case, the employer will enjoy a positive overall rate of return on its investment in training. It will therefore decide to invest in training apprentices.

If, however, apprentices tend to leave their employer shortly after completing their training, so that the blue-shaded area in Figure 1b is smaller than the orange-shaded area, then the employer will not earn a sufficient return on its investment to offset its costs and will therefore be unwilling to invest in training in the first place. This case is shown in Figure 1d.

Figure 1d: An apprenticeship that yields a negative overall net benefit to the employer because the apprentice leaves shortly after completing training.



In this case, the positive returns enjoyed by the employer after T_2 are too small to offset the costs it incurs prior to T_2. Therefore if the employer were to take on apprentices it would suffer a negative overall return. In Figure 1d the third (red-shaded) column lies below the horizontal axis, showing that in this case the firm will suffer losses from its investment in training. As a result, the firm will decide against investing in apprenticeship training.

We shall return to this point in section 3.1 below, when we consider whether the amount of training undertaken in the absence of government intervention is likely to be optimal from the point of view of society as a whole. Before doing so, however, we shall consider the decision about whether or not to participate in training – or, put slightly differently, to invest in one's skills or human capital – from the vantage point of the prospective trainee.

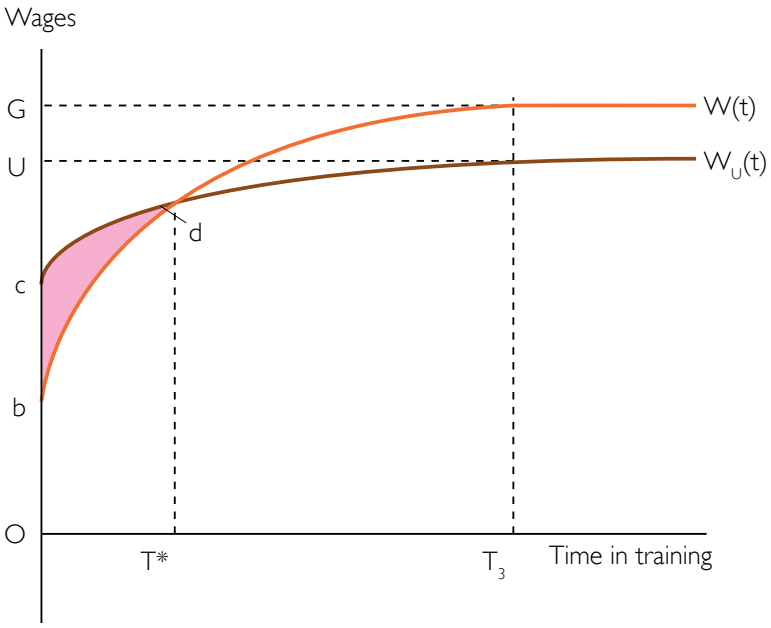
2.2 THE EMPLOYEE'S DECISION

In order to examine the worker's decision to invest in training, consider Figure 2. The diagram reproduces the wage curve W(t) used in Figure 1b.

At the outset of his/her training, the apprentice's wage is given by the vertical distance Ob. The apprentice's wage increases as his or her training progresses. This is shown by the upward-sloping W(t) line. The apprentice completes his or her training at time T_3, at which point (s)he becomes a skilled worker and is paid the going rate for the job (OG).

In Figure 2 the wage curve for the apprentice W(t) is accompanied by another wage curve, $W_U(t)$, which shows how the wage earned by an unskilled worker varies over time.

Figure 2: The time paths of apprentice wages and of wages for unskilled workers.



Orange line shows how the apprentice's wage increases over time, and ends up higher than the unskilled worker's wage

Brown line shows the small amount of change in the unskilled worker's wage

Pink area shows the size of the apprentice's investment

Comparing the curves W(t) and $W_U(t)$ reveals the following points:

- First, the W(t) curve initially (T = 0) lies below the $W_U(t)$ curve. This indicates that the wage initially earned by an apprentice (which is given by the vertical distance Ob), is less than that initially earned by an unskilled worker (Oc).
- Second, the apprentice wage continues to be less than the unskilled worker's wage up until time T*. Between T = 0 and T = T*, therefore, the apprentice's total earnings (which are given in the diagram by the area ObdT*), will be less than the unskilled worker's total earnings (which are represented by the area OcdT*). The difference is represented by the pink shaded area *bcd*.
- Third, the W(t) curve is steeper than the $W_U(t)$ curve, rising more rapidly as time passes (from left to right in Figure 2). This indicates that the apprentice's wage rises more rapidly than the wage earned by unskilled workers. This is because as the apprentice is being trained his/her marginal product increases faster than that of the unskilled worker (who is receiving little if any formal training).
- Fourth, because the apprentice's wage is growing faster than the unskilled worker's wage, it is the case that from time T* onwards the apprentice earns more than the unskilled worker. This is shown in Figure 2 by the way that the W(t) curve lies above the $W_U(t)$ curve from point d onwards.
- Fifth, the wage ultimately earned by someone who has completed an apprenticeship (whose value is given by the vertical distance OG in Figure 2) is greater than that earned by an experienced unskilled worker (whose wage is represented by the vertical distance OU).

The comparison between the wage curve for unskilled workers and apprentices reveals that people who become apprentices are making an investment in their skills. The wage they earn while in training is less than the wage they could have earned as unskilled labourers. Assuming that the way in which the wages of

unskilled workers change over time is given by the wage curve $W_u(t)$, then the size of the apprentice's investment is given by the pink shaded area *cbd*. This represents the cost – in terms of wages forgone – that the apprentice has to pay in order to become a skilled worker.

However, this is a cost the apprentice believes (s)he will recoup – it is an investment (s)he believes will pay dividends – because from time T* onwards the apprentice's wage will exceed that earned by unskilled workers. In Figure 2 the wage earned by skilled ex-apprentices (OG) exceeds that paid to even the most experienced unskilled worker (OU).

The higher wage ultimately earned by people who take an apprenticeship and become skilled workers is their reward for their initial investment in their skills. This makes it worthwhile for apprentices to spend time in training. More specifically, so long as the benefit to be had by becoming a skilled worker (as represented in Figure 2 by the area lying between the W(t) and $W_U(t)$ curves to the right of point d) exceeds the cost of acquiring the skills in question (as given by the pink area *cbd*), then the investment in skills is worthwhile and something that a rational person should undertake.[5]

We can complete this part of the analysis by referring back to Figure 1b and considering how the cost of training the apprentice is divided up between the employer and the worker. The division of the costs of training between the apprentice and the employer depends on the wage that the apprentice is paid and, more specifically, on how that wage compares with the trainee's marginal product (i.e. it depends on the position of the W(t) curve). The cost of providing training is borne by the employer to the extent that it pays the trainee a wage exceeding value of his or her marginal product. It is borne by the trainee to the extent that his/her wage while in training is less than the wage that (s)he could have earned by doing something else. This could be working as an unskilled labourer, for which wages are assumed to be given by the wage curve $W_u(t)$ in Figure 2.

In the example shown in Figure 1b, the trainee's wage exceeds his or her marginal product (that is, the value of his/her net contribution to output) until time T_2. This implies that the employer makes an investment in training whose value is represented by the orange-shaded area *abef*. This is an investment that, as noted earlier, the employer hopes to recoup because after time T_2 the worker's marginal product exceeds his/her wage.

By accepting an apprenticeship position rather than working as an unskilled labourer, the trainee incurs a cost in the form of forgone earnings. The value of this is depicted by the pink area *cbd* in Figure 2. This is an investment the worker believes will pay dividends because the pay of a skilled worker exceeds that of an unskilled labourer. In Figure 1b, other things being the same, the lower is the initial apprentice wage (Ob), and the flatter the wage curve W(t), the smaller will be the area *abef*, and the greater will be the share of the cost of training borne by the apprentice.

5 Strictly speaking, because the costs and benefits of investing in skills are incurred/enjoyed at different points in time, any comparison between them should be couched in terms of discounted present values. In particular, an apprentice will earn a positive return on his or her investment in training so long as the discounted present value of the extra wages (s)he will ultimately earn by completing his/her training exceeds the discounted present value of the wages (s)he initially forgoes because early in the apprenticeship his/her wage is less than what (s)he could earn as an unskilled labourer.

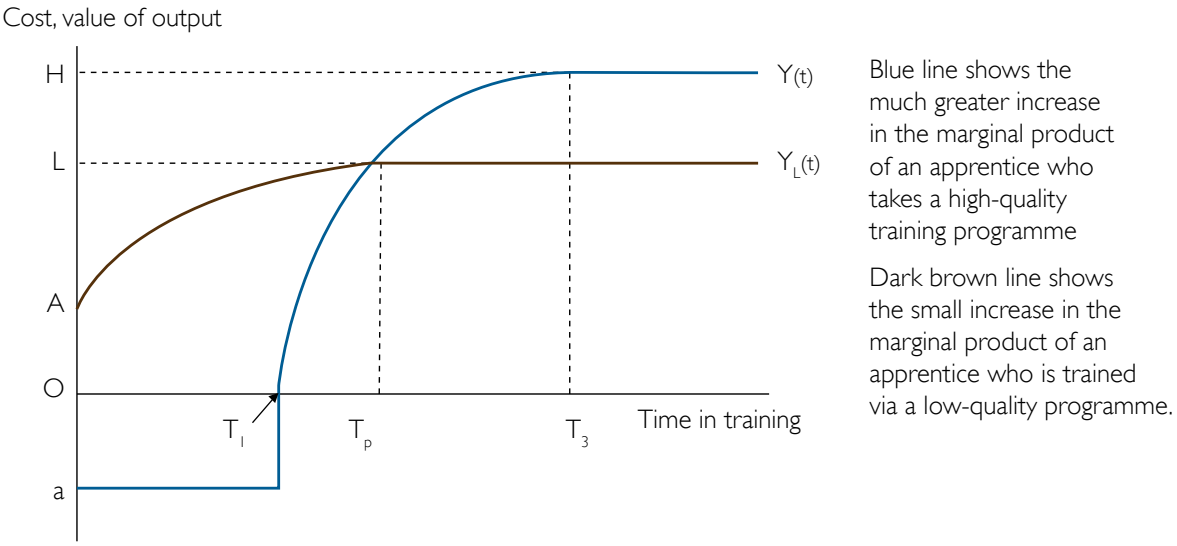
Section 3 below considers the important question of whether the incentives confronting firms and workers encourage them to finance as much training as would be ideal from the point of view of society as a whole.

2.3 LOWER-QUALITY TRAINING

Figures 1a, 1b and 2 are drawn on the (implicit) assumption that the training on offer is high-quality, both in terms of inputs (trainees receive considerable instruction, both on- and off-the-job) and also in terms of output (the productivity of a worker who has successfully completed the programme, OH, is significantly greater than that of an unskilled worker).

Figure 3 illustrates a rather different case, where the employer exploits the ignorance of trainees about the quality of their training and offers low-quality training.

Figure 3: The marginal product over time of trainees receiving low-quality and high-quality training ***(modified from Ryan 1994: Figure 4.2)***



As before, the curve labelled Y(t) describes how the marginal product of apprentices receiving high-quality training varies over time. The new marginal product curve $Y_L(t)$ shows the time path of the marginal product of apprentices who receive poor quality training.

The training on offer is low-quality in that it involves:

- only a small amount of on-the-job instruction;
- little rotation between different tasks and/or departments within the organisation; and
- little or no off-the-job technical, vocational education (Ryan *et al*. 2006; Fuller and Unwin 2008).

Apprentices in receipt of low-quality training learn less, and so acquire lower levels of skill and knowledge, than those in higher-quality schemes. In adopting a low-quality approach to training, employers are effectively changing the position of the Y(t) curve that shows how the apprentices' marginal product varies over time.

The salient attributes of a low-quality training scheme are as follows:

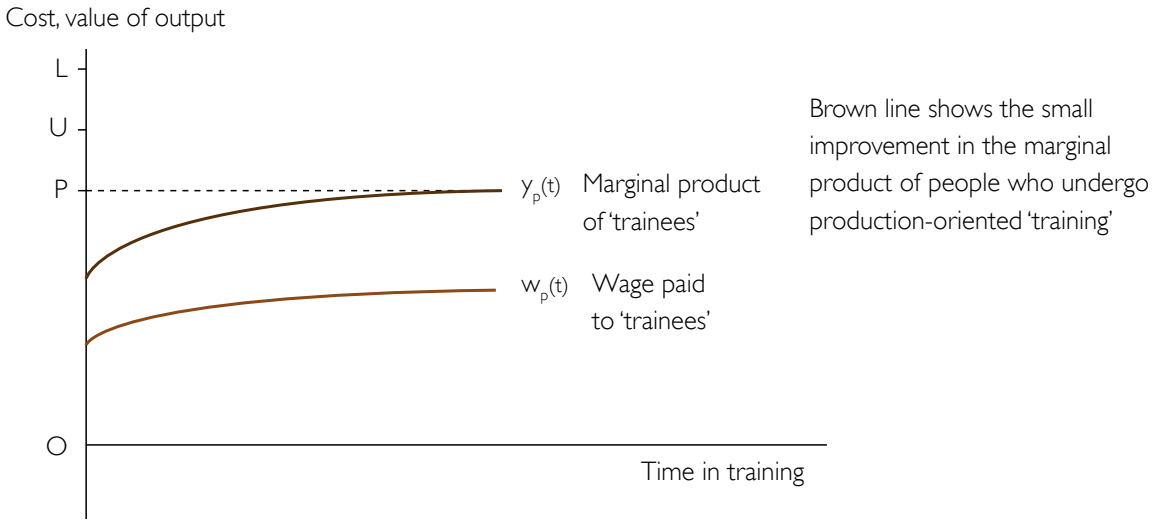
- apprentices in a low-quality programme have a higher initial level of output (OA) than those in the higher-quality one, reflecting the fact that they are on the shop floor and doing some productive work from the outset;
- this contrasts starkly with the way in which, in high-quality training programmes, apprentices have a negative marginal product between $T = 0$ and time T_1, reflecting the fact that apprentices receiving high-quality training often have an initial period of time either in a training workshop or in college on block release;
- however, while under the low-quality programme the apprentices are more immediately useful to the employer than their counterparts in the higher-quality scheme, the deficiencies in their training imply that their productivity plateaus both earlier (at time T_2, rather than time T_3) and at a lower level (OL rather than OH);
- while the provision of low-quality training will enable employers to reduce their overall training costs, this short-run gain will come at the price of a less skilled workforce (with a marginal product of OL) than if a higher-quality approach to training had been adopted (in which case the worker's marginal product would have been OH, as it was in Figures 1a and 1b above).

Workers produced by low-quality training schemes have lower productivity than those who have undergone high-quality training. However, this low-quality approach may be sustainable for firms who adopt relatively unsophisticated approaches to production of the kind associated with a so-called 'low-skills equilibrium'. Such firms aim at segments of the product market that centre on the sale – often only in domestic markets – of low-quality, standardised goods. These can be made by a comparatively poorly-skilled workforce whose members work in narrowly-defined jobs involving a series of repetitive tasks using well-established production techniques (Finegold and Soskice 1988; Finegold 1991; Chapman 1993: 109-11).[6]

The approach to training shown in Figure 3 is not as focused on quality as that in Figures 1a and 1b. However, the apprenticeships on offer may still be described as *investment-oriented*. This is because their primary purpose is to ensure that the employers acquire the future skills they need, given the product-market strategy they have chosen to adopt. A more extreme case of low-quality training occurs when employers no longer treat it as a way of securing future skills but rather view it simply as a means of reducing the cost of current production (Lindley 1975; Wolter and Ryan 2011: 536-38, 546-48). Such an approach to 'training' – hereafter placed in quotation marks to indicate that in practice little genuine training is actually provided – is said to be *production-oriented* and is illustrated in Figure 4.

6 In contrast, a 'high-skills equilibrium' involves firms targeting product market niches devoted to high-quality goods, often in international markets, and using innovative production methods. Workers need both a higher level, and a wider range, of skills in order to undertake the small-batch production, often involving the customisation of goods for specific customers and the use of innovative methods of production, involved in catering for such markets (Finegold 1991: 97-98, 107-10; Soskice 1994: 37-38).

Figure 4: Production-oriented training



Production-oriented 'training' involves employers using 'trainees' to carry out work that would otherwise be undertaken – at a higher cost – by unskilled or skilled workers. Other key aspects of Figure 4 are as follows:

- the wage earned by these 'trainees' (w_p) is less than the wages paid to unskilled labourers (OU) from the outset and at all times during the (supposed) programme of 'training';
- the amount of training provided is so low, relative to the amount of productive work the 'trainees' carry out, that their marginal product exceeds their wage throughout (as illustrated in Figure 4 by the fact that the $y_P(t)$ curve showing how the marginal product of a 'trainee' changes during their employment lies everywhere above the $w_p(t)$ curve showing how their pay varies over time);
- therefore, the net training costs incurred by the employer are negative, so that the firm makes a net profit on its 'trainees' even during the period of so-called 'training';
- because 'trainees' receive little or no actual training, their productivity increases by little if anything over time (as shown in Figure 4 by the very shallow slope of the $y_P(t)$ curve);
- consequently, at the end of their 'training', the marginal product (OP) of the workers who have undergone a production-oriented programme of instruction is considerably less than that of people who have undergone even a low-quality, investment-oriented training programme (OL).

In production-oriented 'training', therefore, employers offer 'apprenticeships' – rather than genuine apprenticeships – because doing so enables them to substitute cheaper for more highly-paid workers in their production process. This reduces the employers' costs and increases their profits. While such behaviour may yield an increase in short-run profits, firms may find it unsustainable in the long-term, as they suffer adverse consequences either from a shortage of skilled labour or from a burgeoning reputation as providers of poor-quality training.

SECTION 3 MARKET FAILURE IN THE CASE OF VOCATIONAL EDUCATION AND TRAINING

3.1 ECONOMIC ANALYSIS OF MARKET FAILURE IN THE CASE OF SKILLS AND TRAINING

We saw in section 2.1 that employers who face an imperfectly competitive market for skilled labour have an incentive to invest in equipping workers with transferable skills. However, market-based incentives alone may be insufficient to encourage them to undertake the socially optimal level of investment in training. The root cause of the problem is that the asset which is created when an employer invests in training, namely a skilled worker, is one over which the employer cannot establish a property right. (Anti-slavery laws prohibit the employer from owning the worker in whom the skills are embodied.) Consequently, the workers in question are free to move to other employers, who may tempt them away from the employer who initially trained them by offering higher wages than the latter can afford, given the need to earn a return on its investment. Such labour mobility means that the potential benefits from training accrue not only to the firm financing it and the workers acquiring the skills, but also to other employers to which those workers might move in the future (Stevens 1996: 29-30).

The prospect of losing its skilled workers implies that the employer making the initial investment in training them will discount the return it expects to earn from its investment, reducing its willingness to finance training. And while the organisations that subsequently recruit the workers benefit from their skills, the employer making the initial investment will not take those broader social benefits – or (positive) externalities, as they are known – into account when deciding how much to invest. The employer focuses only on the (truncated) private returns it expects to enjoy. In this way, the prospect of skilled workers being poached by other firms drives a wedge between the private and the social returns on training, and therefore deters employers from investing as much in training as would be optimal from the point of view of society as a whole. More specifically, from society's vantage point, too few workers will be trained.

To put this point slightly differently, using the language of game theory, the situation faced by the firms is an example of a prisoners' dilemma. This is a situation in which if each individual takes the course of action that it is rational for him to pursue, then the outcome that arises will sub-optimal for the group as a whole. This situation is illustrated in Figure 5 and explained below.

Figure 5: Training as a Prisoners' Dilemma game

		Firm 2	
		Train	Don't train
Firm 1	Train	5, 5	2, 6
	Don't train	6, 2	3, 3

To keep the exposition simple, it is assumed that there are just two firms, each of which can choose between two strategies:

- it can invest in training workers, to a high standard, itself ('Train'); or
- it can choose not to train, preferring to hire workers ready made from the external labour market ('Don't train').

The numbers in each of the boxes in the diagram illustrate the rewards or payoffs to the two firms from the outcomes arising when the players choose particular combinations of strategies. Firm 1's payoff is shown by the first number in each box, while firm 2's payoff is shown second. The rationale for the payoffs is as follows.

- An industry as a whole will be better off if its constituent firms all, or almost all, engage in training, because that will ensure the existence of an adequate pool of skilled workers from which all firms can benefit. This outcome is represented by the top left-hand box in Figure 5, where both firms receive a payoff of 5.
- However, each individual firm will do best – in the sense of maximising its payoff – if other firms train but it does not, choosing instead to 'free-ride' on the other firms' development of skilled workers by luring them away with offers of higher wages once they have been trained elsewhere. For example, Firm 1 does best, gaining a payoff of 6, when it chooses not to train, but Firm 2 does train. This is because Firm 1 does not incur the cost of training skilled workers but can acquire them by luring them away from its rival. Firm 2 does poorly in this case, earning a payoff of just 2, because it incurs the costs of training but, because it loses some of its skilled workers, does not earn a good return on its investment. This case is represented by the bottom left-hand box in the payoff matrix.
- The opposite is true if Firm 1 trains and Firm 2 does not, as shown in the top-right box in the matrix.
- However, if every firm thinks along these lines, and attempts to satisfy its need for skilled workers principally via recruitment, then too few workers will be trained overall. This leads to problems such as poaching, rising wages costs, and shortages of skilled labour. Both firms earn a relatively low payoff of 3. This is shown in the bottom right-hand box in the payoff matrix.

If this game is played just once, then both firms have what economists refer to as a 'dominant strategy' (that is, a strategy that is a best course of action for the firm in question, irrespective of what its rival chooses). To see why, suppose that we view the situation from the vantage point of Firm 1. Let us consider what Firm 1's best response is to the two courses of action open to Firm 2.

- If Firm 2 chooses 'Train', so that we are considering the left-hand column in the payoff matrix, then Firm 1 will receive a higher payoff (of 6) if it chooses 'Don't train' than if it decides to 'Train' (in which case its payoff will be 5).
- Equally, if Firm 2 chooses 'Don't train', so that the relevant column in the payoff matrix is the right-hand one, then Firm 1 will receive a higher payoff (of 3) if it too chooses 'Don't train' (payoff of 3) than if it decides to 'Train' (payoff of 2).

So if Firm 1 is rational, in the sense that it aims to maximise its payoff, then it will choose 'Don't train' irrespective of what Firm 2 does. The same is true of Firm 2. In other words, each firm has dominant strategy, namely 'Don't train'.

If both firms select their dominant strategy, then the outcome will be that shown in the bottom right-hand cell of the payoff matrix. This outcome leaves both worse off – with a payoff of 3 – than they would be if both choose to 'Train' (in which case both would enjoy a higher payoff of 5). This is a situation where, as economists put it, there is a conflict between individual rationality and collective rationality. When each firm selects the individually rational, payoff-maximising course of action, picking their dominant strategy, the outcome leaves both firms worse off than they could otherwise have been. Both would achieve the higher payoff of 5 if they could commit to training workers, but the individual incentives confronting them discourage them from doing so (Finegold 1991: 103-06; Chapman 1993: 95-99).

The basic principles that should inform and govern the finance of apprenticeship training can now be distilled from the above analysis. Apprenticeship training benefits three parties:

- apprentices gain transferable skills that enable them to command higher pay;
- the employers who help to train apprentices benefit through having access to more skilled workers; and
- society as a whole, including employers who do not participate in apprenticeship training, is better off because of the productivity gains facilitated by an increase in the supply of human capital.

Achieving what from the vantage point of society as a whole is the optimal volume of apprenticeship training requires that the three sets of beneficiaries contribute to the cost of that training, in proportion to the share of the benefits they derive from it. Only then will each party have the correct incentives to invest. The parties who stand to benefit most from an increase in the supply of skilled labour should bear a correspondingly high proportion of the cost of training. This is because only they will be willing to incur the costs in question. Those groups which derive only limited gains from apprenticeships should have to cover only a correspondingly small share of the costs of producing those skills. This is because the fact that they expect to gain only a comparatively small share of the benefits will discourage them from making anything more than a limited contribution towards financing those skills.

If the costs of training are not shared amongst the beneficiaries along these lines, then the optimal volume of training will not take place. That is precisely the problem created by the existence of externalities to training. If training generates external benefits, then the implication is that the members of one group that incurs a considerable proportion of the cost of training, namely apprentice employers, are unable to appropriate a correspondingly large share of the benefits. This reduces their incentive to invest in training to a level below what society as a whole would wish. A second group of players, namely the employers who recruit skilled workers trained by other firms, enjoy a positive share of the benefits of the training. However, because they are not required to make any contribution to financing that training, they contribute nothing towards it. Therefore, they do not make up for the shortfall in investment on the part of those employers who do train, leading to too low a volume of training overall. The rationale for a government subsidy is, of course, to make good this shortfall (Steedman 2008: 3-5, 11).

Therefore, while firms in imperfectly competitive labour markets have reason to invest in training their workers, the incentives they face may be insufficient to motivate them to carry out the socially optimal amount of training. There may be

potential for government intervention to remedy the problem of under-investment in transferable skills by sharpening the incentives for firms to train. In particular, the granting of subsidies to employers that train apprentices can increase the private return that employers expect to earn from their investment in transferable skills until it equals the social return. This would give employers an incentive to train more workers, as the socially optimal outcome requires (Streeck 1989: 93-94; Finegold 1991: 104; Chapman 1993: 95-105; Stevens 1999; BIS 2010a: vii, 35-36, 2010b: 43-49, 73).

3.2 THE PERSPECTIVE PROVIDED BY HUMAN RESOURCE MANAGEMENT (HRM)

Economic theory indicates that employers may attempt to reduce the likelihood of poaching by reducing the breadth and generality, and therefore the transferability, of the skills with which they equip their workers. This may, for example, involve firms cherry-picking apprenticeship modules to suit their specific needs rather than those more general modules that will better serve the long-term interests of the apprentice (Finegold and Soskice 1988: 40; Stevens 1994, 1996: 30-31).

This point is emphasised not only by economics literature but also by literature on human resource management (HRM). The theoretical perspective on apprenticeship provided by HRM focuses on the compatibility or 'fit' between apprenticeship and the employer's wider HR practices. On this view, the tighter the fit between training, job content and other HR practices, the more the benefits of training will accrue to the employer who provides it rather than to its competitors and the greater will be the use of training relative to recruitment. The HRM perspective suggests, therefore, that employers will select their approach to training so as to maximise the mutual consistency or 'fit' between the mode of training in question, the content of the jobs in their organisations, and their other HR practices (Green 2000: 263–264). This may involve the firm trying to narrow the content of the apprenticeship, both through the selection for its apprentices of a range of modules which are closely tailored to the firm's specific requirements, and also through reduced off-the-job vocational education. One potential advantage of the external accreditation of apprenticeships by professional bodies, as suggested by the Richard Review of Apprenticeships, is that – by requiring apprenticeships to conform to the requirements set by professional bodies – it promises to help offset this tendency towards narrowness and ensure that apprentices are equipped with general, transferable skills (Richard 2012).

There is one important respect in which economics and HRM diverge in their analysis of apprenticeship. Economics suggests that the external certification of skills normally associated with apprenticeship training will lead to higher rates of labour turnover, and thence to lower rates of return on training. HRM points to a different possibility, namely that certificated training of the kind involved in apprenticeship may actually reduce turnover. The reason is that by offering their apprentices good training followed by a realistic prospect of promotion up through the organisation, employers can demonstrate to the young people that they are valued, that the employer is willing to invest in them, and that they have a good opportunity to develop their career within the organisation. This should reduce the likelihood that they will want to leave. On this view, employees may view certificated qualifications as a passport to promotion within the organisation that trained them, not as an escape route to a different employer. External certification may therefore reduce

turnover and increase the rewards that employers gain from their investment in training. If that is indeed the case, then employers may be more favourably disposed towards external certification – and apprenticeships – than economic theory predicts.

Ultimately, the extent to which equipping trainees with transferable, reliably certificated skills leads to increased labour turnover and thereby deters employers from training apprentices is an empirical matter. Far from increasing labour turnover, apprenticeship training might even make skilled workers less likely to leave the firm that trained them. Apprenticeship training might promote loyalty and commitment, thereby reducing turnover. (See, for example, Ryan and Marsden 1995: 71; Ryan *et al*. 2007: 140-41; Lewis 2012: 29.) However this process of loyalty-building via apprenticeship training might be more likely in larger firms with well-developed internal labour markets that afford employers ample opportunities for promoting young people, than with the smaller firms where opportunities for promotion may be more limited.

SECTION 4 CONCLUSION

This paper sets out the economic analysis of apprenticeship training. The theory of human capital under asymmetric information has been used to explain why both employers and employees might be willing to invest in such training (Section 2).

However, the perspective provided by economic theory suggests that employers may be deterred from investing in apprenticeship training by concerns about whether newly qualified (ex-)apprentices will remain with them long enough for the employer to earn a positive overall return on its investment in their skills.

The upshot is a situation in which the rational conduct of employers and apprentices may lead to a situation in which, from the point of view of society as a whole, there will be too little investment in apprenticeship training, so that too few apprentices will be trained. While the alternative perspective provided by HRM suggests that the scale of this problem may be exaggerated in the case of large firms, there is nevertheless a *prima facie* case for government intervention to support apprenticeship training. This would be most notably in the form of subsidies to encourage SMEs in particular to train more apprentices.

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